Keysight N5511A
Phase Noise Test System

Getting Started
Guide

KEYSIGHT
TECHNOLOGIES

Notices

Trademark Acknowledgments

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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 the following URL:

http://www.keysight.com/find/n5511a

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/techsupport

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1 Initial Setup

Introduction

Use this guide to unpackage and set up your benchtop N5511A Phase noise test system.

Check all the cable connections to the Phase detector, Data Converter and Reference modules.

Power on the N5511A unit for the first time. The N5511A system will arrive with the instrument software and licenses already installed. Before making your first measurement, you should check the installed assets and add any additional assets to the system.

After adding the reference sources (spectrum analyzer and oscilloscope (not required)) to the system, perform the first measurement. Perform the system functional check by making an Absolute Phase Noise Measurement as your first measurement.

NOTE

If you need to upgrade the phase noise software in the N5511A system controller for any reason, refer to the N5511A Phase Noise Test System User's Guide for information and procedures.

Use Table 1-1 as a guide to the chapters to use for your benchtop system:

Table 1-1 N5511A installation reading road map

Benchtop
Chapter 1, "Initial Setup"
Chapter 2, "General Information"
Chapter 3, "System Interconnections"
Chapter 4, "Making a Measurement"
Chapter 5, "Recovery"
Chapter 6, "Service, Support, and Safety Information"

Unpacking and Inspecting the System

This section presents procedures for unpacking a benchtop model. Do not attempt to unpack your system without reviewing them.

To unpack a benchtop system

To unpack an N5511A benchtop system, you need the following tools:

- Safety glasses
- Utility knife

NOTE Retain all packing material—front panel instrument cover, boxes, and foam—for future use should you need to move the system to another location or return for service.

1. Cut open the shipping container.
2. Remove and open the accessory shipping box.
3. Remove the box contents list.
4. Retain all calibration and shipping documents.

Verify shipping contents

After unpacking the shipping container, the next step is to inspect the contents thoroughly to ensure that nothing was damaged during shipment.

NOTE

If the container or packing material is damaged, the contents should be checked both mechanically and electrically. If the contents are damaged or defective, contact your customer support engineer through your local Keysight Technologies Service Center. Keep the shipping materials for the transport company's inspection.

Verify that all parts and materials are included in your shipment:

- N5511A Phase Noise Test System - Getting Started Guide
- Certificate of Calibration
- Power cord

  The N5511A system is shipped with an AC power cord appropriate for your location.
- Instrument connectors and adapters specific to your system
- Keyboard and mouse
- Torque wrench, 8 inch-pound, 5/16-inch, p/n 8710-1765
- N5511A Phase Noise Test System Users Guide[a]

  a. Available online @ http://www.keysight.com/find/n5511a

NOTE

User must supply monitor with display port cable.

Table 1-2 N5511A Cables and Accessories

N5511A - 540			
Qty	**Part #**	**Description**	**Specifications**
1	0955-3206	Microwave Power Splitter	10 - 40 GHz, Female 2.92 mm
2	8121-3154	Cable assembly	6.22 inch, 2.92 mm to 2.92 mm

Remove Shipping Cover

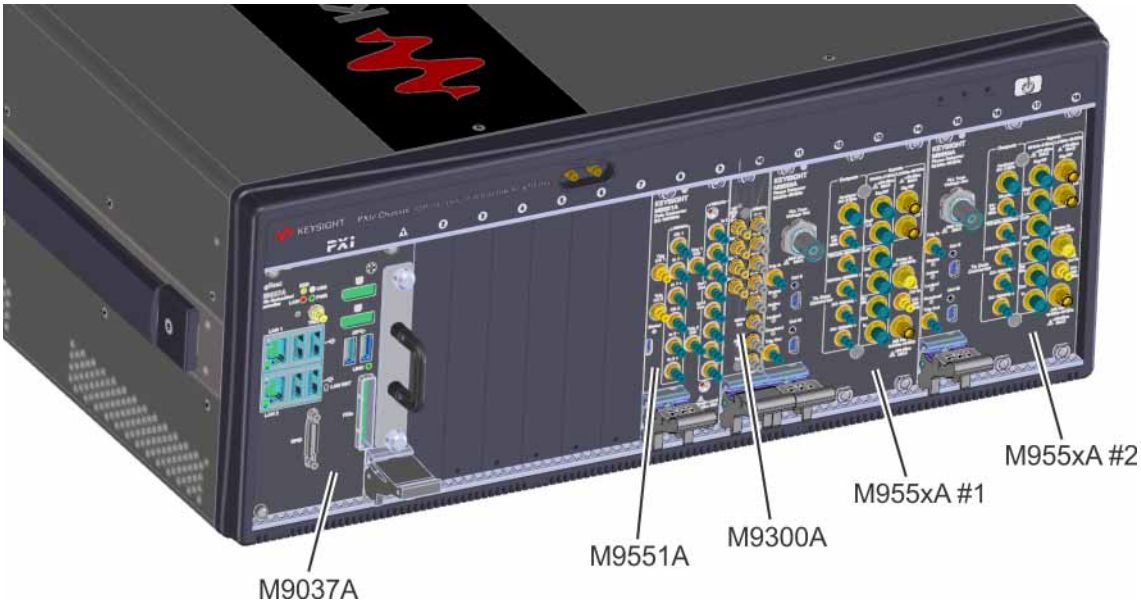
The N5511A system is shipped with a protective cover over the front panel. Remove the cover using a T-20 driver (not included) to remove the 8 screws attaching the cover to the chassis.

NOTE

Retain the protective cover and screws for future use should you need to move the system to another location or return for service. The screws can be inserted into the top of the protective cover for storage.

System Components

Figure 1-1 Keysight N5511A Phase Noise Test System



The N5511A system is available as a benchtop model. Due to the system's flexibility, the hardware in the system varies with the options selected. You may be installing instruments you already own in the system as well. A typical N5511A system includes these components:

- N5511A PXIe chassis
- M9037A Controller with removable SSD drive with Windows 10 Professional
- M9551A Data Converter
- M9300A Frequency Reference
- M9550A Phase Detector 1 or 2

Making Connections

Use the information in this section to connect your system hardware.

CAUTION

Make all system hardware connections without AC power applied. Failure to do so may result in damage to the hardware. Make connections in a properly grounded environment. Keysight recommends wearing grounding wrist or foot straps. Failure to do so may result in damage to the hardware.

1. **Verify all cables connected to instruments with the appropriate connectors and adapters, using the following pages in this section.**
2. **You may connect other assets (in addition to those supplied with the system) either at this time or after running the confidence test.**
3. **Lastly, connect the power cord(s) to the AC power supply.**

Before connecting the cables to any device:

CAUTION

Keysight Technologies recommends the use of adaptors as connector savers to extend the lifespan of the test ports on the N5511A Phase Noise Test System.

USE CAUTION WHEN INSTALLING ADAPTORS! Rotation of the adaptor after the connectors are engaged will damage the connector on the system.

– Check all connectors for wear or dirt.

– When making the connection, torque the connector to the proper value.

Proper Connector Torque

– Provides more accurate measurements

– Keeps moisture out of the connectors

– Eliminates radio frequency interference (RFI) from affecting your measurements

The torque required depends on the type of connector. Refer to Table 1-3. Do not overtighten the connector.

Never exceed the recommended torque when attaching cables.

Table 1-3 Proper Connector Torque

Connector	Torque cm-kg	Torque N-cm	Torque in-lbs	Wrench P/N
Type-N	52	508	45	hand tighten
3.5 mm	9.2	90	8	8710-1765
2.92 mm	9.2	90	8	8710-1765

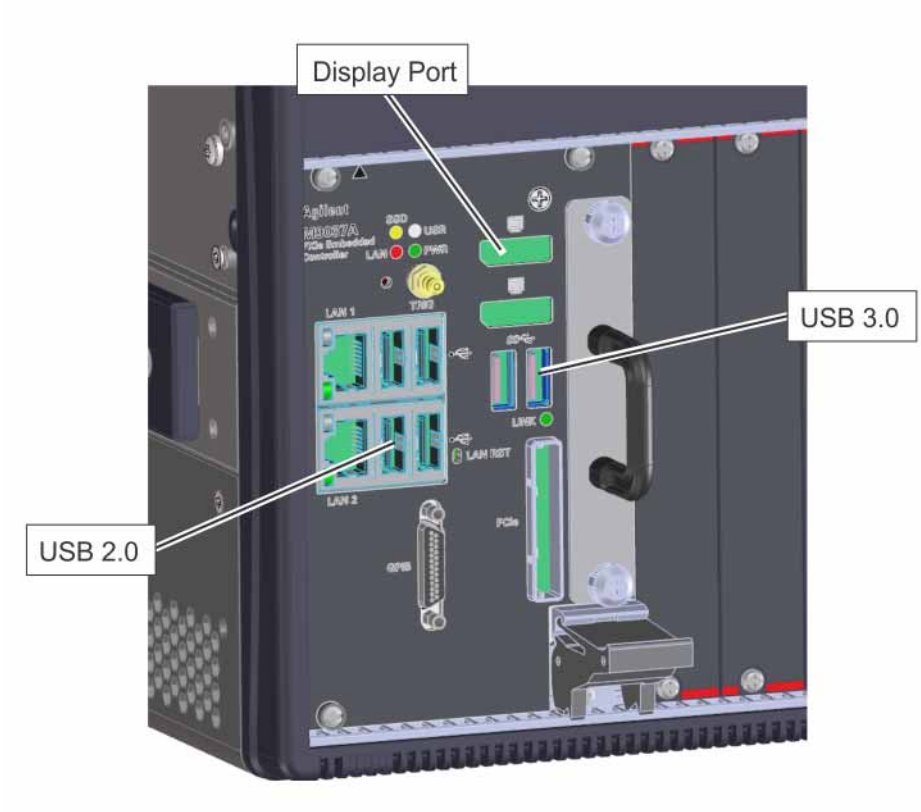
Connecting a Display to your System

The N5511A Phase noise test system does not have a display.

You will have to provide a monitor to view the user interface. Connect a display port cable to the M9037A controller display port connection and your monitor.

NOTE You can use an adapter for other monitor cable types to the display port.

Figure 1-2 M9037A Controller Display Port



Connect the keyboard and mouse to the USB 2.0 ports.

NOTE Proper ergonomics should be considered when using accessories such as a keyboard or a mouse.

Powering the System On

Connect your system to an appropriate AC power source using the power cord provided.

The N5511A system is shipped with an AC power cord appropriate for your location.

WARNING

Before applying power, make sure the AC power input and the location of the system meet the requirements given in Table 2-7 on page 34. Failure to do so may result in damage to the system or personal injury.

NOTE

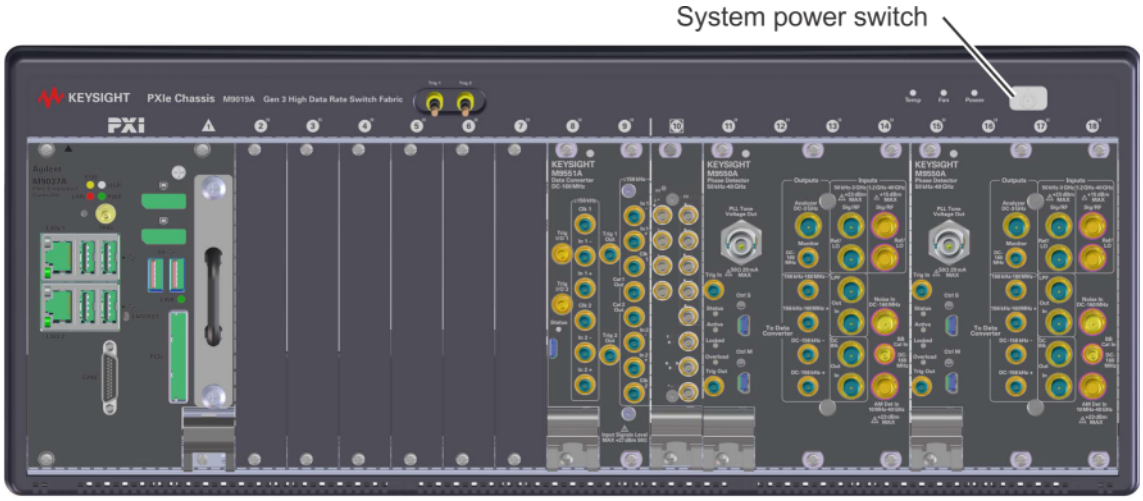
Warm-up Time: The downconverter and RF source instruments contain ovenized oscillators which must warm up for 30 minutes to produce accurate measurements.

Standby Mode: The RF source uses a standby mode to keep the ovenized oscillator warm when the instrument is connected (plugged in) to AC power, even when the power switch is in the off position. To completely shut down the instrument, you must disconnect it from the AC power supply.

The N5511A Benchtop system consists of an N5511A Phase Noise Test System with one or two test sets installed. You must connect a monitor, keyboard, and mouse before powering on the system.

Press the system power switch.

Figure 1-3 Power on the N5511A System



To power on a racked system

1. Press the system power switch (front, top right of the rack) to the on position.
2. Verify that all instrument power switches are on.
3. Allow the system to warm up for 30 minutes.

Starting the Measurement Software

The N5510 software is pre-installed on the N5511A Phase Noise system.

CAUTION

Keysight Technologies, Inc. **has not provided internet security software** for this N5511A Phase Noise Test System. Connecting the PC to a Local Area Network (LAN), without first installing internet security software (firewall, virus protection, etc) puts both your PC and data at risk. If you decide to connect the N5511A to a LAN, without first installing internet security software, you do so at your own risk.

Keysight recommends turning on Windows updates and installing updates when available from Microsoft.

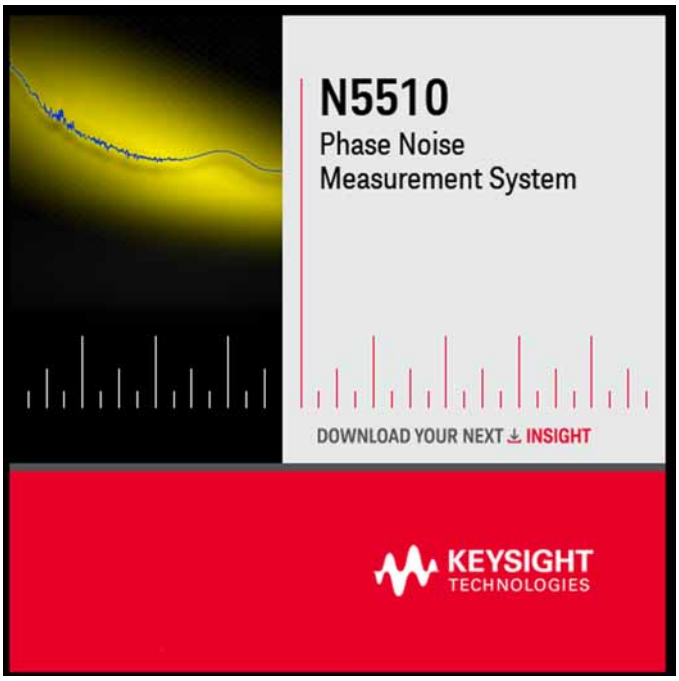
NOTE

During the first boot up of the system, you will see the Windows End-User License Agreement screen. Click **Agree** to continue. If **Disagree** is selected, the system will shut down and the same EULA will appear when the system is booted.

Choose the N5510 software icon 

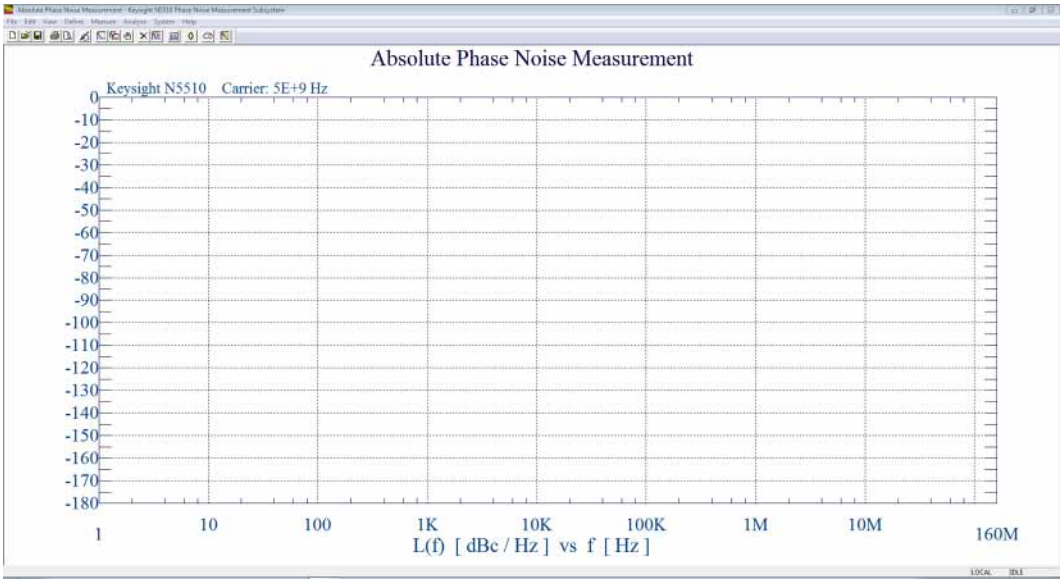
to launch the user interface.

Figure 1-4 Splash Screen



1. To start the program, double-click on the N5510 icon on the desktop shortcut (shown above), or navigate to the N5510 User Interface through the Windows start menu. Click **Start > All Programs > Keysight N5510 > N5510 User Interface**.
2. When the program starts, the main N5510 measurement window appears (see Figure 1-5). It shows the phase noise graph.

Figure 1-5 Main N5510 user interface window

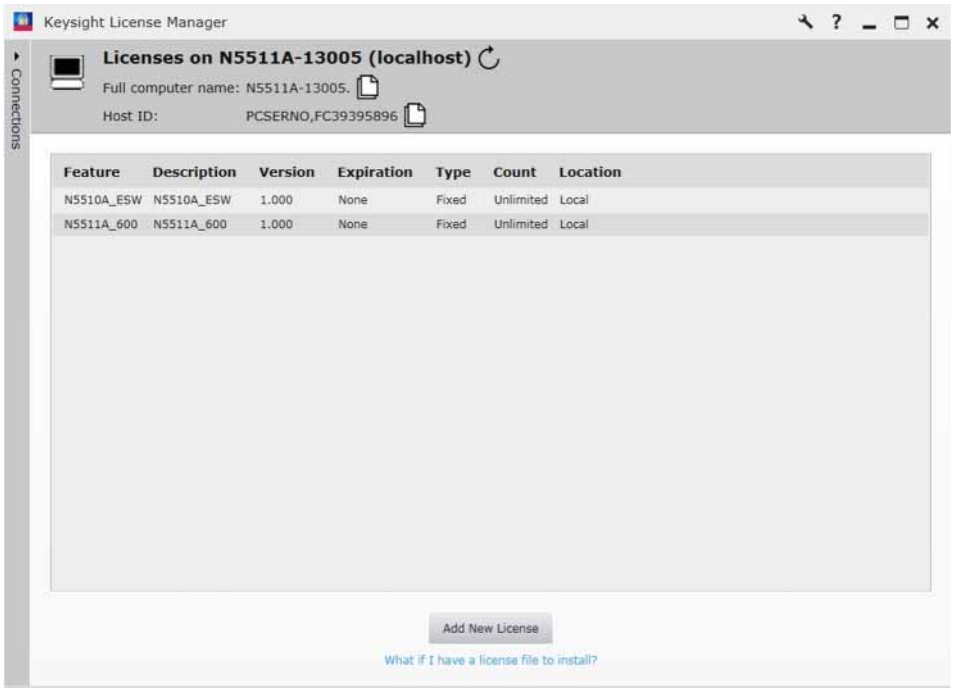


Verify License Key is Installed

NOTE The N5511A will have the license key already installed, but if you ever need to install the license key, use the following procedure.

3. Use the Keysight License Manager to see the license keys installed. **Start > All Programs > Keysight License Manager > Keysight License Manager**
4. Verify the licenses are installed.

Figure 1-6 Keysight License Manager



Asset Manager

The Asset Manager adds assets to the N5511A system. All the test sets and digitizers should be installed at the factory. The procedure is essentially the same for any asset. We use a source as an example. Adding an asset involves two steps, once the hardware connections have been made:

– Configuring the asset

– Verifying the server hardware connections.

NOTE Reloading or installing a software update will require re-installing all the assets.

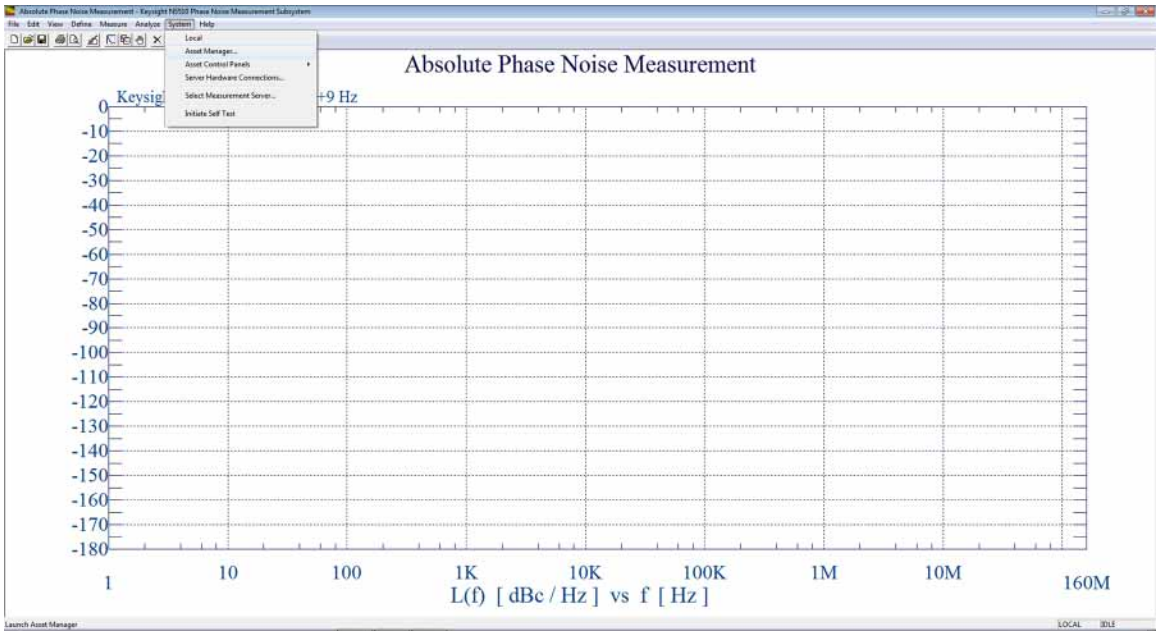
NOTE If you have not already connected the assets to the system, do so now. Be sure to power off the system before making all hardware connections other than LAN. (For more information on connecting assets, see Chapter 3, “System Interconnections”)

NOTE Instruments that only have GPIB interface will use the 82357B USB to GPIB Interface Adapter.

Configuring an Asset

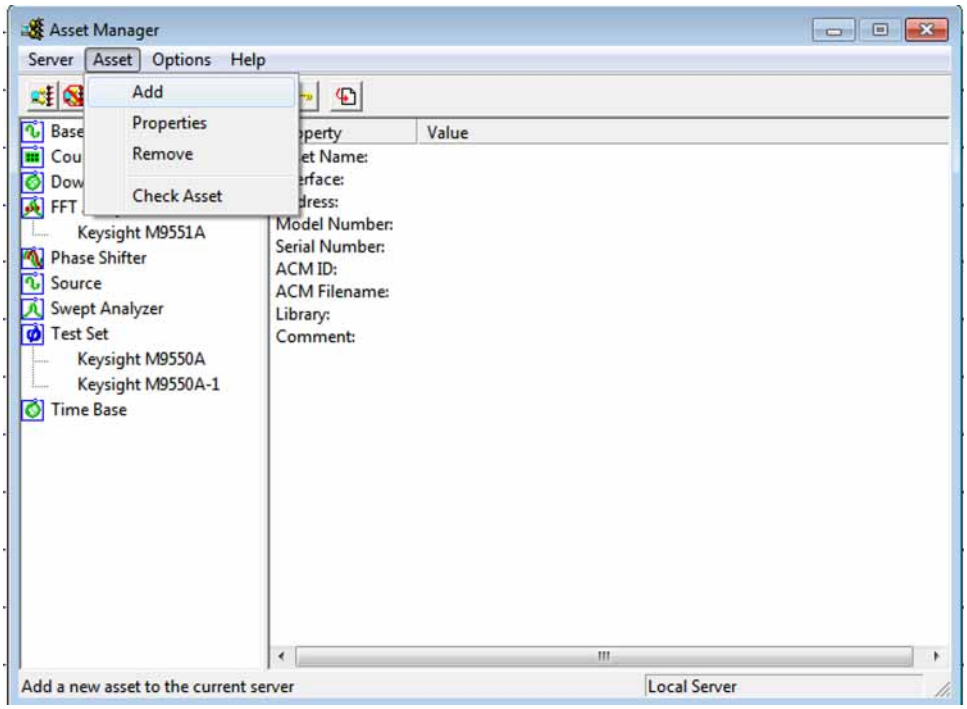
1. Using Figure 1-7 as a guide, navigate to Asset Manager. For this example we invoke the Asset Manager Wizard from the N5510 main screen. This is the most common way to add assets.

Figure 1-7 Navigate to Asset Manager



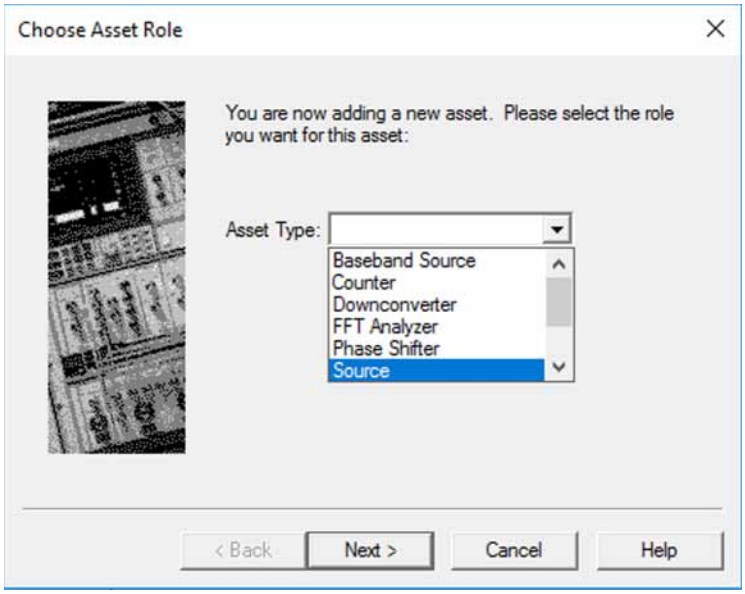
2. Refer to Figure 1-8. Select Add in the Asset Manager window.

Figure 1-8 Navigate to Add in Asset Manager



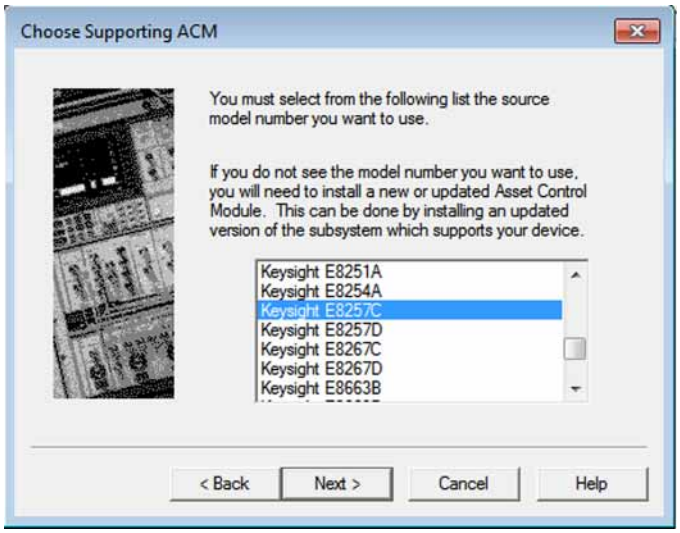
3. Refer to Figure 1-9. From the Asset Type pull-down list in Choose Asset Role dialog box, select Source, then click Next.

Figure 1-9 Select source as asset type



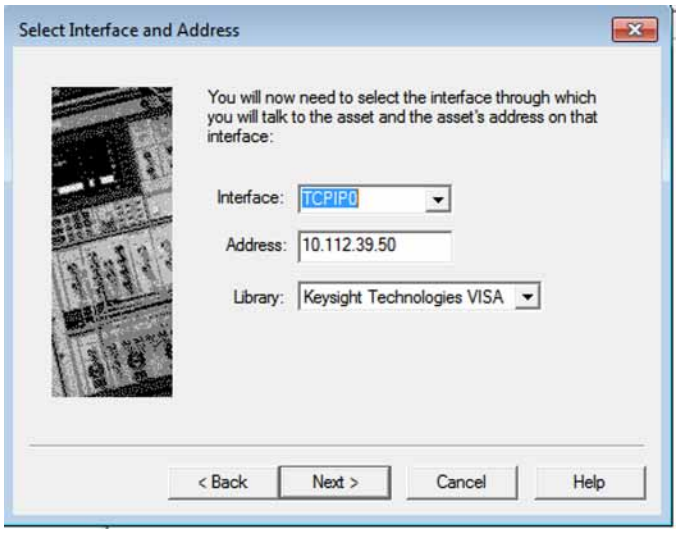
4. Refer to Figure 1-10. Click on the source to be added, then click the Next button.

Figure 1-10 Choose source from list and select Next



5. Refer to Figure 1-11. From the Interface pull-down list, select TCPIP0.
6. In the Address box, type the IP address of the source.

Figure 1-11 Select Interface, Address, and I/O Library



NOTE 19 is the default address for the Keysight 8663A sources, including Keysight 8662A, 8663A, 8644B, and E82X7A/C/D. The following table shows the default GPIB address for all system instruments.

NOTE GPIB interface is via the USB to GPIB Interface Adapter, model 82357B, p/n 82357B-FG.

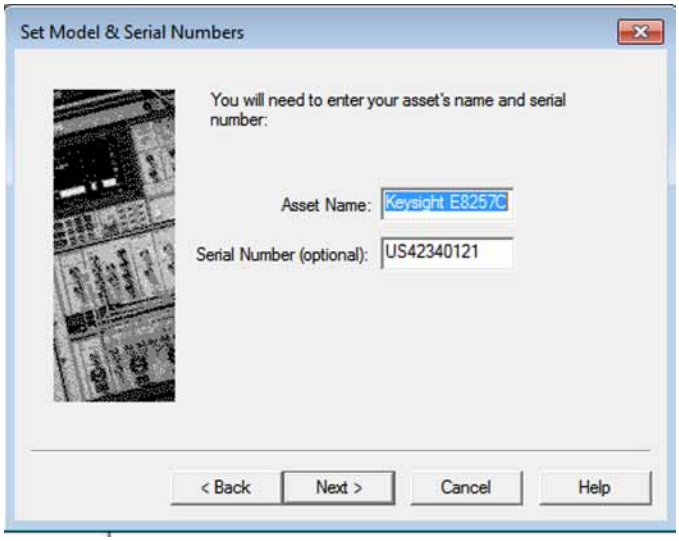
Table 1-4 Default GPIB addresses

Instrument	Address
Test set 1	20
Test set 2	21
RF analyzer	17
FFT analyzer (PC digitizer card)	1
FFT analyzer (89410A)	18
Source # 1	19
Source # 2	23
Counter	3
Keysight E1430 VXI digitizer	129
Keysight E1437 VXI digitizer	192
Keysight E1420B VXI counter	48
Keysight E1441 VXI ARB	80
Keysight GPIB Secondary port	22

7. In the Library pull-down list, select the Keysight Technologies VISA. Click the Next button.

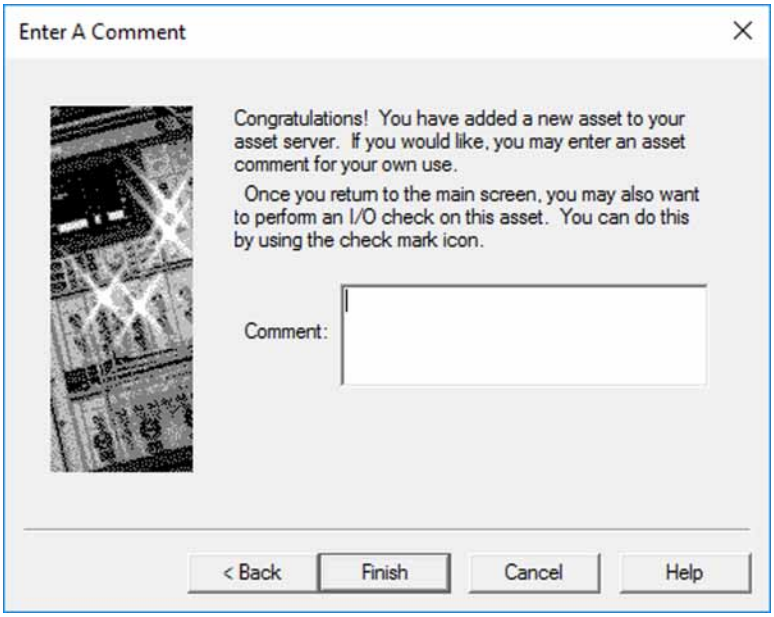
8. Refer to Figure 1-12. In the Set Model & Serial Numbers dialog box, type in your source name and its corresponding serial number. Click Next.

Figure 1-12 Enter asset and serial number



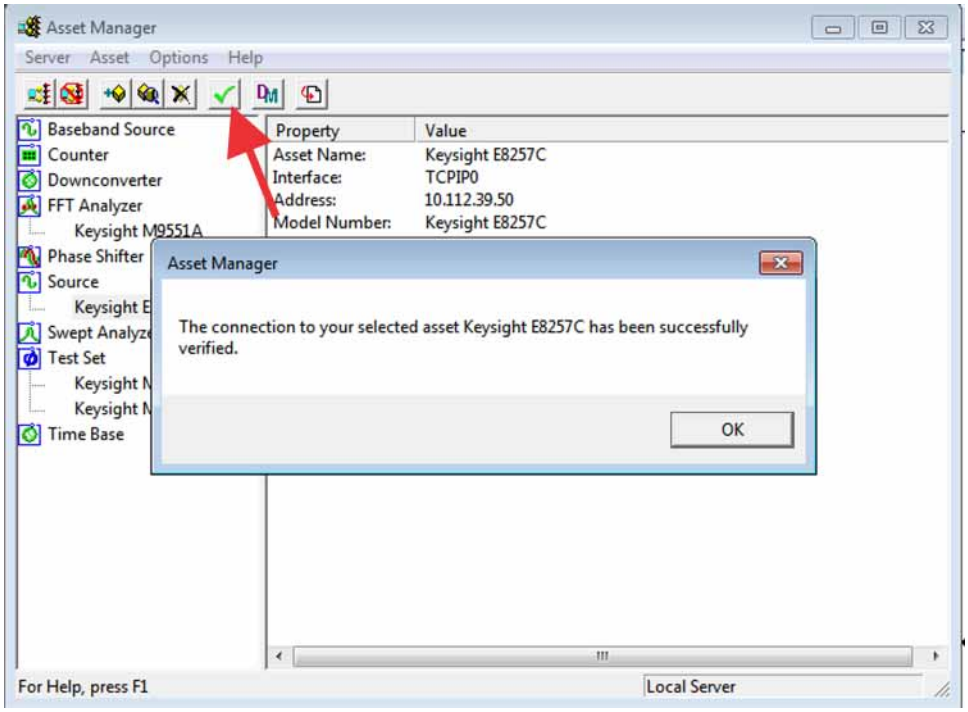
9. Refer to Figure 1-13. In the Enter A Comment dialog box, you may type a comment that associates itself with the asset you have just configured. Click Finish.

Figure 1-13 Enter comment



10. Refer to Figure 1-14. In the Asset Manager window, select the source in the left window pane. Click the check-mark button on the toolbar to verify connectivity.

Figure 1-14 Click Check button



The Asset Manager displays a message verifying the connection to your asset. This indicates that you have successfully used the Asset Manager to configure a source.

11. To exit the Asset Manager, on the menu select Server/Exit.

Powering the System Off

1. On the N5510 software menu, select File\Exit, Start icon, then shut down. Always shut down the N5510 software before powering off the N5511A system.
2. Use the Start menu to shut down the PC. Press the power switch on each instrument to the off position.

If you receive error messages during the power on or off procedures, or during operation, use the Windows event log for detailed information on the errors.

2 General Information

This chapter introduces you to the Keysight N5511A Phase Noise Test System. It contains an overview of the system, system specifications, and cable connections.

System Overview

The Keysight N5511A Phase Noise Test System provides flexible sets of measurements on one-port devices such as voltage controlled oscillators (VCOs), dielectric resonator oscillators (DROs), crystal oscillators, and synthesizers, and on two-port devices such as amplifiers and frequency converters. The N5511A system measures absolute and residual phase noise, and AM noise for CW and pulsed signals. It operates in the frequency range of 50 kHz to 40 GHz.

The N5511A Phase Noise Test System combines standard instruments, phase noise measurement components, and PC software for maximum flexibility and re-use of assets. The system PC operates under Windows 10 Professional and controls the system through the N5510 measurement software. The N5510 software enables many stand-alone instruments to work in the system. This stand-alone instrument architecture easily configures for various measurement techniques, including the absolute phase noise PLL/reference-source technique, and delay-line and FM-discriminator methods.

The N5511A system is available as a benchtop model. Due to the system's flexibility, the hardware in the system varies greatly with the options selected. You may be installing instruments you already own in the system as well. A typical N5511A system includes these components:

- N5511A PXIe chassis
- M9037A Controller with removable SSD drive with Windows 10 Professional
- Keysight N5510 Phase Noise Measurement software
- M9550A Phase Detector 1 or 2
- M9551A Data Converter
- M9300A Frequency Reference
- Microwave Power Splitter

Customer provided monitor with display port cable and RF source(s).

Additional instruments may include a spectrum analyzer, oscilloscope, RF counter, and power meter.

For detailed information on the instruments in your Keysight N5511A Phase Noise Test System, refer to the individual instrument user guides.

Figure 2-1 Keysight N5511A benchtop system

Figure 2-1 shows the N5511A Phase Noise Test System.

The N5511A can replace earlier Keysight E5505A phase noise systems. The N5511A system uses a LAN or USB/GPIB port to communicate with the assets in the system. However, the N5511A system and N5510 software are backwards compatible with earlier E5505A systems and instruments. You may easily integrate existing assets into your N5511A system. Figure 2-2 and Table 2-1 show the N5511A and earlier-model equivalents.

GPIB communication is done by using an 82357B GPIB to USB interface adapter.

Figure 2-2 Keysight E5505A system comparison to N5511A system, typical configuration

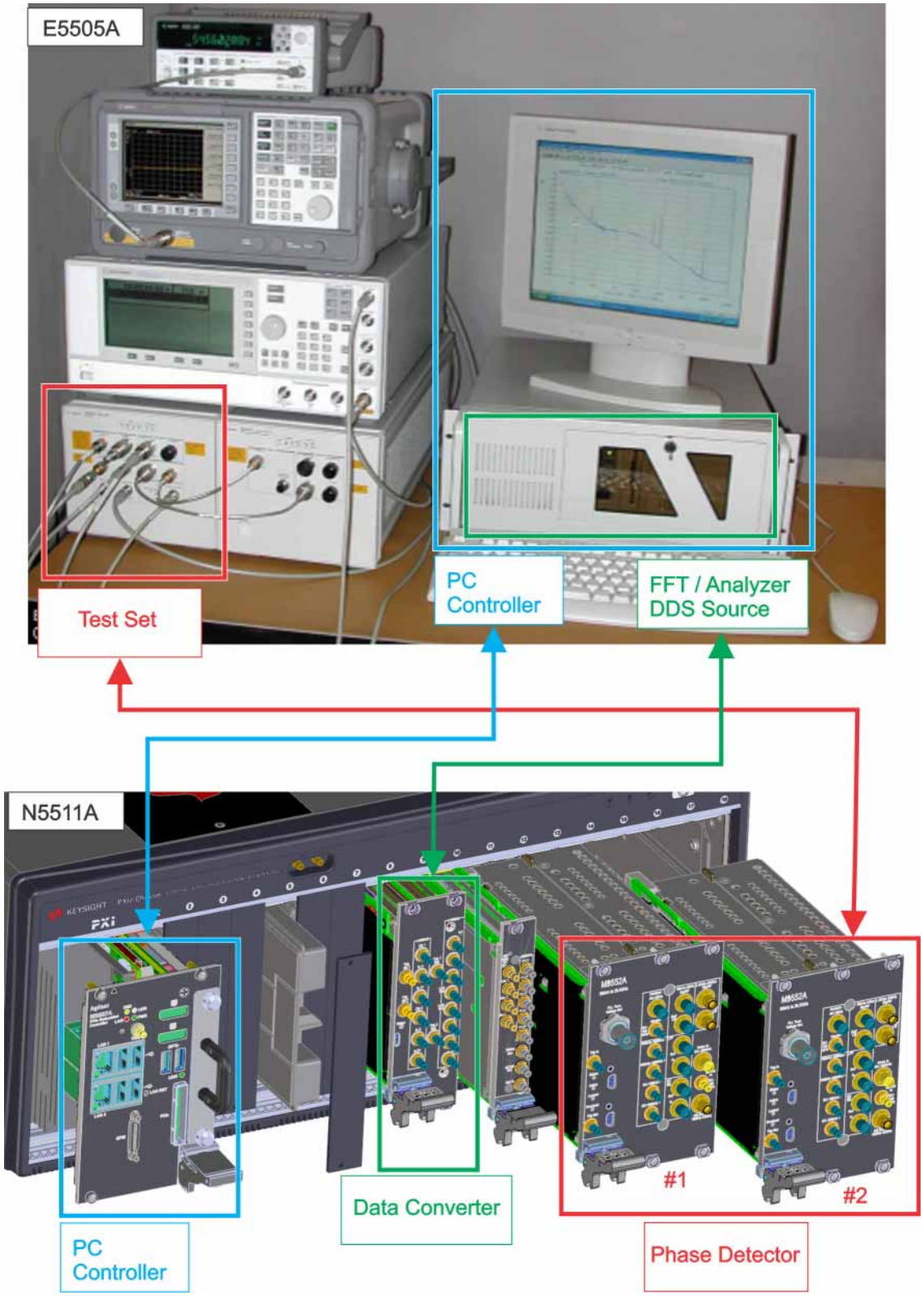


Table 2-1 Equivalent system/instrument model numbers

System or Instrument	Number	Old Number
Phase Noise Test System	N5511A	E5505A
50 kHz - 40 GHz phase detector	M9550A	N5500A-201 50kHz - 26.5 GHz Baseband Test Set
FFT/ Data Converter DC - 160 MHz	M9551A	E5505A-RHK PC with data converter card and swept analyzer

System Specifications

This section contains mechanical and environmental specifications, operating characteristics, power requirements, and PC requirements for the system.

Table 2-2 contains the mechanical and environmental specifications for a system. Table 2-3 shows the system's operating characteristics.

The N5511A Phase Noise Test System is designed for indoor use only.

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

Table 2-2 Mechanical and environmental specifications

Specifications	Values
Temperature:	
Operating	0 °C to 55 °C (32 °F to 131 °F)
Non-operating/storage	-40 °C to 70 °C (-40 °F to 158 °F)
Altitude	9842.5 ft (3000 m)
Relative humidity	Maximum Relative Humidity (non-condensing): 95% RH up to 40° C, decreases linearly to 45% RH at 55° C[a]
Air flow space required	Refer to the section "Equipment Installation" for air flow requirements for bench top systems as well as rack mount systems.
System weight:	
Approximate, typical	46 lbs (21 kg)
System dimensions:	
Height	192 mm (7.5 in)
Width	445 mm (17.5 in)
Depth	466 mm (18.3 in)

a. From 40° C to 55° C, the maximum % Relative Humidity follows the line of constant dew point.

Table 2-3 Operating characteristics

Warm up time required	30 minutes
Carrier frequency Input Range	50 kHz to 40 GHz
System noise response	–175 dBc/Hz typically (>10 kHz offsets)
System spurious response	≤ 120 dBc typically
External noise input port	0.01 Hz to 160 MHz
Measurement accuracy	±2 dB (<1.0 MHz offsets) ±4 dB (<160 MHz offsets)

CAUTION To prevent damage to the M9550A Phase Detector, do not exceed the input port voltage limits shown in Table 2-4.

Table 2-4 M9550A Phase Detector Input Port Voltage Limits

M9550A Input Port	Maximum Input Voltage
+15 dBm port	1.3 VAC
+23 dBm port	3.2 VAC

Table 2-5 Offset Frequency Ranges

Offset Frequency	Detector Input Frequency
0.01 Hz to 20 kHz	50 kHz to 500 kHz
0.01 Hz to 200 kHz	500 kHz to 5.0 MHz
0.01 Hz to 2.0 MHz	5.0 MHz to 50 MHz
0.01 Hz to 20 MHz	50 MHz to 400 MHz
0.01 Hz to 160 MHz	400 MHz to 40 GHz

Power requirements

The flexibility of the N5511A system configuration results in a significant range of power requirements, depending on the type and number of instruments in a system. Table 2-6 shows the power requirements of the N5511A chassis/test set. Table 2-7 provides the maximum requirements for individual instruments so that you can determine the requirements of your specific system. It also provides the maximum current drawn by an N5511A system that contains one of each type of instrument listed in the table.

Table 2-6 N5511A Chassis/Test Set power requirements

	100/120 VAC 50/60Hz	**220/240 VAC 50/60Hz**
N5511A chassis/test set	1200W Max	1300W Max

The instrument can operate with mains supply voltage fluctuations up to ± 10% of the nominal voltage.

CAUTION This instrument has auto-ranging line voltage input, be sure the supply voltage is within the specified range and voltage fluctuations do not to exceed 10 percent of the nominal supply voltage.

The N5511A system is shipped with AC power cords appropriate for your location.

Table 2-7 Example Test System - maximum AC power requirements

Component	**115 VAC**	**230 VAC**
Display (LCD)	Refer to specific product data sheet	
N5511A chassis/test set	2.3 A (110/120 VAC 280 W)	2 A (220/240 VAC)
Spectrum analyzer	Refer to specific product data sheet	
Frequency counter	Refer to specific product data sheet	
Oscilloscope	Refer to specific product data sheet	
RF Source E8257D	~ 2.2 A	~ 1.1 A

For information on an instrument's power line module, see the instrument's separate user's guide.

Equipment Installation

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

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

WARNING

This is a Safety Protection Class 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.

WARNING

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.

Do not operate the instrument or system in the presence of flammable gases or flames.

WARNING

DO NOT REMOVE AN INSTRUMENT COVER.

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Test Set Location and Mounting Requirements

Locating the test set

Make sure that the fan inlet and exhaust vent areas on the sides, bottom, and back of the test set chassis are not obstructed. Airflow restrictions cause additional airflow noise and cause the fans to speed up so they can draw in enough air for the required cooling resulting in excessive audible noise.

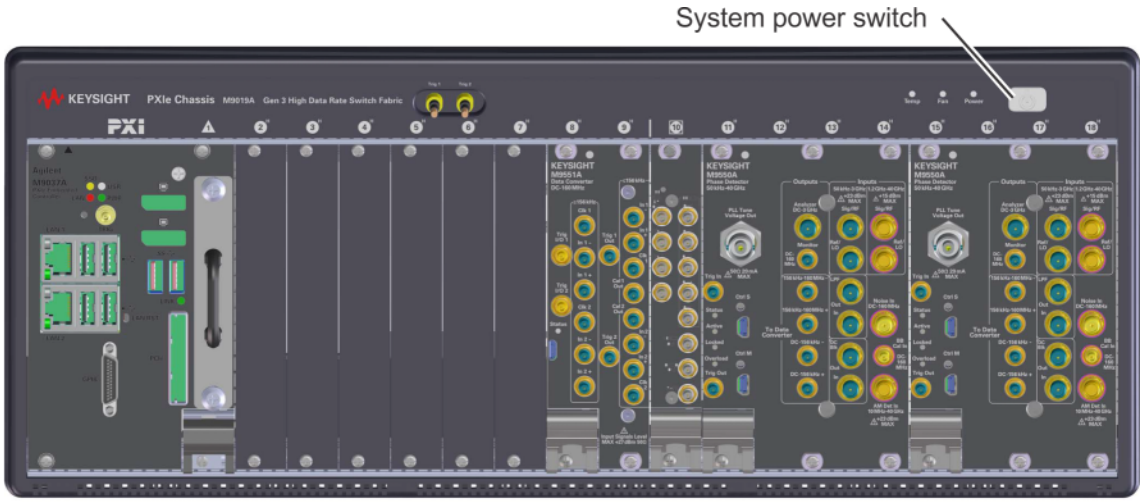
It is recommended to orient the instrument horizontally (as illustrated below), not vertically, and at least half a meter above the floor.

Cooling and rack mounting

Do not locate the test set side-by-side with any other instrument with side-by-side ventilation. Make sure the exhaust air from one instrument is directed away from the inlet of any other instrument (heated air directed into the inlet of an instrument can cause instrument failure due to excessive operating temperatures). The test set draws air in from the sides and bottom of the chassis and exhausts air from the back.

Refer to the section "N5511A Rack Mount Instructions (Optional)" for information on installing the system in a rack mount.

Figure 2-3 Keysight N5511A Phase Noise Test System Front View



N5511A Rack Mount Instructions (Optional)

Keysight Y1215C Flush Mount Rack Kit

This section contains procedures for installing the Y1215C Flush Mount Rack Kit for the Keysight M9018A, M9018B or M9019A 18-slot PXIe Chassis in a Keysight rack.

NOTE

This kit is designed for Keysight racks and the rear brackets may not fit a non-Keysight rack. Installation of the Y1215C Rack Kit on a non-Keysight rack may require using the Y1217A Support Rail Kit.

General Rack Mounting Guidelines

In rack mounting the chassis, follow these guidelines:

- The heaviest instrument or chassis should always be mounted at the bottom of the rack. Always begin installing heavy instruments at the bottom of the rack and work up. This maintains a lower center of gravity and reduces the possibility of the rack tipping.
- Anti-tipping feet, if available with the rack, should always be extended.
- For maximum cooling and optimum rack thermal efficiency, place the instrument or chassis with the greatest power consumption towards the top of the rack. This promotes efficient cooling since heat rises when placed nearer to the top of the rack, high power instruments will not unnecessarily heat other instruments. However, in doing this, do not violate the guideline that the heaviest instruments should be placed at the bottom of the rack.
- When installing the instrument(s) into a cabinet consideration shall be given to the convection flow into and out of the cabinet. Consideration shall also be given to the individual instruments to avoid having the heated discharge of one instrument, now becoming the cooling intake air for another instrument.

  Another area of concern is verification that the maximum ambient operating temperature of the instrument(s) is not exceeded by cabinet installation. Keysight recommends forced air convection whenever an instrument(s) are installed in a cabinet and further recommends that the maximum operating temperature of the cabinet be reduced 10°C from the lowest, of the maximum operating temperature of a single instrument.

NOTE

If instruments or modules in the chassis are consuming maximum power, 1U of rack space is required for ventilation below the chassis.

If there are any concerns or special requirements a Keysight Field Engineer should be consulted to assure instrument(s) temperature compliance and performance.

NOTE You may find installation of the rack mount kits easiest if you remove the side panels from the rack.

The parts included with the Y1215C are listed in the following table.

Table 2-8 Y1215C Flush Mount Kit

Part Number	Description	Quantity	
M9018-00127	Flush Mount Front Bracket	2	See Figure 2-6
M9018-21101	Front Handle	2	See Figure 2-6
M9018-00208	Nut Bracket	2	See Figure 2-8
0590-0804	Channel Nuts, 10-32 x 0.5 (Note: if you use the new M9018-00208 Nut Bracket, then only four of these channel nuts are required and you will have four as spares)	8	
2680-0278	10-32 x 0.5 Pan Head T25 Torx Screws (Rear Frame Bracket to Mtg Bracket)	4	
3030-1768	10-32 Pan Head Dress Screws for Rack Flanges (painted to match the brackets)	4	
0515-5828	M4 x 0.7 x 10 mm Phillips Flat Head Screws w Patch Lock (8 on brackets, 4 on handle)	12	
0515-5827	M5 x 0.8 x 8 mm Phillips Flat Head Screws w/Patch Lock	4	
8710-2727	Offset Screwdriver. Used to tighten the dress screws.	1	

Assembly and Installation

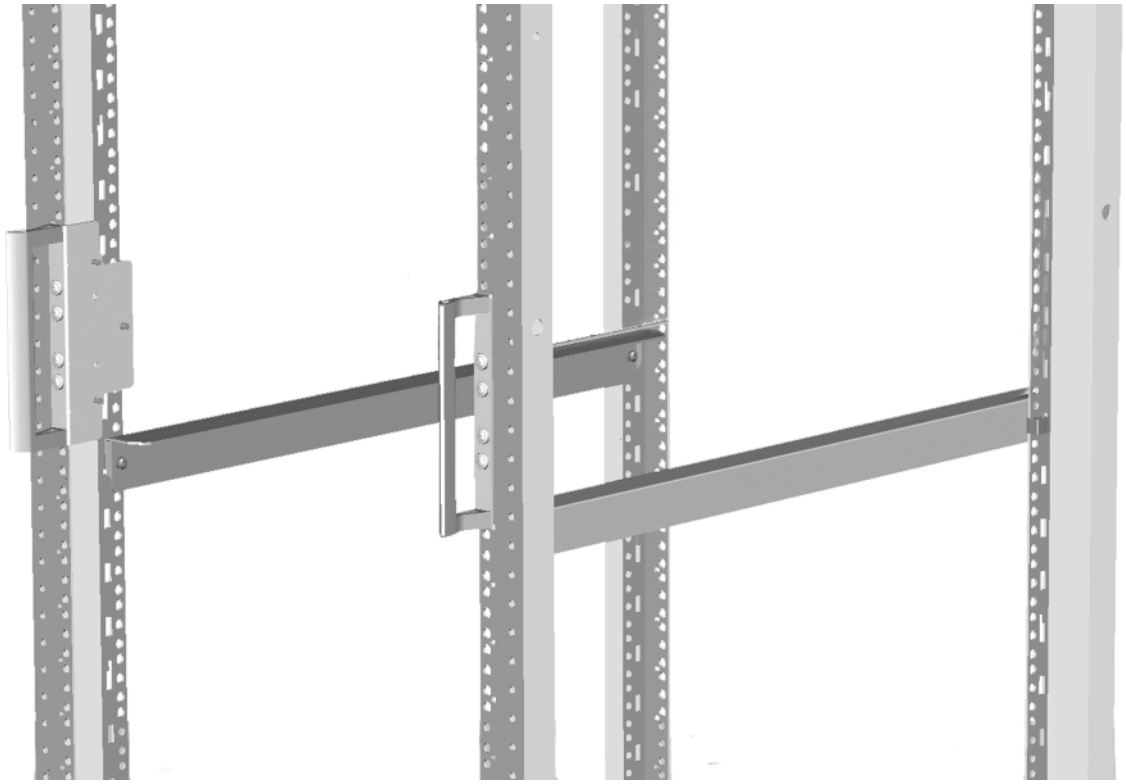
Tools Required: #1 and #2 Phillips screwdriver, T25 Torx driver, Offset Screwdriver (p.n., 8710-2727, supplied with rack mount kit)

NOTE The following instructions supersede the instructions that came with the rack mount kit.

NOTE Figure 2-4 and Figure 2-5 below show the proper position of the chassis mounting brackets and Y1217A Support Rails in the rack. Do not install the brackets and rails to the rack at this time.

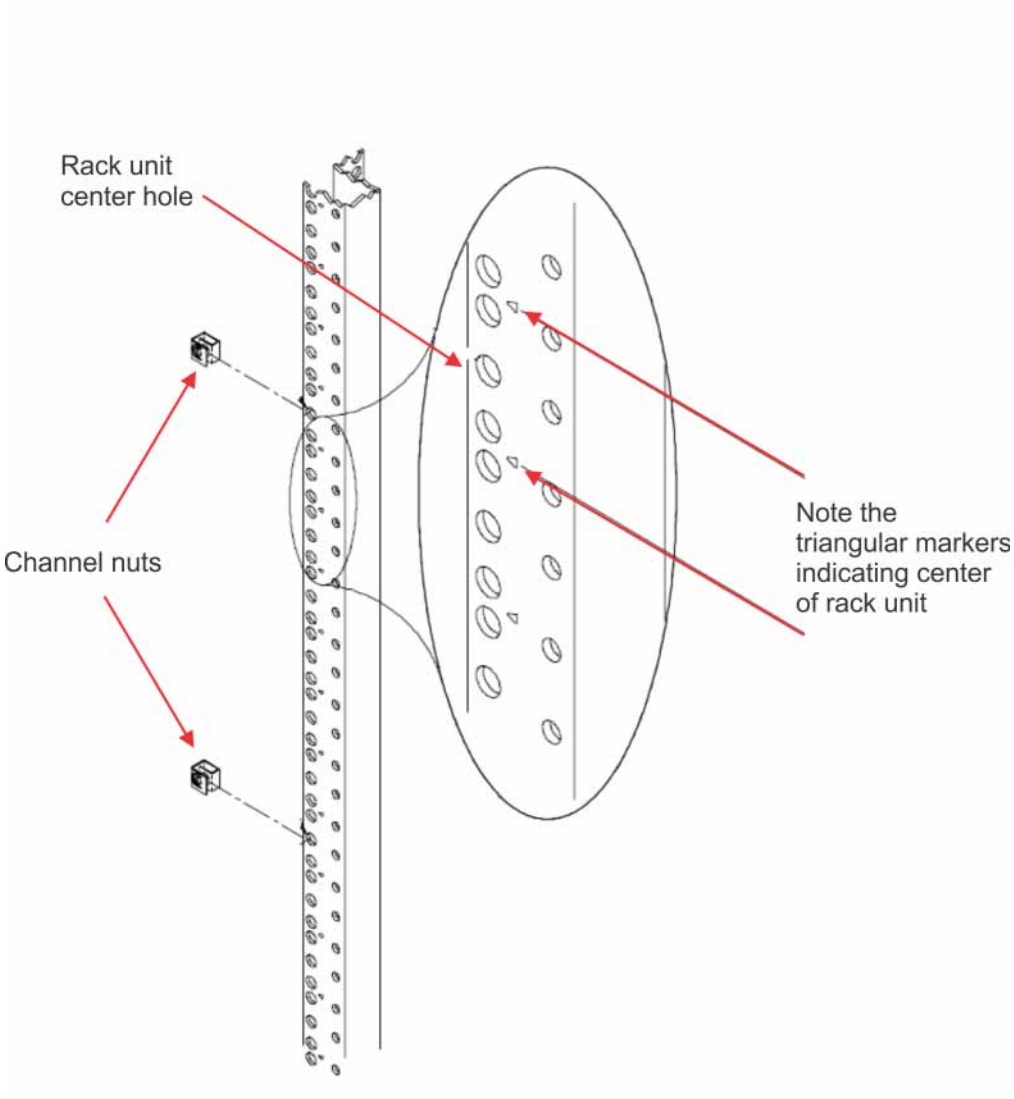
Using the front brackets as templates, position the brackets on the rack's vertical columns where the chassis is to be mounted. Do this for the front brackets on both sides of the rack. Align the bracket holes over the "center" holes of the rack units. Slide channel nuts over the rack holes to be used by the rear rack mount flanges. See Figure 2-4 and Figure 2-5 below.

Figure 2-4 **Y1215C Flush Mount Rail Kit Installed on a Rack - Note: For clarity, the rack sides and PXIe chassis are not shown**



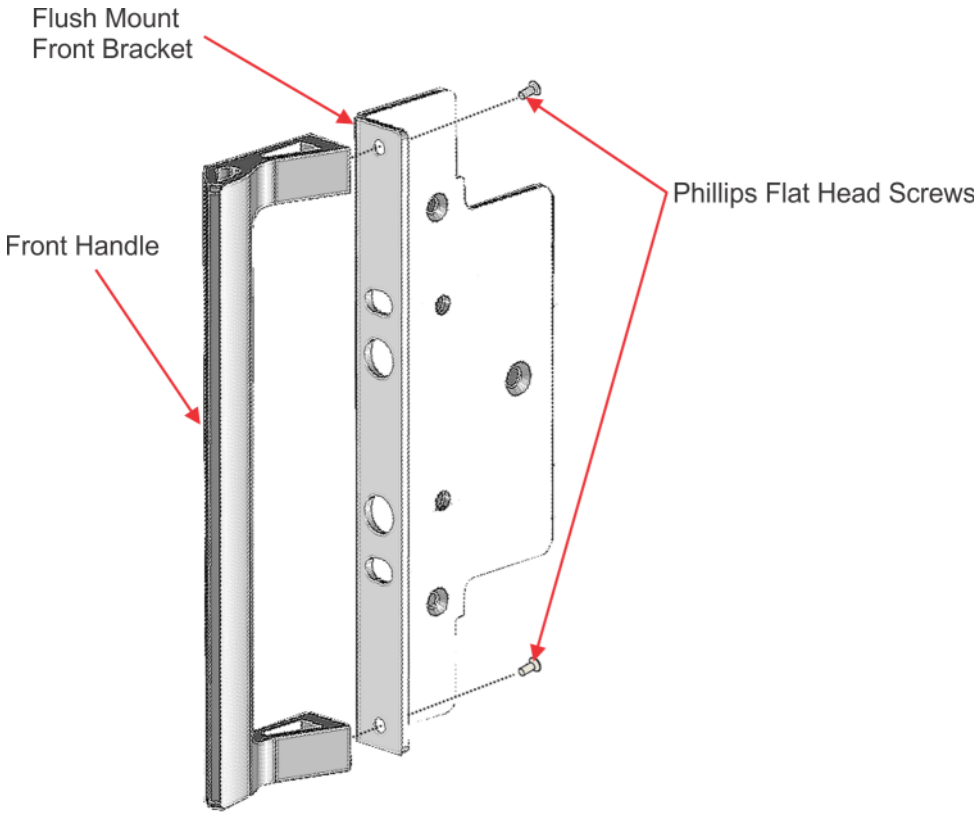
NOTE If you are installing on a N5511A PNTS chassis, the Rear Bracket assemblies are not required.

Figure 2-5 Center Holes of Rack, Attaching Channel Nuts - Note: Right side of rack is shown



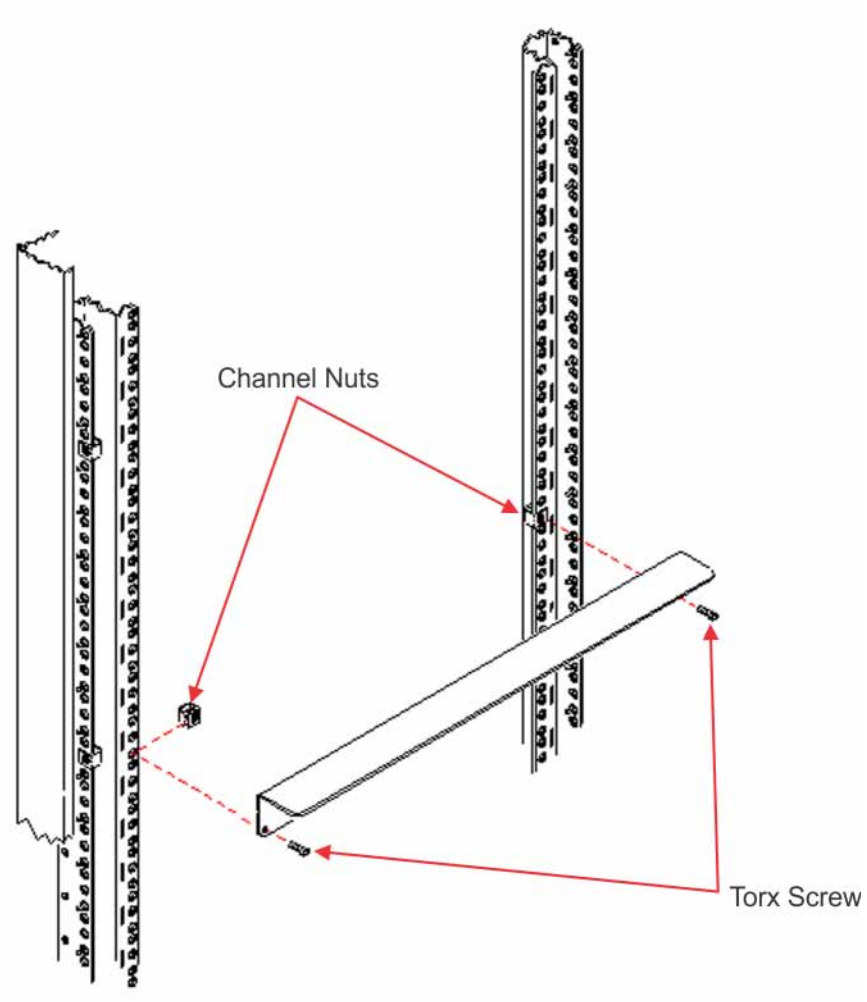
1. Optional step. If you are using handles, attach the front handles to the Front Mounting Brackets. See Figure 2-6.

Figure 2-6 Y1215C Flush Mount Rack Kit Handle to Front Bracket Assembly



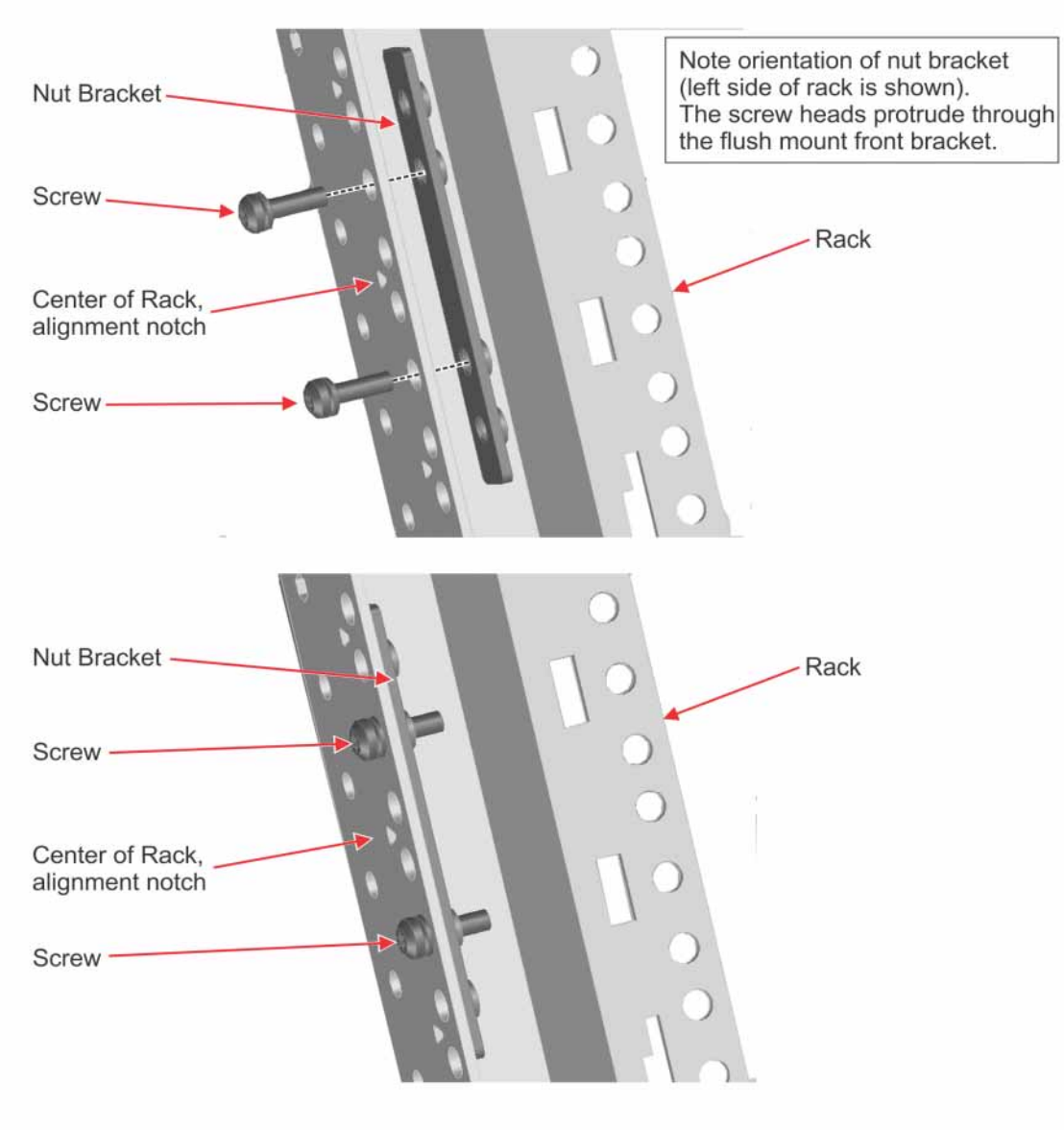
2. If you are using the Y1217A Rack Mount Rail Kit, position the rails on the rack's vertical columns where the chassis is to be mounted. Remember that the rails must be installed upside down to not interfere with the chassis cooling vents. Align the adapter holes over the "center" holes of the rack units. See Figure 2-7.
3. Use four (4) 0590-0804 Channel Nuts and four (4) 2680-0278 10-32 screws (supplied with the Y1217A Rail Kit). Slide channel nuts over the rack holes to be used by the support rails.

Figure 2-7 Attaching the Support Rails to the Rack



4. See Figure 2-8. Install the two M9018-00208 Nut Brackets in the channel of the rack.

Figure 2-8 Nut Bracket Installation

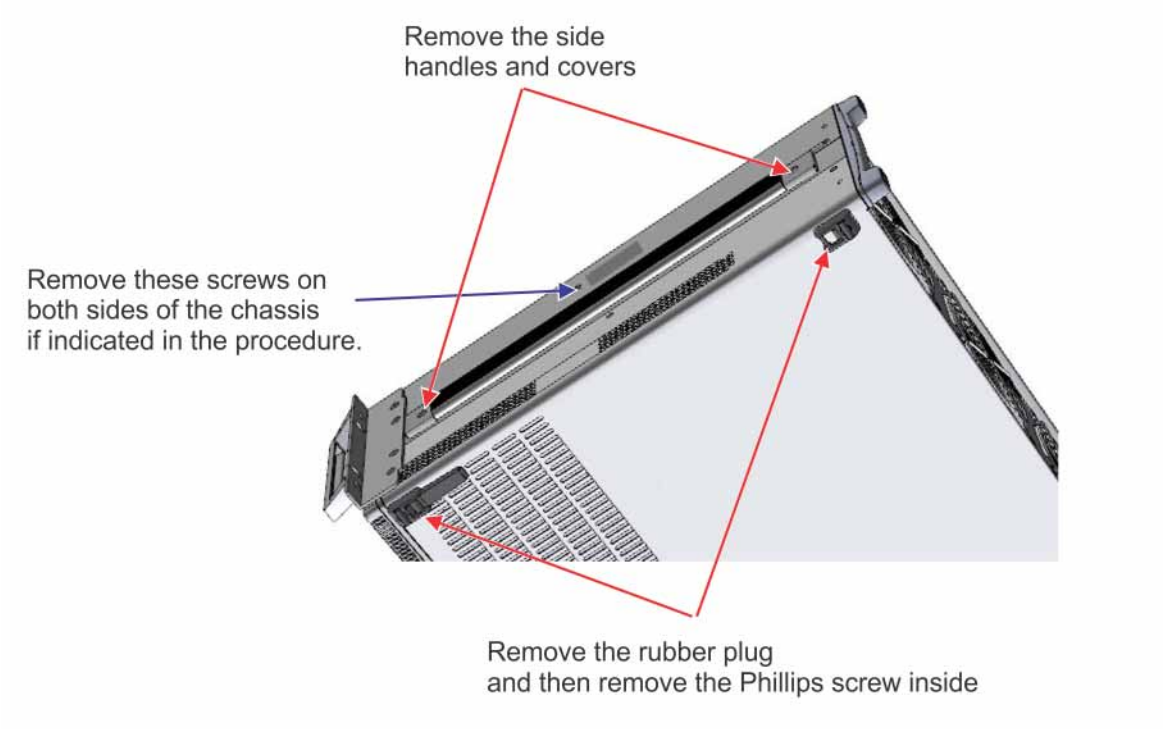


5. See Figure 2-9. Remove the side handles and handle covers from both sides of the M9019A PXIe chassis.

CAUTION Do not stand the chassis on its side; the side handles may cause the chassis to tip over.

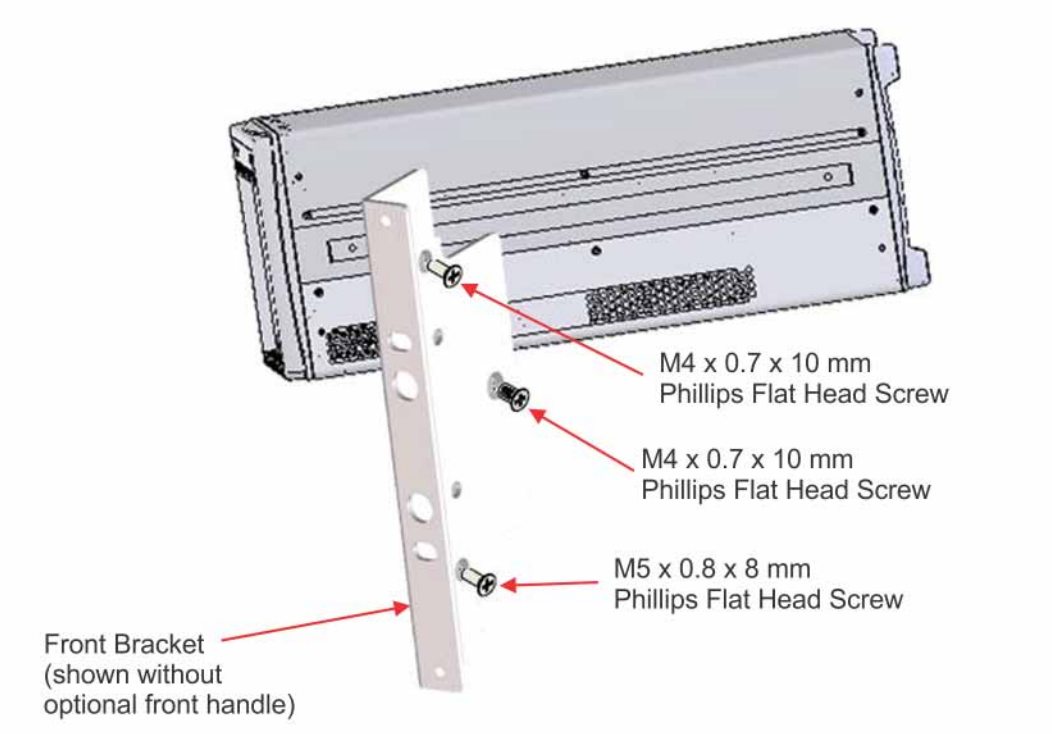
6. Remove the four chassis feet by pulling out the small rubber insert on each foot and then removing the Phillips screw that attaches the foot to the chassis.

Figure 2-9 Removing the chassis feet, side handles, and shipping screws



7. See Figure 2-10. Attach the front mounting bracket assemblies to the chassis.

Figure 2-10 Mounting the front bracket to the chassis - (right side shown)



8. Set the M9018A/B or M9019A chassis onto the support rails.

WARNING To prevent injury during rack mounting, the chassis should be empty and two people should lift it into the rack.

9. Slide the chassis into the rack until the Front Brackets and the Rear Frame Brackets are against the rack's front and rear (respectively) vertical columns.

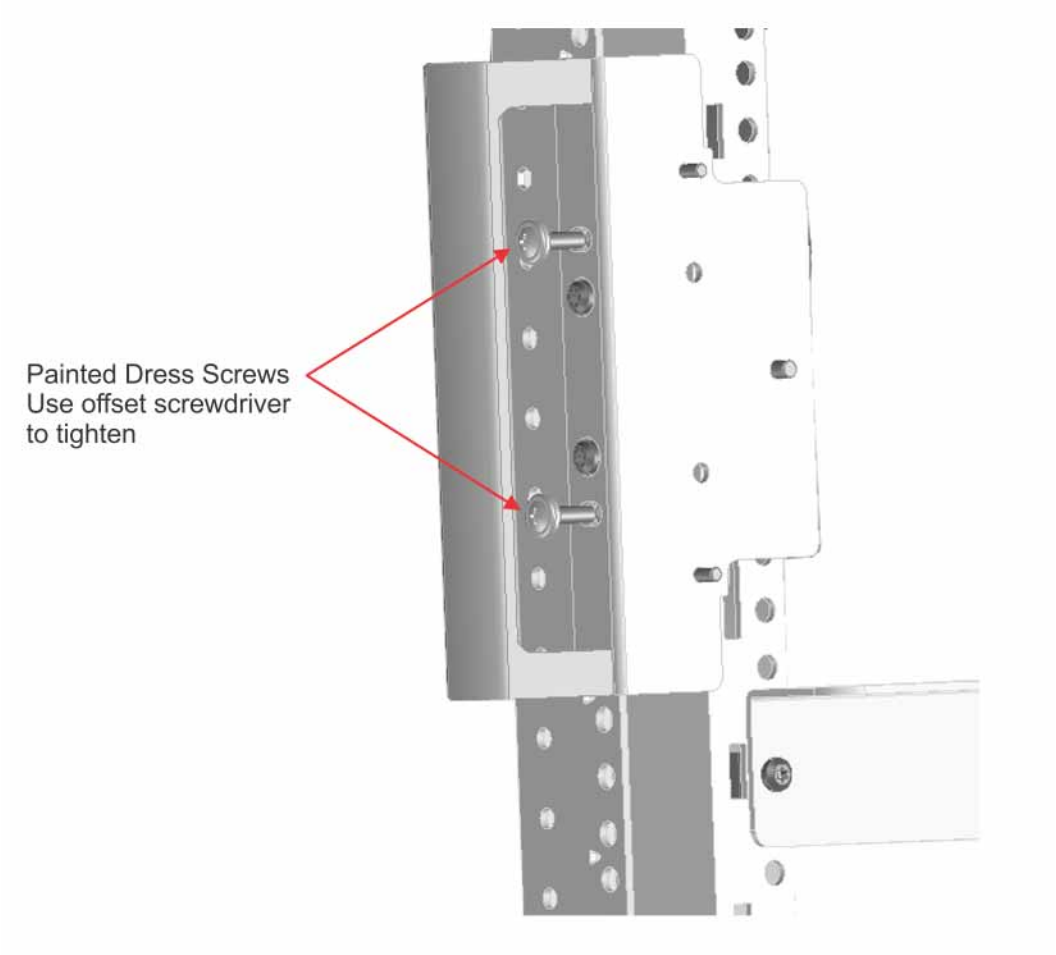
NOTE When you slide the front bracket up against the rack vertical columns, the 2680-0278 screws (see Figure 2-8) used to secure the M9018-00208 Nut Bracket to the rack will protrude through holes on the front bracket.

10. See Figure 2-11. Secure the front mounting brackets to the rack using the offset screwdriver and painted dress screws (Front Bracket).

NOTE

If the rack will be used for residual measurements, you should use support rails and ratcheted cargo straps to secure the chassis to the rack slides. You should always put the feet down on the rack for better phase noise measurements.

Figure 2-11 Closeup of left side front Y1215C Front Bracket



Documentation

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

http://www.keysight.com/find/n5511a

Contacting Keysight Technologies

To contact Keysight for sales and technical support, refer to support links on the following Keysight websites.

Assistance with test and measurements needs and information or finding a local Keysight office are available on the Web at:

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

Contact Keysight for service:

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

For product specific information and support, software and documentation updates, browse to the following URL:

http://www.keysight.com/find/n5511a

3 System Interconnections

To set up a benchtop system use the diagrams in this chapter to connect the instruments. Otherwise, skip to Chapter 4, "Making a Measurement." (The instruments in a racked system are already connected.)

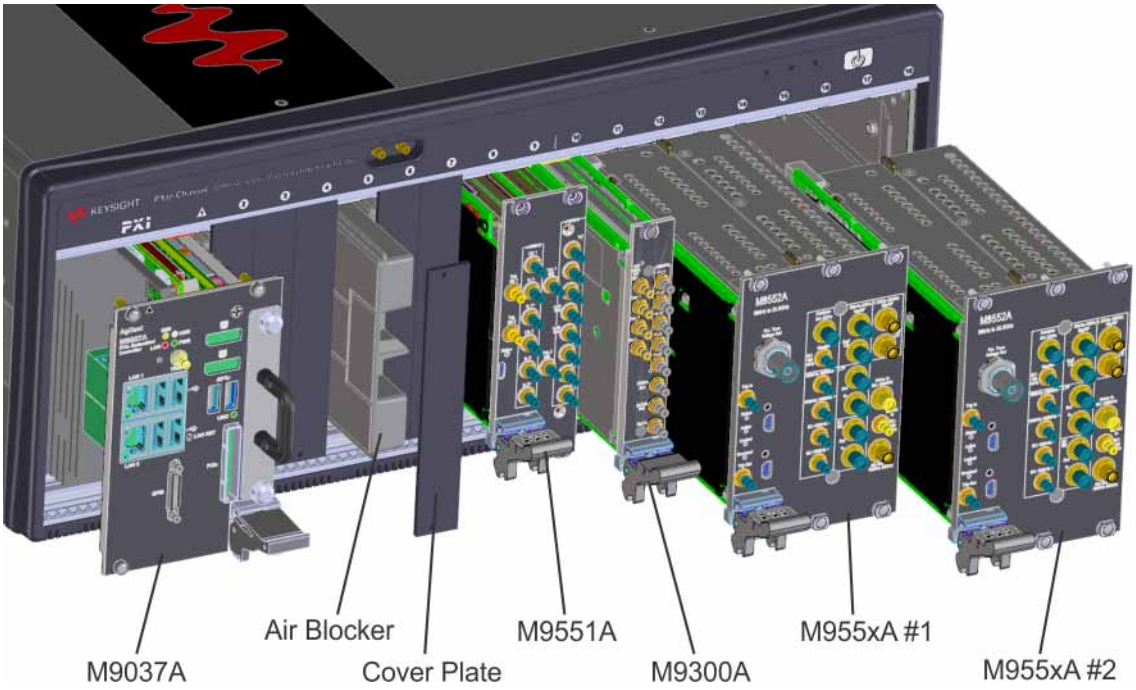
CAUTION

Keysight Technologies, Inc. **has not provided internet security software** for this N5511A Phase Noise Test System. Connecting the PC to a Local Area Network (LAN), without first installing internet security software (firewall, virus protection, etc) puts both your PC and data at risk. If you decide to connect the N5511A to a LAN, without first installing internet security software, you do so at your own risk.

Keysight recommends turning on Windows updates and installing updates when available from Microsoft.

N5511A System Modules

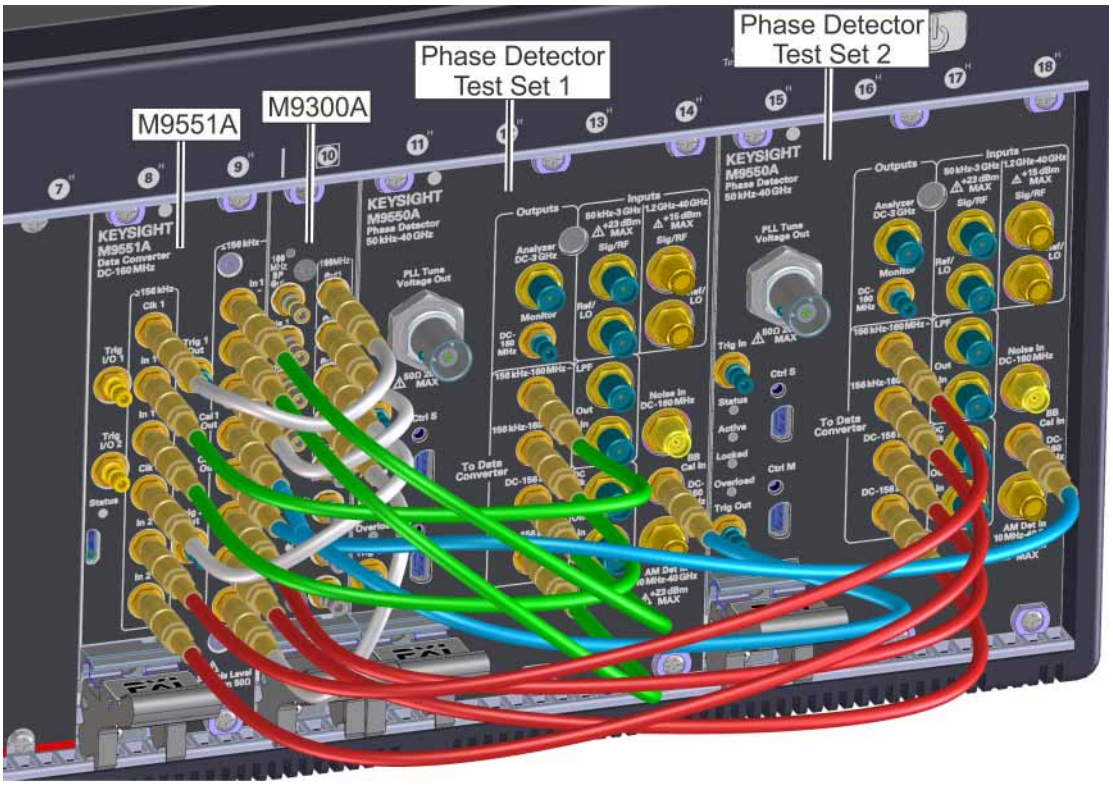
Figure 3-1 N5511A System Modules



N5511A Two Channel Cable Connections

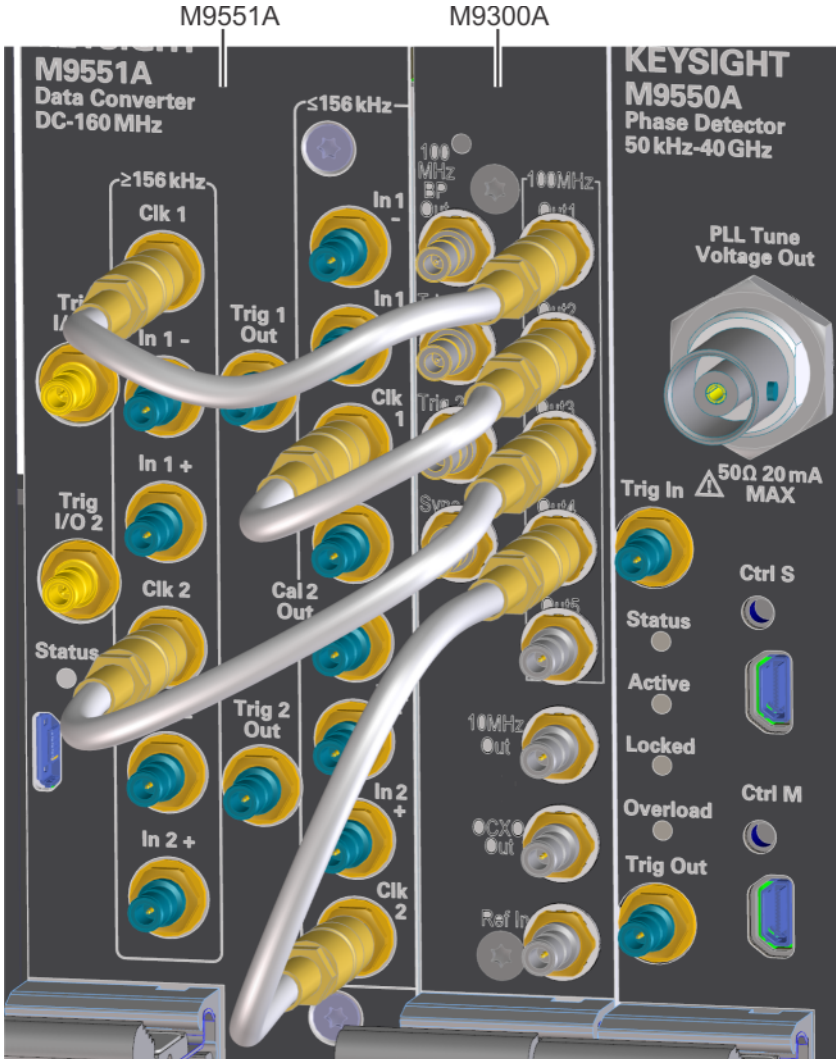
NOTE Cable colors are for identifying purposes only.

Figure 3-2 All Cables



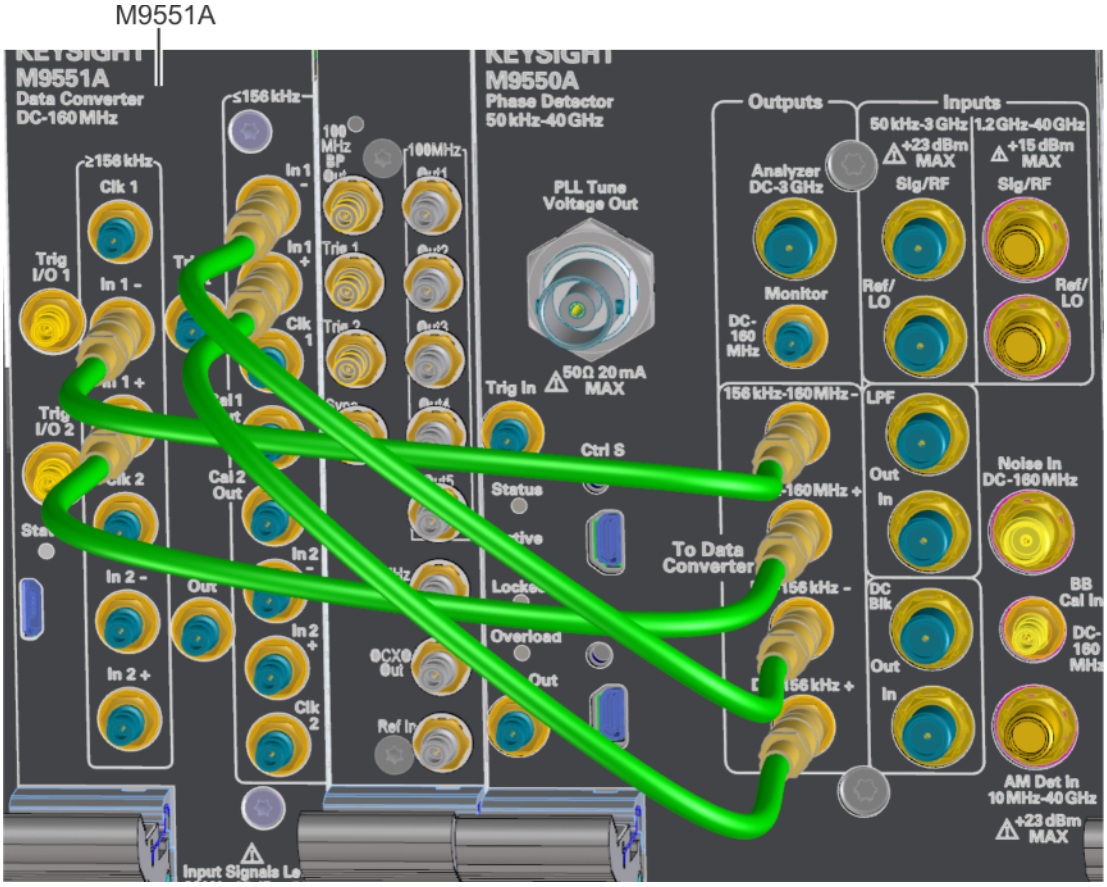
Cable Color	Cable Group	Cable Part Numbers
White	Clock	8120-5091 (120 mm)
Green	Phase Detector Test Set 1	8121-2175 (300 mm)
Red	Phase Detector Test Set 2	8121-2175 (300 mm)
Blue	FFT/Data Converter	8121-2175 (300 mm)

Figure 3-3 Clock Cables



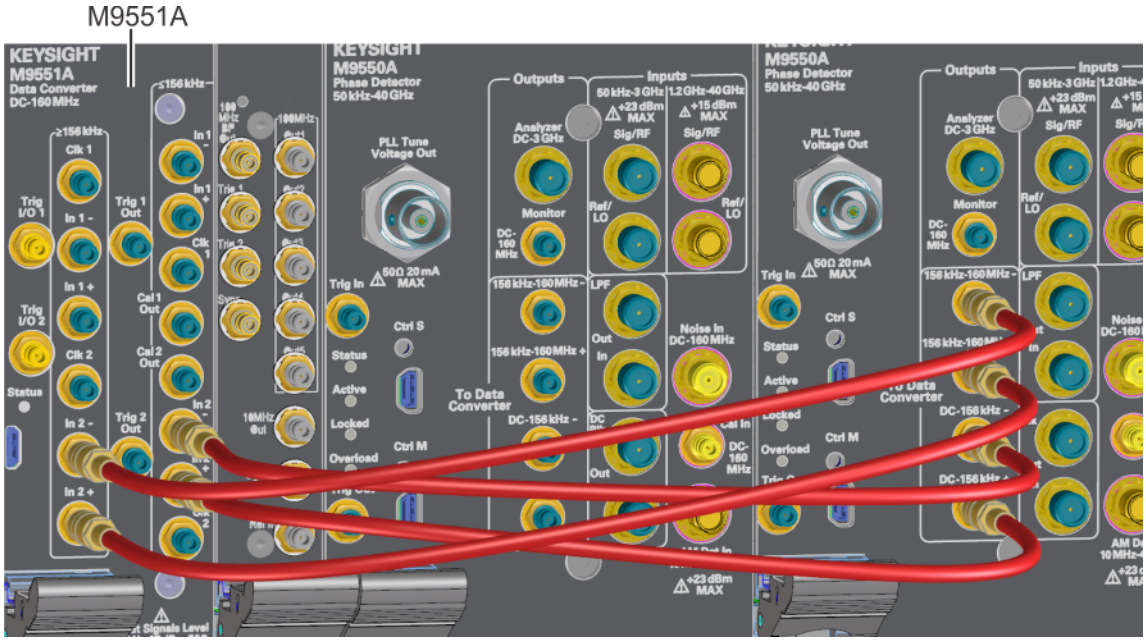
Clock Cable Connections All Cables Part # 8120-5091 (120 mm)	
M9551A	**M9300A**
≥ 156 kHz Clk 1	100 MHz Out 1
≤ 156 kHz Clk 1	100 MHz Out 2
≥ 156 kHz Clk 2	100 MHz Out 3
≤ 156 kHz Clk 2	100 MHz Out 4

Figure 3-4 Phase Noise Test Set 1 Cables



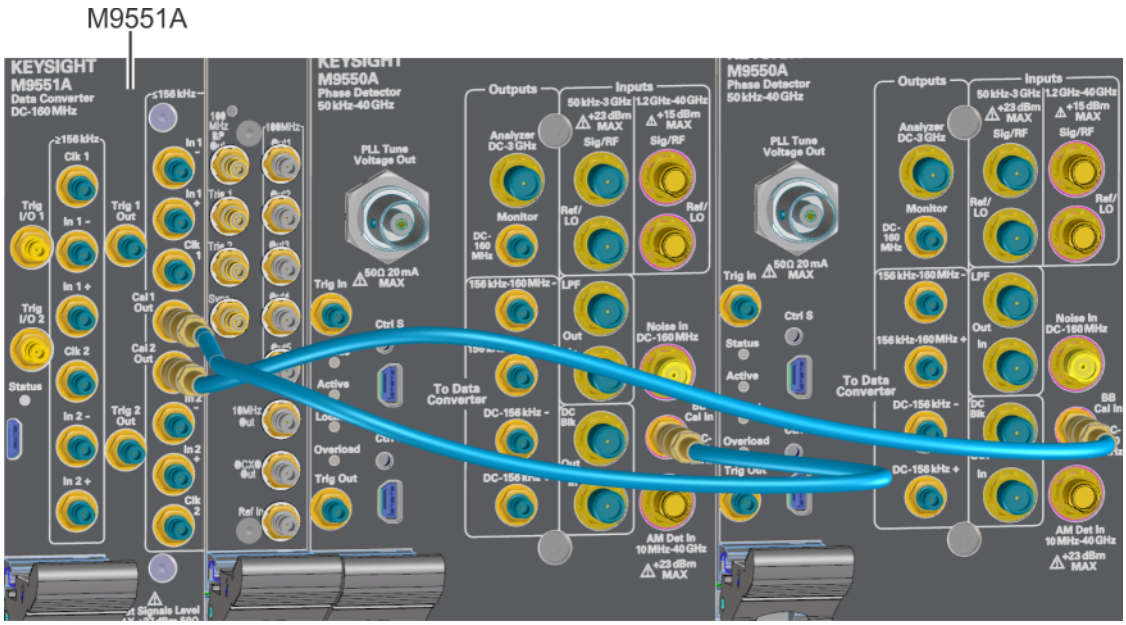
Phase Noise Test Set 1 Cable Connections All Cables Part # 8121-2175 (300 mm)	
M9551A	**M955xA**
≥ 156 kHz IN 1 –	156 kHz - 100 MHz –
≥ 156 kHz IN 1 +	156 kHz - 100 MHz +
≤ 156 kHz IN 1 –	DC - 156 kHz –
≤ 156 kHz IN 1 +	DC - 156 kHz +

Figure 3-5 Phase Noise Test Set 2 Cables



Phase Noise Test Set 2 Cable Connections All Cables Part # 8121-2175 (300 mm)	
M9551A	**M955xA**
≥ 156 kHz IN 2 –	156 kHz - 100 MHz –
≥ 156 kHz IN 2 +	156 kHz - 100 MHz +
≤ 156 kHz IN 2 –	DC - 156 kHz –
≤ 156 kHz IN 2 +	DC - 156 kHz +

Figure 3-6 FFT - Data Converter Cables



FFT - Data Converter Cable Connections All Cables Part # 8121-5091	
M9551A	**M955xA**
≤ 156 kHz CAL 1	BB Cal In DC - 100 MHz TEST SET 1
≤ 156 kHz CAL 2	BB Cal In DC - 100 MHz TEST SET 2

4 Making a Measurement

"Making a Single Channel Absolute Phase Noise Measurement" on page 58

This chapter contains procedures for making a Single Channel Absolute Phase Noise Measurement to verify that all system assets are communicating.

Making a Single Channel Absolute Phase Noise Measurement

NOTE This measurement example uses Electronic Frequency Control (EFC). Refer to the N5511A Phase Noise Test System User's Guide for other methods to make an absolute phase noise measurement.

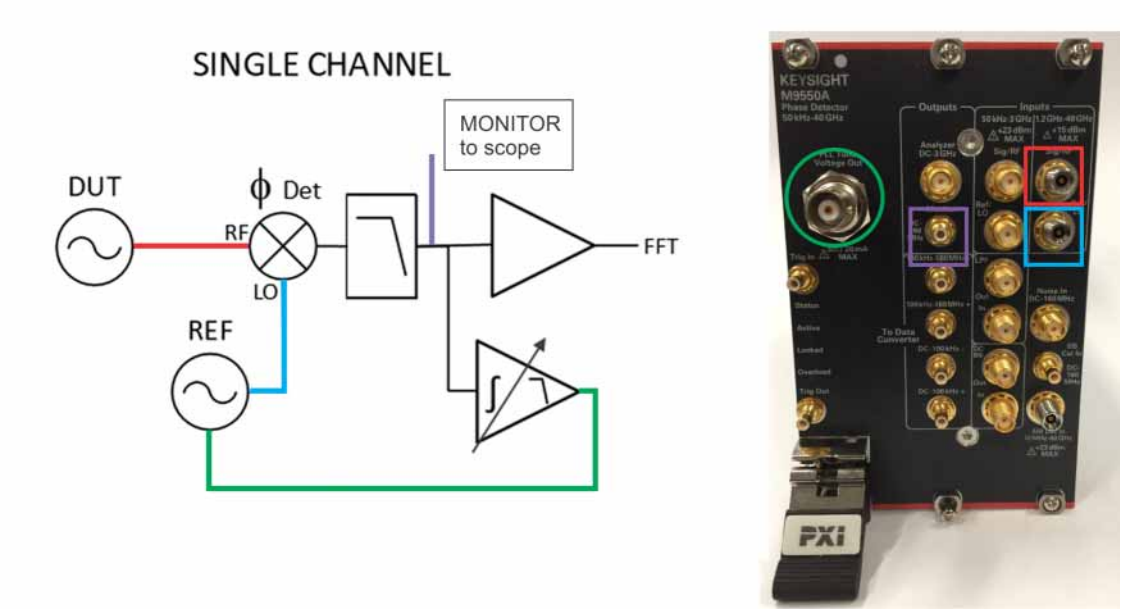
Equipment Needed

- Two SMA 3.5 mm cables - ideal lengths: approximately 20 inch
- One BNC-to-BNC cable
- Two signal sources: one source acting as a DUT and the other source acting as a reference (REF) with external frequency control (EFC) capability
- One Keysight N5511A (PNTS) Phase Noise Test Set
- One oscilloscope
- One SMB-BNC cable, or appropriate cable for connection from M9550A monitor port to oscilloscope

Connections

Connect the setup as shown in the diagram and as outlined by the steps below.

Figure 4-1 Measurement Setup



Connectors on M9550A	Connects to
Green	EFC Out on rear of PSG
Purple	Scope Monitor
Red	DUT source RF Out
Blue	Reference source RF Out

1) CH 1 PLL Tune Line	Connect the Ch 1 PLL Tune Voltage Out port (green) of the M9550A phase detector module inside the PNTS chassis to the EFC port at the back of the REF (PSG as reference) source using the BNC-to-BNC cable.
2) DUT to Sig/RF on PNTS	Connect the RF output of the DUT source to the high-band RF input (1.2 to 40 GHz) labeled "Sig/RF" on the M9550 phase detector module using an SMA cable
3) REF to Ref/LO on PNTS	Connect the RF output port of the REF source to the high-band RF input (1.2 to 40 GHz) labeled "Ref/LO" on the M9550 phase detector module (blue) using an SMA cable
4) MONITOR output to Scope	Connect SMB-to-BNC cable from the "Monitor" output on the M9550 phase detector (purple) to channel 1 of the oscilloscope

Configuring Equipment

Configure the DUT and Source for this measurement:

Set up DUT PSG	Frequency: 3 GHz Amplitude: 11 dBm RF On/Off: RF ON Mod On/Off: MOD OFF
Set up REF PSG	Frequency: 3 GHz Amplitude: 14 dBm RF On/Off: RF ON Mod On/Off: MOD OFF

NOTE The RF power of the DUT source must be at least 3 dB lower than that of the REF source.

Measurement Procedure

Start the N5510 Application

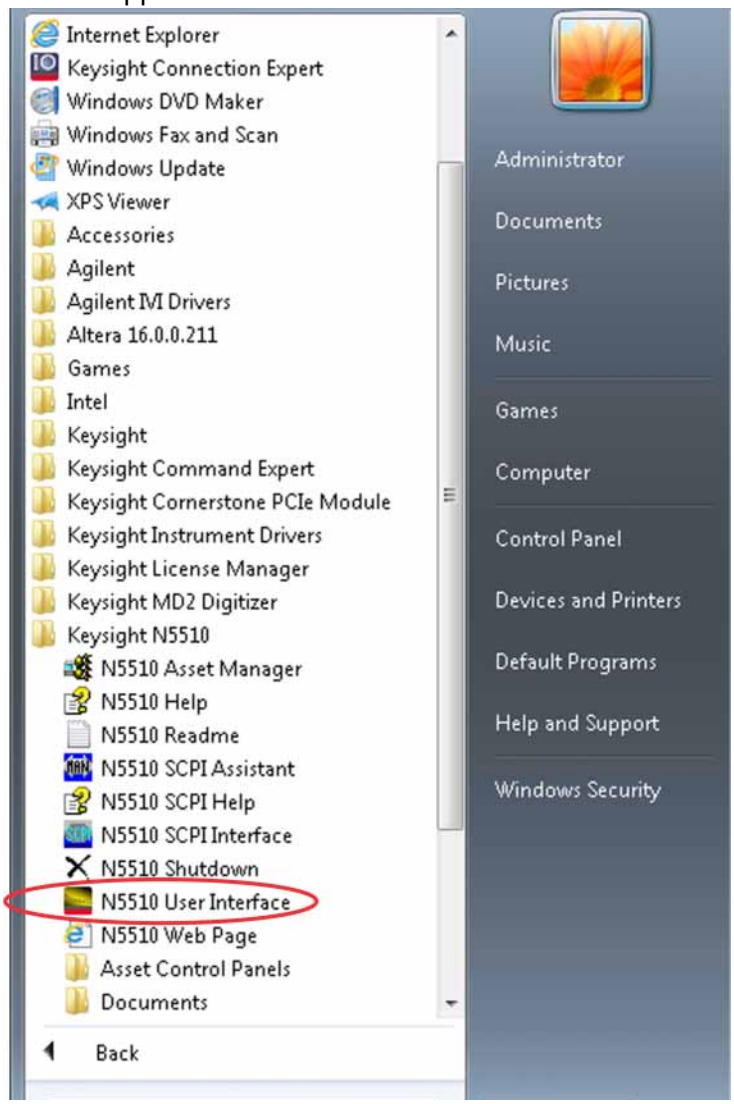
If the application is not already started, click on the icon

. 

OR go to the Windows Start Menu.

From the Windows Start Menu, navigate to the N5510 application software: `Start`, `All Programs`, `Keysight N5510 User Interface`

Figure 4-2 N5510 Application Software



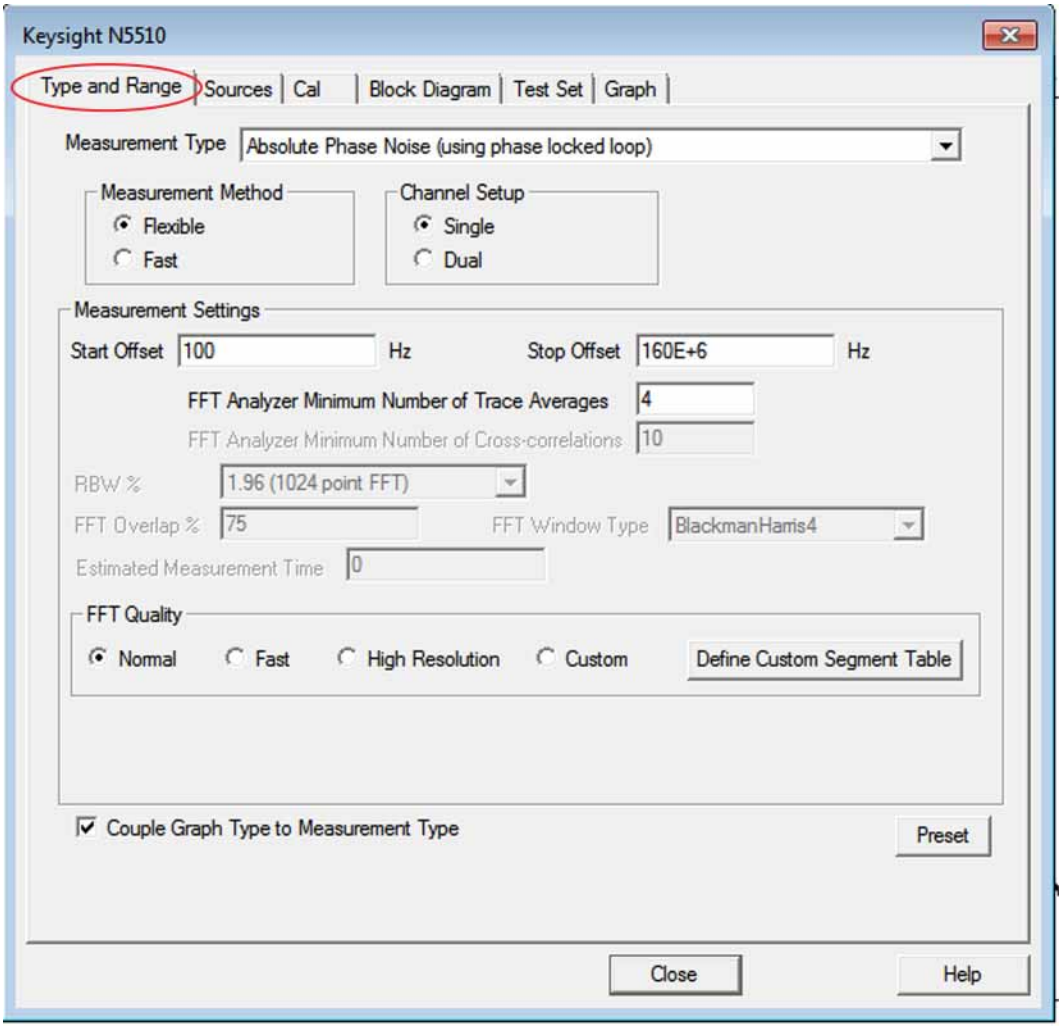
Measurement Type and Range

At the top of the main application window, click `Define` and then select `Measurement` from the drop-down menu.

`Define`, `Measurement`, `Type and Range`

This window will appear:

Figure 4-3 Measurement Type and Range



1) Choose Measurement Type

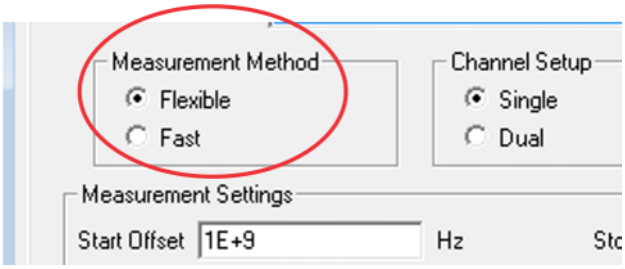
Measurement Type:
Absolute Phase Noise
(using phase locked loop

2) Choose Measurement Method

Flexible mode is a "single segment" measurement method where every segment is captured independently and after the previous segment has been measured (this is how N5510 works)

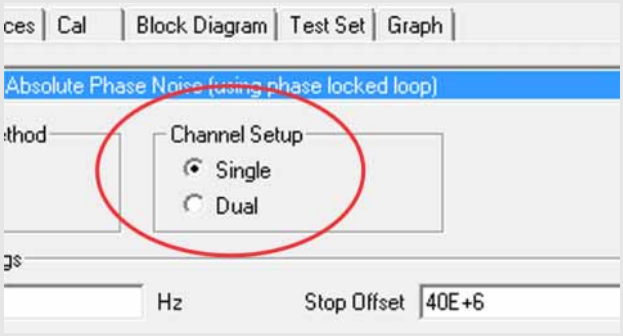
Fast mode is "multi-segment", where segments are being measured in parallel. This option allows for a live view of the data acquisition of the measurement.

Single channel can only use flexible.



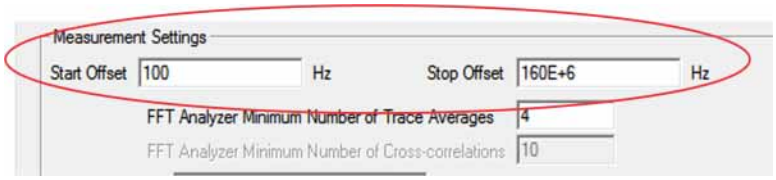
3) Choose Channel Setup

Channel Setup: Single



4) Set Start and Stop Offsets

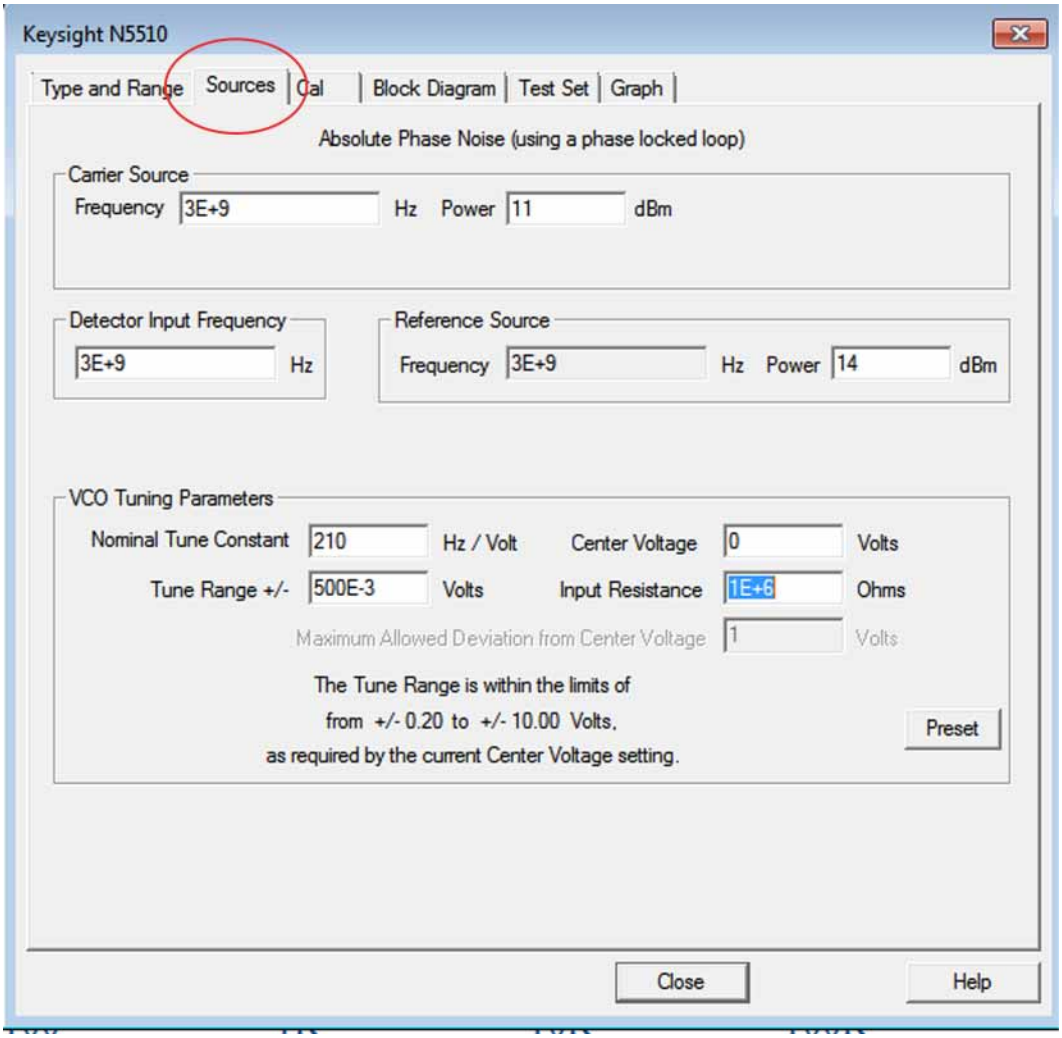
Start Offset: 100 Hz
Stop Offset: 160 MHz



Source Configuration

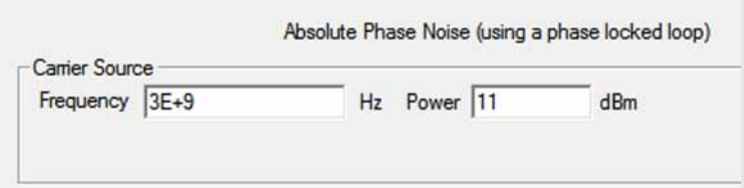
Next, we will configure the settings for the DUT and the reference source (REF). Navigate to the Source tab at the top of the current window and the following will appear:

Figure 4-4 Sources Tab



1) Set Carrier Source (DUT) Settings

Frequency: 3E+9 (3 GHz)
Power: 11 dBm



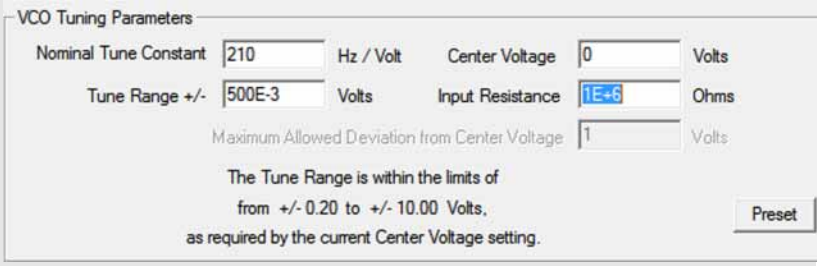
2) Set Reference Source (REF) Settings

Detector Input Frequency: 3E+9 (3 GHz)
Power 14 dBm

3) VCO Tuning Parameters

Nominal Tune Constant: 210 Hz/V
Tune Range: 0.5 V
Input Resistance: 1E+6 (1 MOhm)*

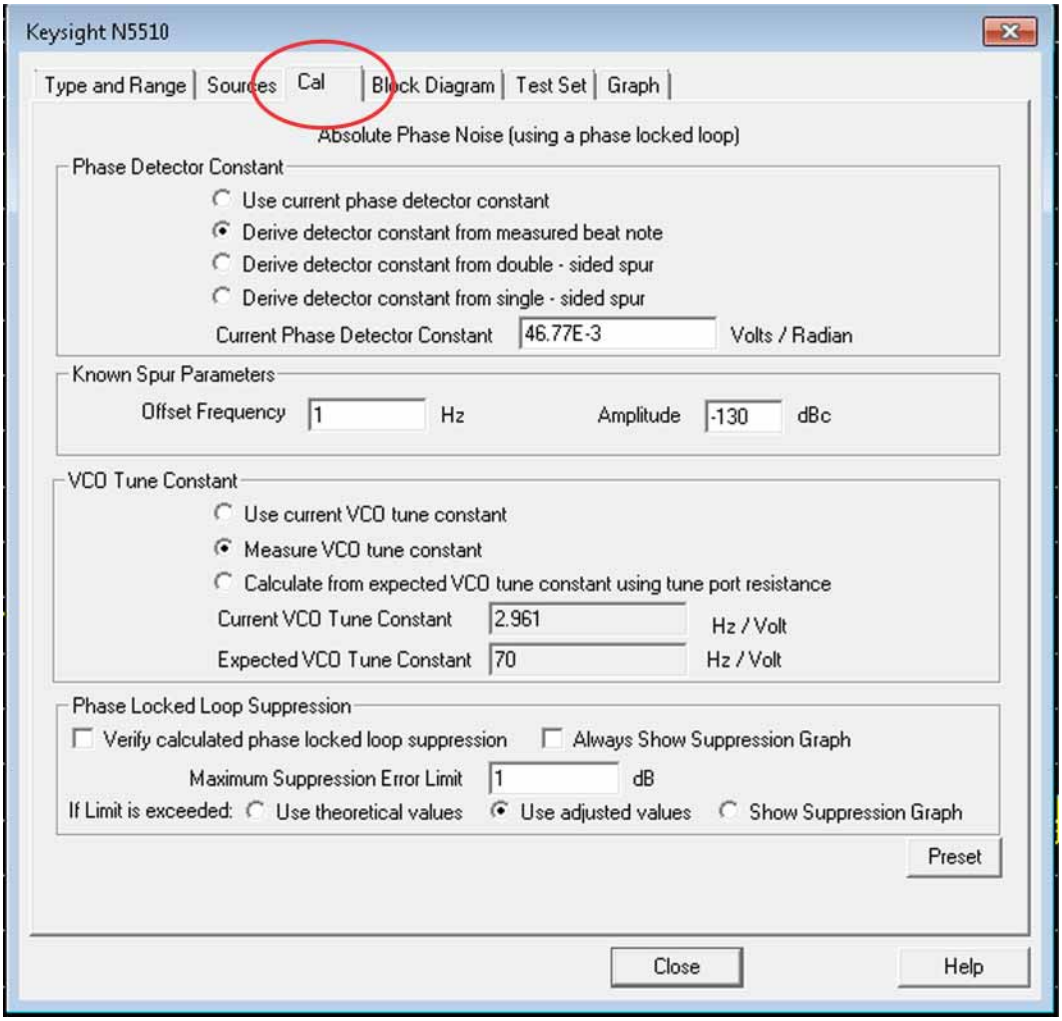
* VCO tuning is dependent to the source used as the reference



Cal Configuration

Navigate to the Cal tab. The following window would appear:

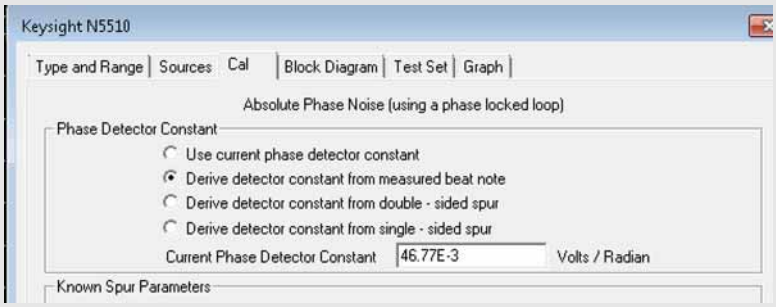
Figure 4-5 Cal Tab



NOTE For this measurement, use the Beat Note Cal. Refer to the Cal Demo Guide for details on using other cal methods.

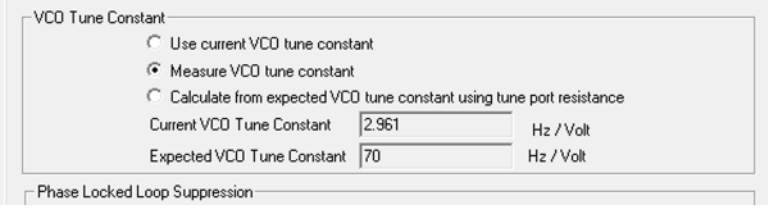
1) Configure Phase Detector Constant Settings

Phase Detector Constant:
Derive detector constant from measured beat note



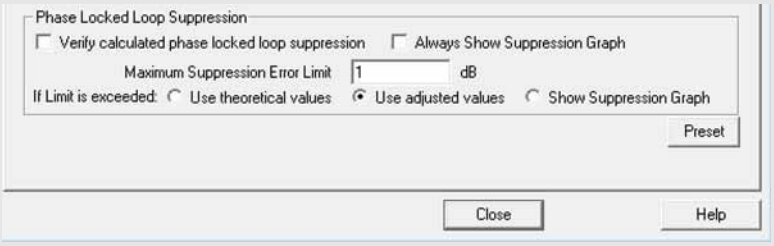
2) Configure VCO Tune Constant Settings

VCO Tune Constant:
Measure VCO tune constant



3) Phase Locked Loop Suppression

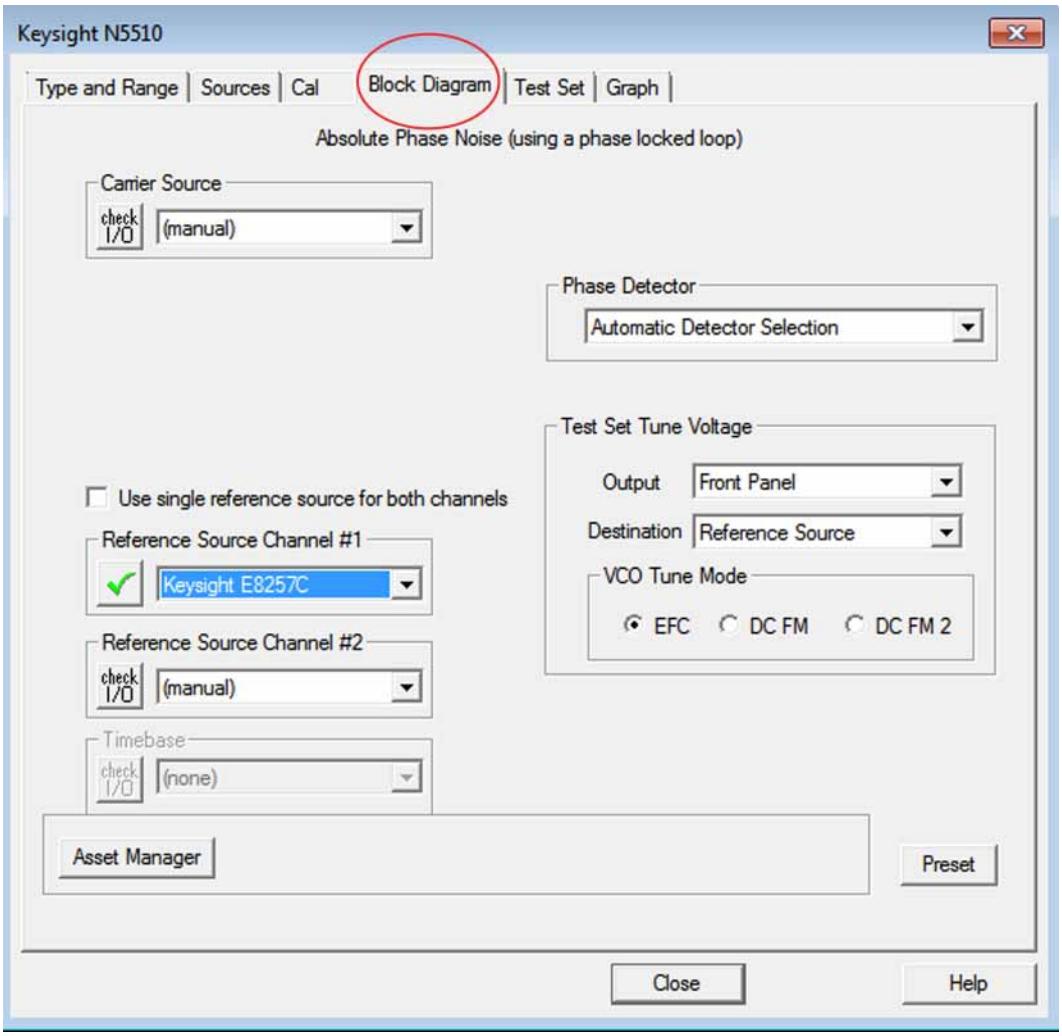
Uncheck "Verify calculated phase locked loop suppression?



Block Diagram Configuration

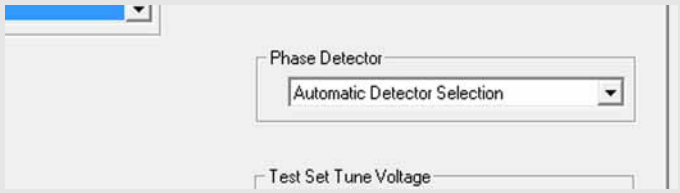
Navigate to the Block Diagram tab. The following window should appear:

Figure 4-6 Block Diagram Tab



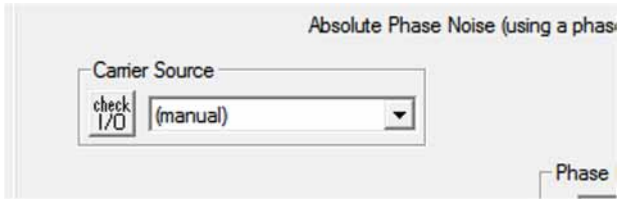
1) Phase Detector

Phase Detector: Automatic Detection Selection



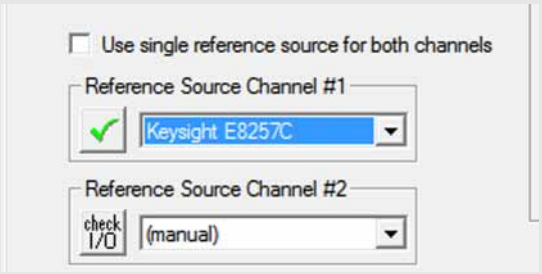
2) Carrier Source

select manual



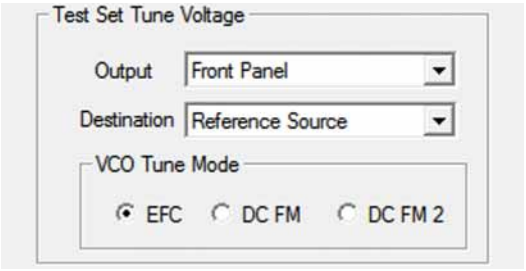
3) Reference Source

select previously setup reference E8257C (a green check mark should appear)



4) Test Set Tune Voltage

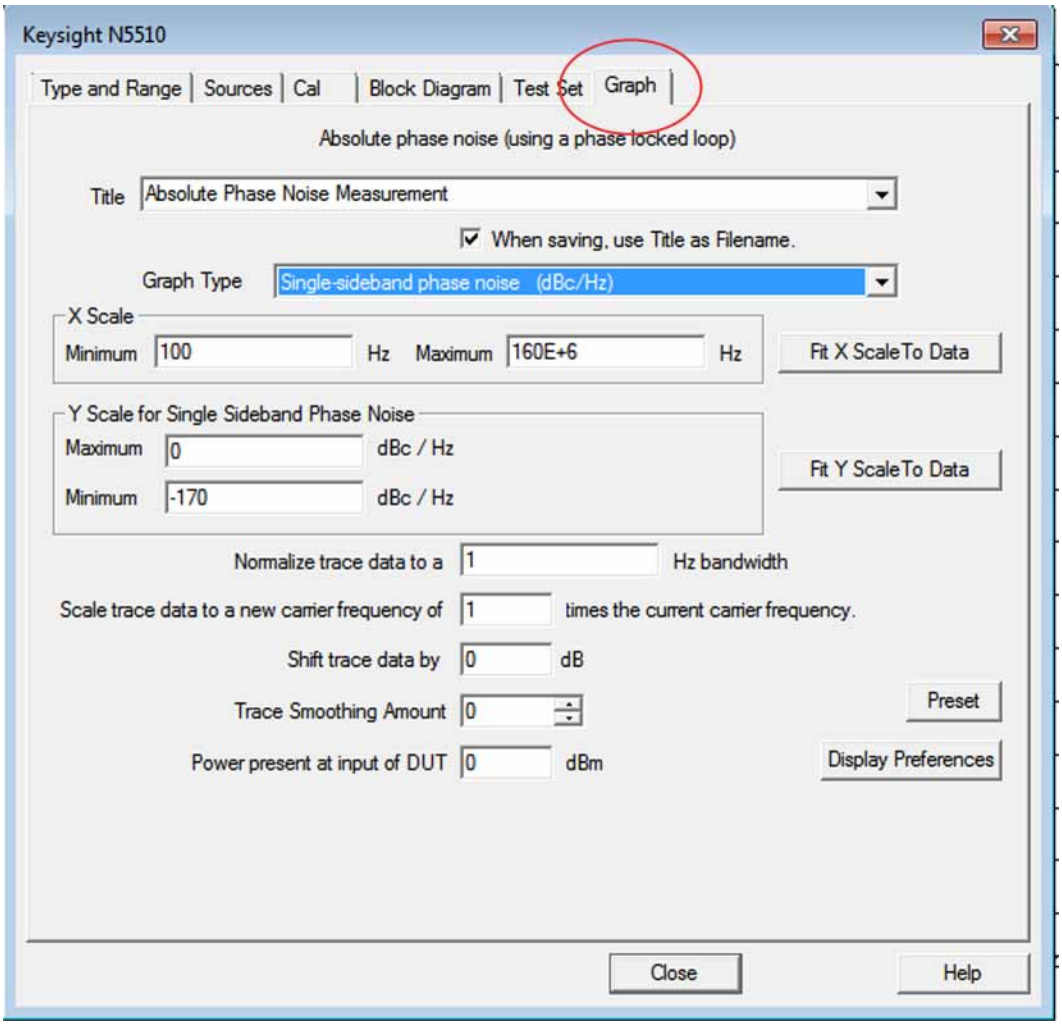
select VCO Tune Mode: **EFC**



Configure Graph

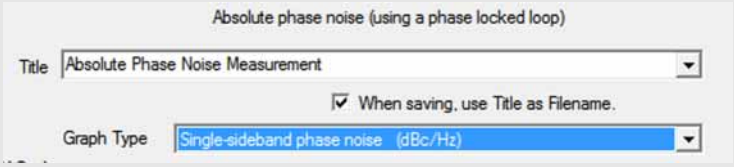
Navigate to the Graph tab. The following window should appear:

Figure 4-7 Graph Tab



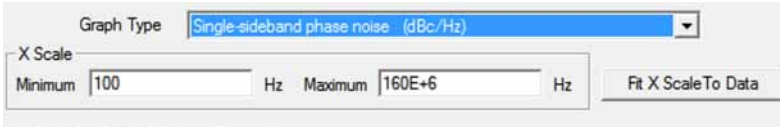
1) Set Title

Absolute Phase Noise Measurement



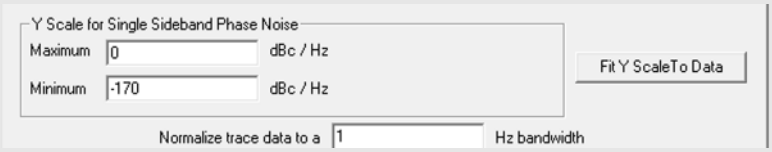
2) Set X-Scale

X-Scale Minimum: 100 Hz
X-Scale Maximum: 160 MHz



3) Set Y-Scale

Y-Scale Maximum: 0 dBc/Hz
Y-Scale Minimum: -170 dBc/Hz

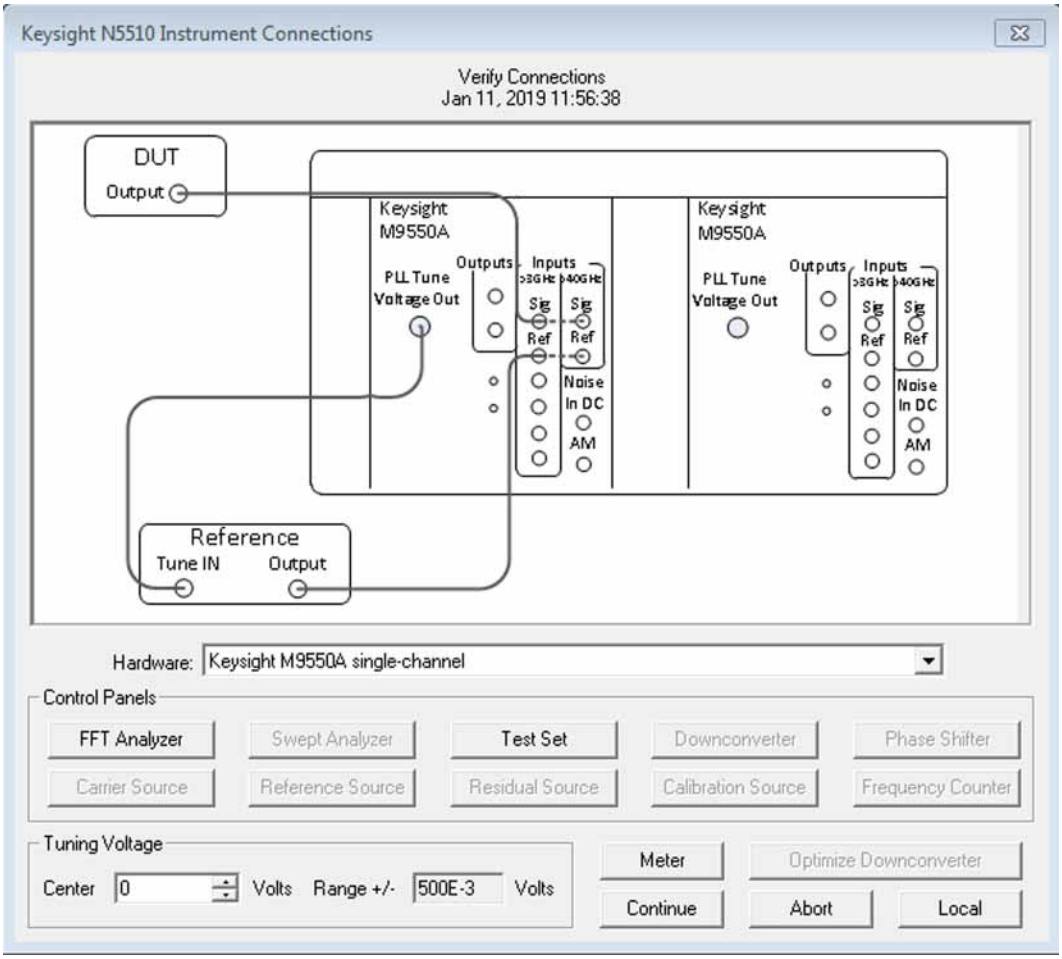


4) Close Measurement Setup Window

New Measurement

Select "New Measurement" by clicking on the Measurement tab and selecting New Measurement.

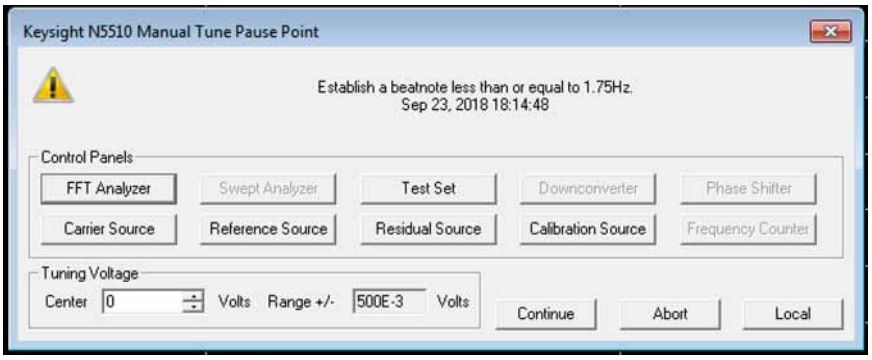
Figure 4-8 Connection Diagram



Press Continue

If the beat note is not within the frequency range required, the software will prompt to tune the reference.

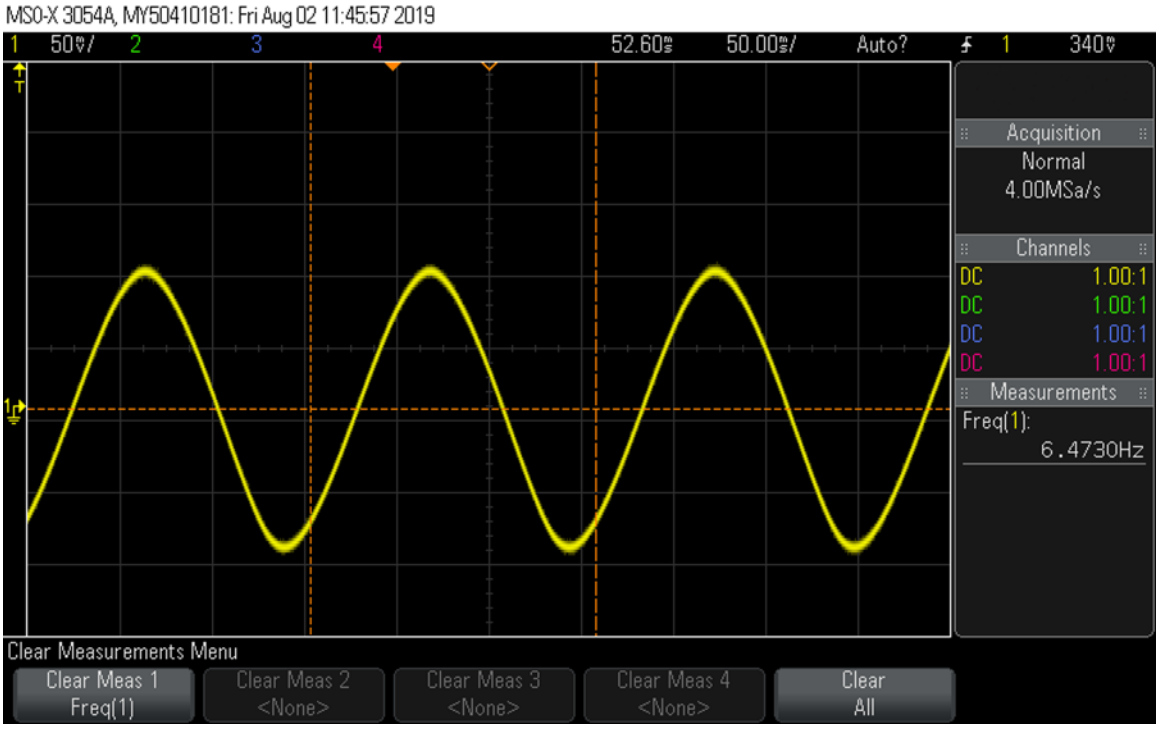
Figure 4-9 Manual Tune Pause Point



Establish a beat note less than 1.75 Hz.

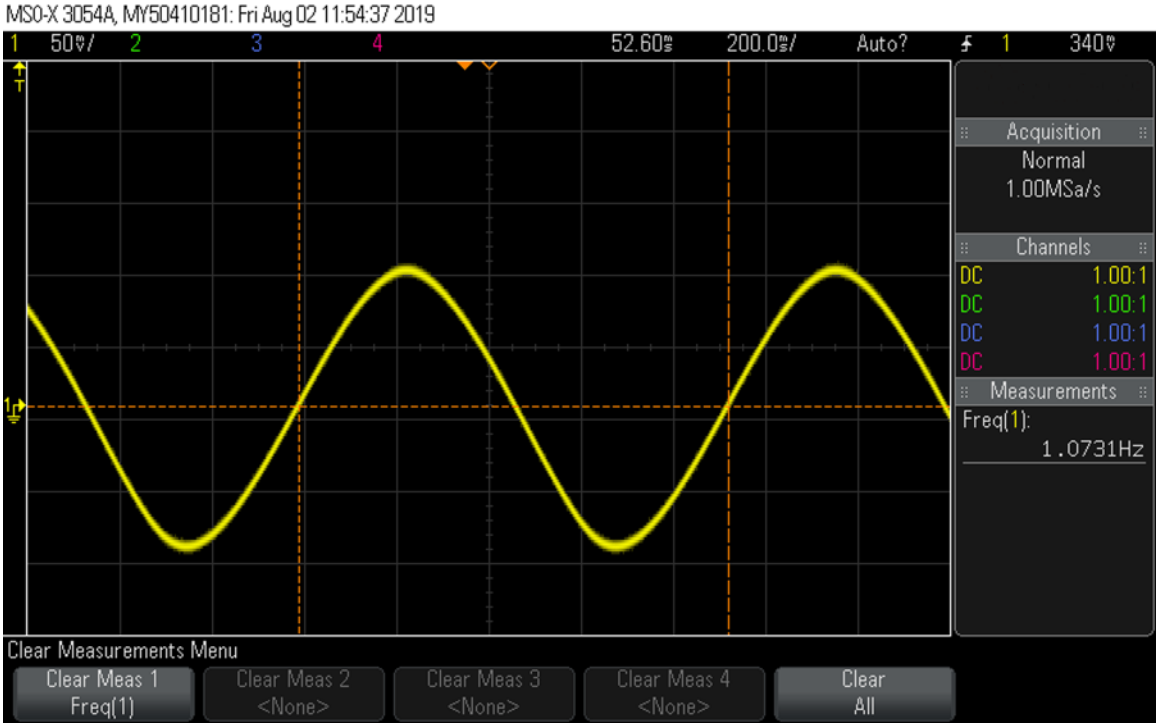
Currently the REF PSG and DUT PSG are offset in frequency from each other (beat note) by 6.47 Hz.

Figure 4-10 6.47 Hz Beat Note



Adjust the frequency of the REF PSG to get less than a 1.75 Hz beat note. Beat note established <1.75 Hz (1.07 Hz in this case).

Figure 4-11 1.07 Hz Beat Note



After selecting "Continue" on the dialog box, there will be a message at the lower bottom of the screen showing "Closing the phase locked-loop". Then the scope will have a DC signal on the monitor output (because the "beat-note" is now zero as the REF and DUT are now phase-locked). Riding on that DC signal will be visible noise as seen below. This is "phase noise" and any deviation from 0V DC is captured by the ADC module in the N5511A and using phase detector constant (in V/rad), will be converted to a phase deviation that is Fourier transformed and processed in frequency "segments" or decades for phase noise at various offsets up to 160 MHz from the carrier (DUT).

The software will step through the processes to continue the measurement.

Figure 4-12 Single Channel Flexible Measurement No Averages

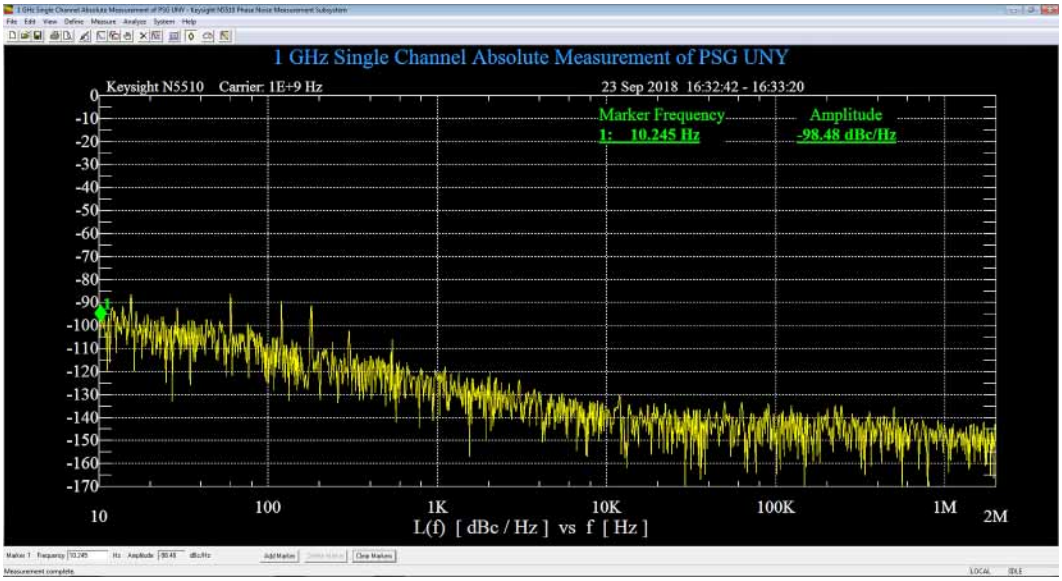


Figure 4-13 Single Channel Flexible Measurement 10 Averages

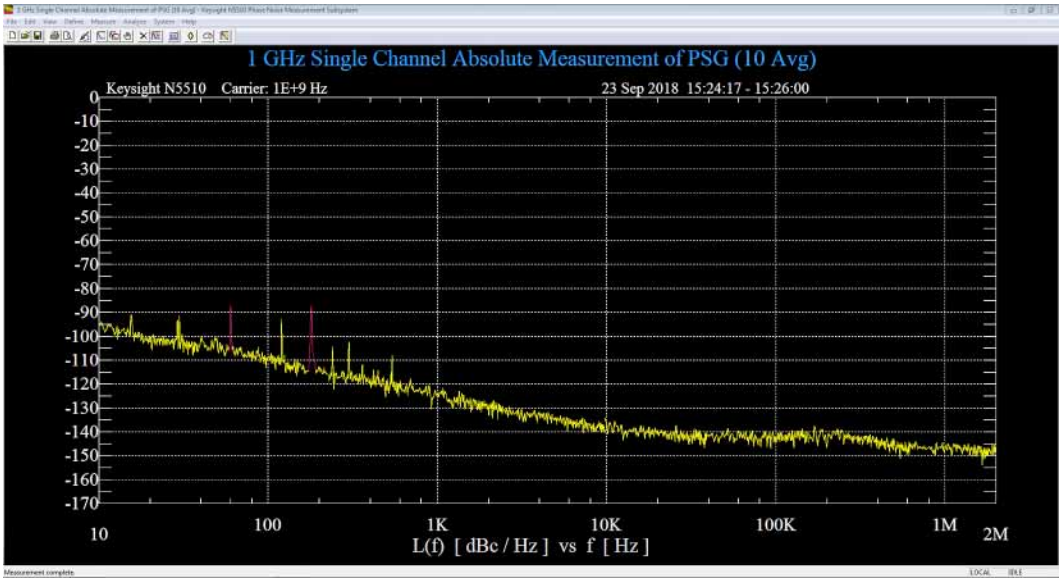
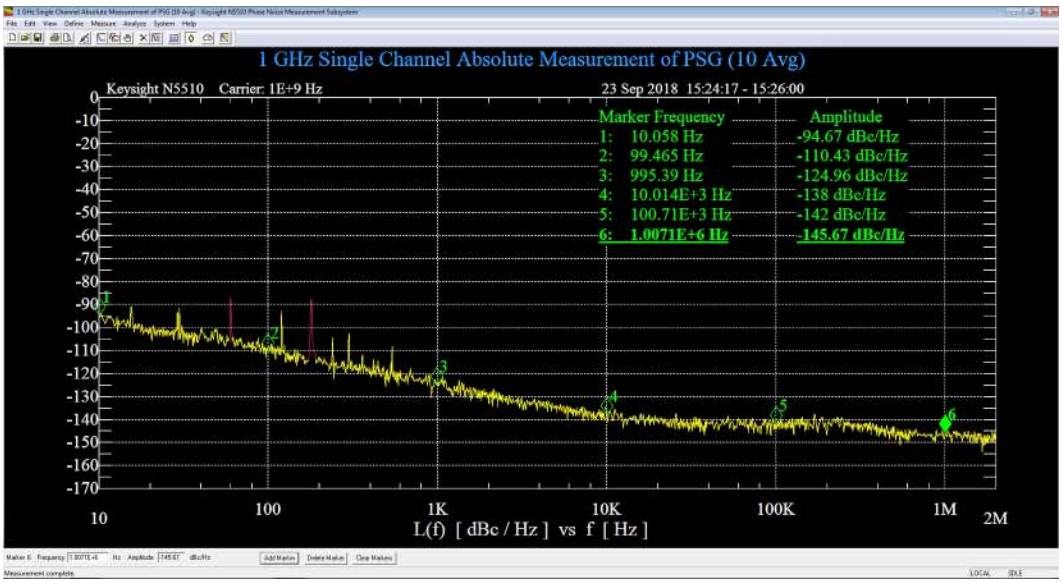


Figure 4-14 Single Channel Flexible Measurement 10 Averages with Markers



5 Recovery

Hard Drive Recovery Process

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

Repairing errors on the hard disk drive may result in loss of data or files stored on the C: partition. If you need more information about the Windows chkdsk error repair process, see the chkdsk documentation in the Microsoft Windows 10 Help and Support Center.

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

- Windows system configurations that were made after the computer was shipped from the factory. For example, Windows and Service Pack updates, user accounts, and windows configuration settings. After an Keysight Recovery, these configurations need to be redone.
- Additional software that was installed after the computer was shipped from the factory. After a Keysight Recovery, that software needs to be re-installed.
- Any data or programs saved on the D: or E: drives.
- Any upgrades that were made to the Keysight measurement application software.

NOTE

It is recommended that you use a regular back up strategy. Your IT department may already have a back up strategy in place which is suitable for the computer and its data. Using the Keysight Recovery System in conjunction with a regular back up strategy should enable you to fully recover the computer software and data.

Table 5-1 Using the Keysight recovery system

Step	Notes
1. Make sure the computer is turned off.	
2. Turn on the computer. NOTE: If you miss moving to the recovery prompt, you can access the batch file from C:Agilent\scripts folder. AgilentRecovery.bat	The following screen is displayed: 
3. Press the down arrow key to move the highlight to Keysight Recovery System, then press Enter.	
4. When the Keysight Recovery System has booted, follow the on-screen instructions to recover the image of the C: drive. – Press 2, then press Enter to select the recovery. – Press 1, then press Enter to continue. – Press 1, then Enter to confirm.	It may take up to 25 minutes for this process to complete.
After exiting the Keysight Recovery System, the computer reboots.	

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 computer configuration, including re-installing applications, data, and performing system customizations.

Configuring recovery prompt timing

You can configure the time at which the computer power-up process waits for the selection of the recovery process by performing the following steps:

Table 5-2 Configuring recovery prompt timing

Step	Notes
1. Right-click My Computer, and click Properties.	This accesses the System Properties tabbed page.
2. Click the Advanced tab.	
3. In the Startup and Recovery section, click Settings.	
4. Under the System Startup section: – you can either clear the Time to display a list of operating systems check box, or; – select the Time to display recovery option when needed check box and change the seconds to delay for it	

NOTE You must be logged in as an administrator to change these settings.

SSD Replacement Procedure

CAUTION Follow the appropriate Electrostatic Discharge (ESD) procedures. ESD can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe workstation.

Removing the SSD

1. Disconnect the instrument from ac power.
2. Refer to Figure 5-1. Use a #1 Phillips screwdriver to loosen the two screws which attach the SSD to the Controller.

Figure 5-1 Controller Module and SSD

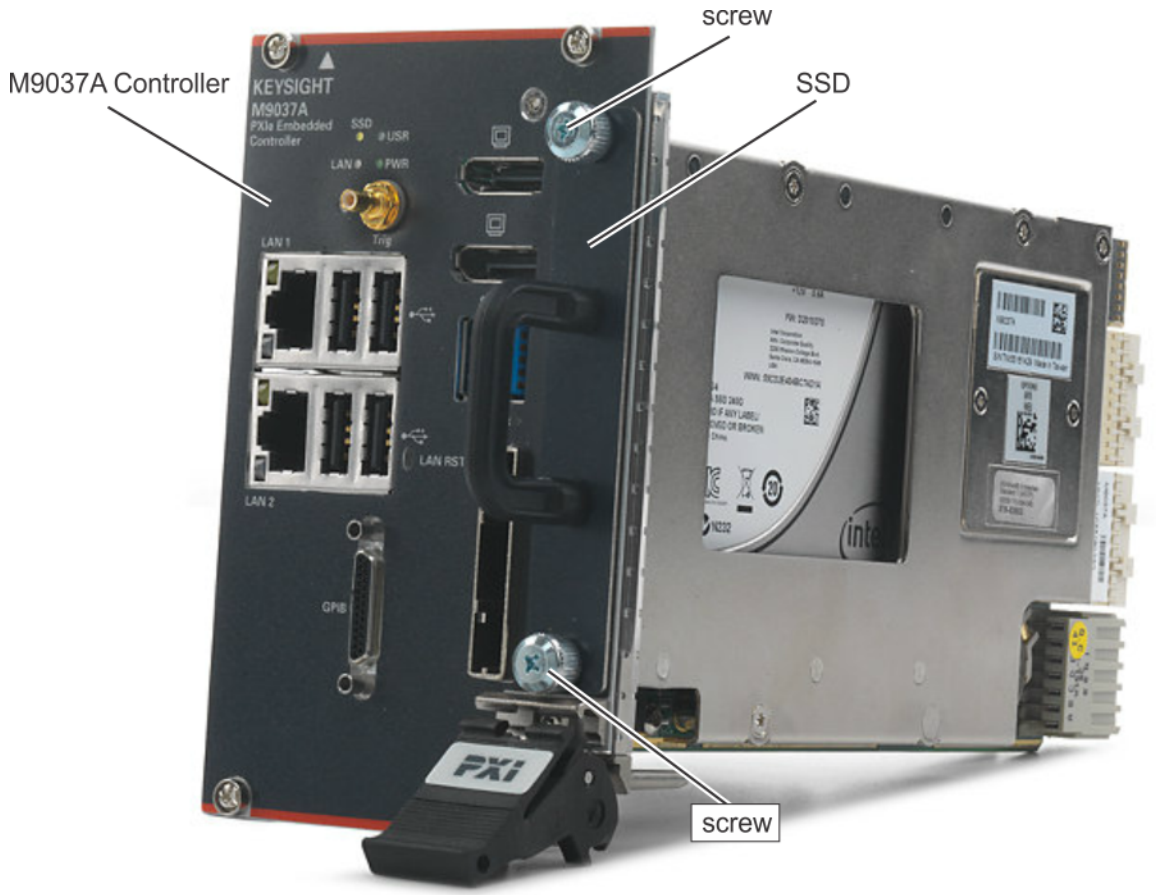


Figure 5-2 SSD

3. Remove the Solid state hard drive from the controller.
4. Install the new Replacement Solid State drive into the M9037A controller.
5. Tighten the 2 screws. Torque to 6 inch-pounds.
6. Go to Keysight license manager software and get the HostID "PCSERNO,XXXXXXXXXX", so the licenses can be re-hosted to the new SSD.

6 Service, Support, and Safety Information

This chapter provides safety and regulatory information, which you should review prior to working with your Keysight system. The information contained in it applies to all Keysight-supplied instruments in the system, and the system as a whole.

It also contains information on servicing and obtaining support for an Keysight system or instrument, including procedures for removing an instrument from a system, returning it to Keysight, and re-installing it.

Safety and Regulatory Information

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings or operating instructions in the product manuals violates safety standards of design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements.

General

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

Do not use this product in any manner not specified by the manufacturer. The protective features of this product must not be impaired if it is used in a manner specified in the operation instructions.

CAUTION Always use the Keysight supplied power cord or one with same or better electrical rating.

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

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

Before Applying Power

Verify that all safety precautions are taken. Make all connections to the unit before applying power. Note the external markings described under the "Safety Symbols and Instrument Markings" section.

Ground the Instrument

Keysight chassis' are provided with a grounding-type power plug. The instrument chassis and cover must be connected to an electrical ground to minimize shock hazard. The ground pin must be firmly connected to an electrical ground (safety ground) terminal at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere

Do not operate in the presence of flammable gases or fumes.

Do Not Operate Near Flammable Liquids

Do not operate the module/chassis in the presence of flammable liquids or near containers of such liquids.

Cleaning

Clean the outside of the Keysight module/chassis with a soft, lint-free, slightly dampened cloth. Do not use detergent or chemical solvents.

WARNING

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

Do Not Remove Instrument Cover

Only qualified, service-trained personnel who are aware of the hazards involved should remove instrument covers. Always disconnect the power cable and any external circuits before removing the instrument cover.

Keep Away from Live Circuits

Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers and shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.

Do Not Operate Damaged Equipment

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.

Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service trained personnel. If necessary, return the product to a Keysight Technologies Sales and Service Office for service and repair to ensure the safety features are maintained.

Do Not Block the Primary Disconnect

The primary disconnect device is the appliance connector/power cord when a chassis used by itself, but when installed into a rack or system the disconnect may be impaired and must be considered part of the installation.

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to a Keysight Sales and Service Office to ensure that safety features are maintained.

In Case of Damage

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

CAUTION

Do NOT block vents and fan exhaust.

Refer to the section "Equipment Installation" for air flow requirements for bench top systems as well as rack mount systems.

Do NOT operate with empty slots: To ensure proper cooling and avoid damaging equipment, fill each empty slot with an AXIe filler panel module.

Do NOT stack free-standing chassis: Stacked chassis should be rack-mounted.

All modules are grounded through the chassis: During installation, tighten each module's retaining screws to secure the module to the chassis and to make the ground connection.

WARNING

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

Safety Symbols and Instrument Markings

The table below lists the definitions of markings that may be on or with the product.

	This symbol is used to indicate power ON.
	This symbol marks the standby position of the power line switch.
	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 (if accompanied by a year, it is the year when the design was proven). It indicates that the product complies with all relevant directives.
	The RCM mark is a registered trademark of the Australian Spectrum Management Agency.
	"This ISM device complies with Canadian ICES-001." "Cet appareil ISM est conforme a la norme NMB du Canada." This is 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 CSA 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-ZZZZZZZZZZZZZZ.

UK conformity mark is a UK government owned mark. Products showing this mark comply with all applicable UK regulations.

Keysight email address

Regulatory Compliance

EMC: Complies with the essential requirements of the European EMC Directive and the UK Electromagnetic Compatibility Regulations 2016 as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity):

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

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

- IEC/EN 61010-1
- Canada: CSA C22.2 No. 61010-1
- USA: UL std no. 61010-1

Acoustic statement: (European Machinery Directive)

Acoustic noise emission
LpA <72 dB
Operator position
Normal operation mode per ISO 7779

To find a current Declaration of Conformity for a specific Keysight product, go to: http://www.keysight.com/go/conformity

Service and Support

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your Keysight Technologies Service Center for assistance.

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

WARNING The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the product from all voltage sources while it is being opened.

Service and Support Options

The standard warranty is a one-year return to Keysight Technologies factory service warranty.

NOTE There are many other repair and calibration options available from the Keysight Technologies support organization. These options cover a range of service agreements with varying response times. Contact Keysight for additional information on available service agreements for this product.

Contacting Keysight Technologies

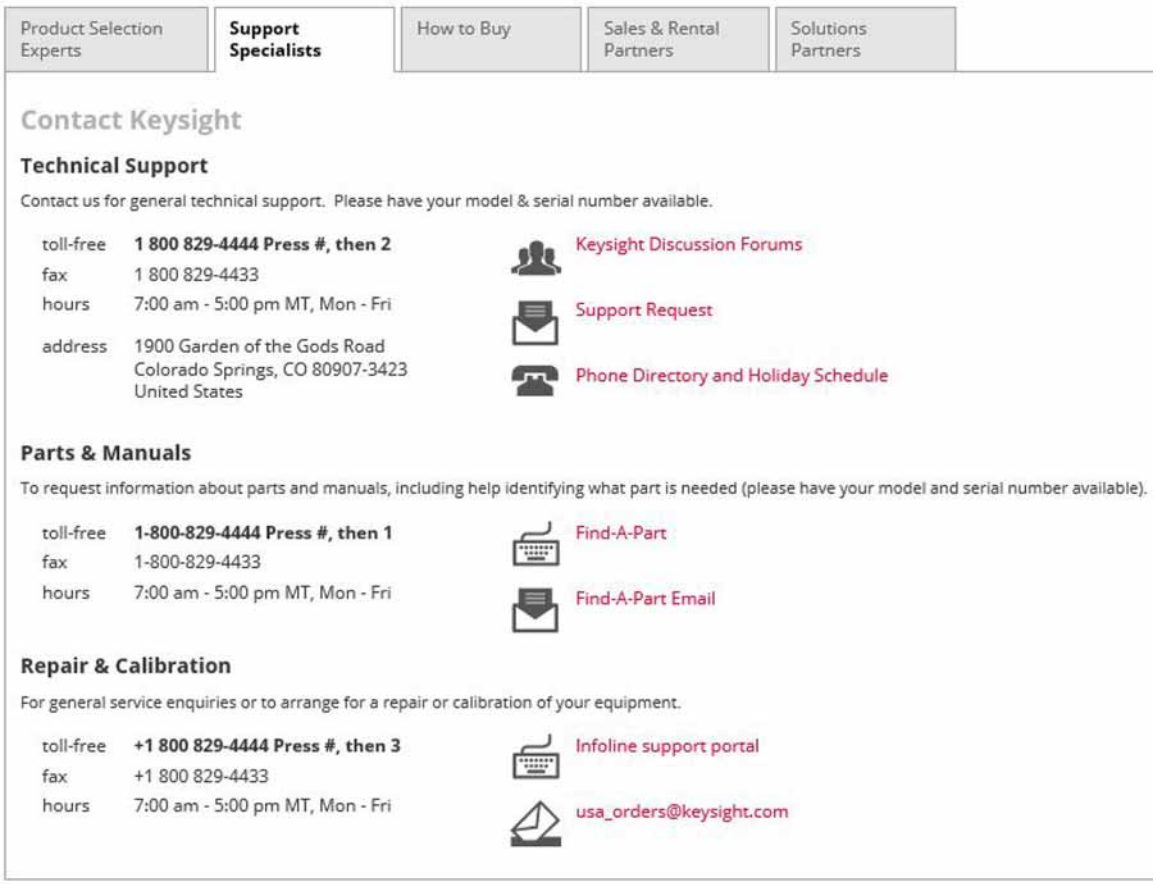
Assistance with test and measurements needs and information or finding a local Keysight office are available on the Web at:

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

Contact Keysight for service:

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

Once on the Services and Support page, click on "Contact an Expert" link in the upper right side of the page. You should be taken to a page similar to this:



If you do not have access to the Internet, contact your field engineer.

NOTE

In any correspondence or telephone conversation, refer to the Keysight product by its model number and full serial number. With this information, the Keysight representative can determine the warranty status of your unit.

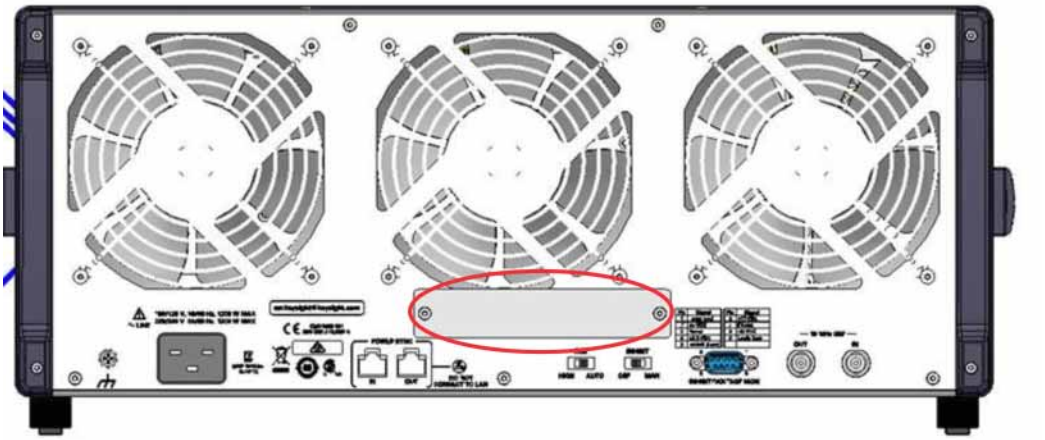
Return Procedure

In any correspondence or telephone conversations with Keysight Technologies, please refer to the instrument by its model number (N5511A, for example) and serial number. With this information, the customer engineer can determine whether your instrument is still within its warranty period and provide accurate shipping information.

Determining your instrument's serial number

When Keysight Technologies manufactures an instrument, it is given a unique serial number. This serial number appears on a label on the rear panel of the instrument (see Figure 6-1).

Figure 6-1 Serial number location



Shipping Your Analyzer to Keysight for Service or Repair

NOTE

Keysight Technologies reserves the right to reformat or replace the internal hard disk drive in your analyzer as part of its repair. This will erase all user information stored on the hard disk. It is imperative, therefore, that you make a backup copy of your critical test data located on the analyzer's hard disk before shipping it to Keysight for repair.

If you wish to send your instrument to Keysight Technologies for service or repair:

- Include a complete description of the service requested or of the failure and a description of any failed test and any error message.
- Ship the analyzer using the original or comparable packaging, with the antistatic packaging materials.
- Contact Keysight for instructions on where to ship your analyzer.

Shipping the instrument

Use the following procedure to package and ship your instrument for service. For instructions on removing an instrument from the system and re-installing it, refer to the system user's guide.

Table 6-1 To package the instrument for shipping

Step	Notes
1. Place the instrument in its original packaging materials. Place the shipping cover (p/n M9018-01206) back on the front to protect the cables.	Use original packaging or comparable.
2. Surround the instrument with at least 3 to 4 inches of its original packing material or bubble-pack to prevent the instrument from moving in its shipping container.	
3. After wrapping it with packing material, place the instrument in its original shipping container or a strong shipping container that is made of double-walled corrugated cardboard with 159 kg (350 lb) bursting strength.	The shipping container must be large and strong enough to accommodate your instrument and allow at least 3 to 4 inches on all sides for packing material.
4. Seal the shipping container securely with strong nylon adhesive tape.	
5. Mark the shipping container "FRAGILE, HANDLE WITH CARE" to help ensure careful handling.	
6. Use the address obtained from your Keysight customer engineer.	
7. Retain copies of all shipping papers.	

CAUTION

Damage can result if the original packaging materials are not used. Packaging materials should be anti-static and cushion the downconverter on all sides. NEVER USE STYRENE PELLETS IN ANY SHAPE AS PACKAGING MATERIALS. They do not adequately cushion the instrument or prevent it from moving in the shipping container. Styrene pellets can also cause equipment damage by generating static electricity or by lodging in fan motors.

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