

# Keysight Technologies N5252A and N5253E E-Band Vector Network Analyzer Systems

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# Introduction

## Introduction

Use this guide to configure and use your VNA as a millimeter-wave network analyzer system.

- N5252A E-Band PXIe configuration, WR12
- N5253E1, E2, or E3 E-Band Streamline configuration, WR12
- For alternative configurations, refer to the [Banded Millimeter Wave Network Analysis Technical Overview](#)

Refer to the following resources for your VNA solution.

### For N5252A

- [Keysight M937xA PXIe Vector Network Analyzer Modules Startup Guide](#)  
Part Number M9370-90001
- [Keysight M9005A PXIe Chassis User Guide](#)  
Part Number M9005-90001

### For N5253Ex

- [Keysight P50xxA Streamline Series Vector Network Analyzer Data Sheet](#)  
Part Number 5992-3606
- [P5000A Series USB-Vector Network Analyzer Quick Start Guide](#)  
Part Number 9018-04801
- [Streamline Series Vector Network Analyzers Configuration Guide](#)  
Part Number 5992-2823
- [Vector Network Analyzers Technical Overview](#)  
Part Number 5989-7603

### For Alternative System Configurations

- [Keysight N5252APXI 2-Port VNA to VNAX Adapter Module Product Note](#)  
Part Number N5252-90004
- [Keysight N5262BWxx, N5262BTxx, and N5262BRxx Mini VNAX Frequency Extension Modules Product Note](#)  
Part Number N5262-90002
- [Keysight N5252AWxx VNAX Extenders Quick Start Guide](#)  
Part Number N5252-90003

### For All Configurations

- [Banded Millimeter Wave Network Analysis Technical Overview](#)  
Part Number 5992-2177
- [Vector Network Analyzer Extenders \(VNAX\) from Virginia Diodes, Inc.](#)

## System Descriptions

N5252A and N5253E1, N5253E2, and N5253E3 are bundles of VNA, software, frequency extenders, and calibration kits to configure an E-Band Vector Network Analyzer system using the N5252AW12, 60–90 GHz mm-wave frequency extenders. These extenders are designed to work directly with Streamline or PXIe Vector Network Analyzers to configure a WR12 E-Band Vector Network Analyzer.

Alternative systems can be configured with separately purchased VNA, software, extenders, and 2-port test set adapter. See the [Banded Millimeter Wave Network Analysis Technical Overview](#) for configuration details.

For direct connect (VNAX-P) mm-wave band extenders, to enable an upgrade to higher frequencies, see [Keysight N5252AWxx Quick Start Guide \(N5252-90003\)](#).

To use standard VNAX extenders with PXIe or USB Streamline VNA, and using a 2-port test set adapter, refer to the Keysight [N5252APXI Product Note \(N5252-90004\)](#).

## Features

- The VNA provides power level adjustment at the output of the Frequency Extender (extender adjustable attenuator not required).
- Enhanced power level accuracy with calibration using your power meter and power sensor.
- Use as a standard VNA or mm-wave system.

## Available Configurations

- **Keysight N5252A** – lowest cost E-Band solution with PXIe M9374A PXIe in an M9005A PXIe Chassis with an Integrated System Module. Requires tower computer with PCIe card slot for MDX interface, 2-port or 4-port configurations.

Available Options for N5252A

- Option 200 provides items for a 2-Port E-Band (60–90 GHz) system. See [Figure 1](#).
- Option 400 provides items for a 4-Port E-Band (60–90 GHz) system. See [Figure 2](#).
- **Keysight N5253E1** – lowest cost E-Band solution with Streamline P5024A 20 GHz 4-port USB VNA. Two N5253E1 systems can be configured to create a 4-port system. See [Figure 3](#).
- **Keysight N5253E2** – low cost E-Band solution with Streamline P5004A 2-port, 20 GHz and P5008A 2-port, 53 GHz USB VNA. Only 2-port system. See [Figure 4](#).
- **Keysight N5253E3<sup>1</sup>** – E-Band solution with Streamline P5028A 4-port 53GHz VNA. See [Figure 5](#). Two N5253E3 systems can be configured to create a 4-port system.

### NOTE

There are no available options for the N5253E1, E2, or E3 bundles.

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1. To use the N5253E system as a standalone VNA system, you will need to order test cables.

## Verifying Your Shipment of N5252A and N5253E

Refer to your box contents list supplied with your shipment.

**Table 1** N5252A-200 and N5252A-400 Bundle

Description	Quantity for -200	Quantity for -400
M9005A Option 002, PXIe 5-slot Chassis with opt. PCIe card and I/O cable for tower computer.	1	1
M9374A with Option 551, PXIe Network Analyzer, 300 kHz- 20 GHz (installed into M9005A PXIe Chassis).	2	4
N5252AW12 Option 201 (N5252-80002) a pair of TxRx VNAX modules from VDI with 1.2m cable sets in one Pelican case.	1	2
N5262AC12 Calibration Kit, 60-90 GHz.	1	1

**Table 2** N5253E1 Bundle

Description	Quantity
P5024A-400 Vector Network Analyzer, 9 kHz-20 GHz, 4-port.	1
N5252AW12 Option 201 (N5252-80002) a pair of TxRx VNAX modules from VDI with 1.2m cable sets in one Pelican case.	1
N5262AC12 Calibration Kit, 60-90 GHz.	1
S97560B - Operation with N5252AW12 frequency extenders from VDI.	1

**Table 3 N5253E2 Bundle**

Description	Quantity
P5004A-200 Vector Network Analyzer, 9 kHz-20 GHz, 2-port	1
P5008A-200 Vector Network Analyzer, 100 kHz-53 GHz, 2-port	1
N5252AW12 Option 201 (N5252-80002) a pair of TxRx VNAX modules from VDI with 1.2m cable sets in one Pelican case.	1
N5262AC12 Calibration Kit, 60-90 GHz.	1
Y1701A - Multiple USB instruments configuration kit.	1
11904C Adapter, 2.4mm male to 2.92mm female	2
S97560B - Operation with N5252AW12 frequency extenders from VDI.	1
S97551B - Multiple Instruments/Modules Measurements	1

**Table 4 N5253E3 Bundle**

Description	Quantity
P5028A-400 Vector Network Analyzer, 100 kHz-53 GHz, 4-port.	1
N5252AW12 Option 201 (N5252-80002) a pair of TxRx VNAX modules from VDI with 1.2m cable sets in one Pelican case.	1
N5262AC12 Calibration Kit, 60-90 GHz.	1
S97560B - Operation with N5252AW12 frequency extenders from VDI.	1
11904C Adapter, 2.4mm male to 2.92mm female	4

**NOTE**

4-Port systems can be created with the N5253E1 and N5253E3 systems. Items required for operation to configure a 4-port system are:

- Y1701A - Multiple USB Instruments Configuration Kit
- S97551B - Multiple Instruments/Modules Measurements

**NOTE**

For alternative build-your-own systems, please refer to the **Banded Millimeter Wave Network Analysis Technical Overview**.

## All Bundles Include:

- N5252AW12 - TxRx VNAX Millimeter-wave VDI VNA Extenders, 60-90 GHz (Option 201). See the [Keysight N5252AWxx Quick Start Guide](#) for details.
  - Cable sets (1.2 m) and power supplies.
  - USB drive with power level data of N5252AW12 extenders and VDI User's Guide.
- Cable removal tool, SMB/MMCX (5002-3361)
- Socket, 5/16 inch (5023-1450)
- N5262AC12 - WR12 (E-Band, 60-90 GHz) Calibration Kit from VDI. See [Figure 6](#).

## Available Accessories for N5252A and N5253E

- N1913A/14A Power Meter or equivalent
- E8486A-200 (with Option 002) Waveguide Power Sensor, or U8489A with E281CS Adapter
- E281CS and E281DS Waveguide Adapters to 1 mm Coax
- N1913PM5B Waveguide Power Meter and Waveguide Tapers for alternative configurations of 110 GHz or higher (note that E-Band 60-90 GHz is too low for the N1913PM5B)

### NOTE

The N5252A requires a tower computer (not provided) with an available PCIe slot, monitor, mouse, and keyboard. M9374A modules limit future extensions above WR6.5. Refer to the [M9005A PXIe Chassis User Guide](#) for computer requirements.

The N5253E requires a laptop or tower computer (not provided).

Two N5253E1 or two N5253E3 systems can be configured to create a 4-port E-Band system. The N5253E2 system can only be configured for a 2-port system. Refer to the [Banded Millimeter Wave Network Analysis Technical Overview](#).

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## Limitations

- Not all applications are supported. See [Table 6](#) on [page 11](#) and the [Banded Millimeter Wave Network Analysis Technical Overview](#).
- You cannot configure the system for a mm-wave and a standard VNA system at the same time, running in the same VNA application. You can, however, perform this configuration if running in separate VNA applications on the same computer.
- This is a sensitive measurement apparatus by design and may have some performance loss when exposed to ambient continuous electromagnetic phenomenon similar to those used in testing per IEC 61000-4-6 (3V). See [Note on page 60](#) for details.

## Specifications

*Specifications (spec.):* Warranted performance. All specifications apply at 23 °C ± 5 °C unless otherwise stated, and 60 minutes after the instrument has been turned on. Specifications include guard bands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

*Typical (typ.):* Expected performance of an average unit which does not include guard bands. It is not covered by the product warranty.

*Nominal (nom.):* A general, descriptive term that does not imply a level of performance.

**Table 5** Specifications<sup>1</sup> for N5252A, N5253E1, E2, and E3

Frequency		
Range <sup>2</sup> :	60-90 GHz	
Performance <sup>3</sup>		
Dynamic Range (BW=10 Hz):	Minimum 100 dB, typical 110 dB	S-Parameter, S12, S21
Test Port Power:	Minimum +10 dBm, typical +13 dBm	
Magnitude Stability (± dB, typ.):	0.15	S-Parameter, S11, S22
Phase Stability (± deg, typ.):	2	S-Parameter, S11, S22
Physical Attributes		
<ul style="list-style-type: none"><li>Weight and size dimensions for the M9005A Chassis can be found in its <a href="#">User Guide (M9005-90001)</a>.</li><li>Weight and size dimensions for the VDI Extenders can be found on their product page at <a href="https://www.vadiodes.com/en/products/vector-network-analyzer-extension-modules">https://www.vadiodes.com/en/products/vector-network-analyzer-extension-modules</a>.</li><li>Weight and size dimensions for the P50xxA can be found on the <a href="#">VNA Technical Overview</a> (page 30)</li></ul>		
Environmental Requirements		
<ul style="list-style-type: none"><li>Refer to the <a href="#">M937xA</a> and <a href="#">M9005A</a> User Guides for environmental requirements for the N5252A system.</li><li>Refer to the <a href="#">VNA Technical Overview</a> (page 30) for environmental requirements for the N5253E system.</li></ul>		

**Table 6** Application Support

Option	Application	Availability
007	Automatic Fixture Removal	Optional
010	Time Domain	Optional
551	N-Port Calibration	Included
009	Frequency Offset Mode	Not Available

1. For alternative configurations with other than WR12 extenders, refer to the [VDI website](#) for extender specifications.

2. Start Frequency range can be set to as low as 55 GHz, but performance is not specified.

3. This is a sensitive measurement apparatus by design and may have some performance loss when exposed to ambient continuous electromagnetic phenomenon similar to those used in testing per IEC 61000-4-6 (3V). See Note on [page 60](#) for details.

Figure 1 N5252A 2-Port Configuration



Figure 2 N5252A 4-Port Configuration





Figure 3 N5253E1 Configuration with P5024A



Figure 4 N5253E2 Configuration with P5004A and P5008A



Figure 5 N5253E3 Configuration (with P5028A)



Figure 6 N5262AC12 - WR12 (E-Band, 60-90 GHz) Calibration Kit from VDI



#### Calibration Kit Contents

- 2 Loads
- 2 Shorts
- 1 QW Shim
- 1 USB Drive
- 1 Section (2")
- 2 Tools (Ball Drivers, Straight and 90° angle)

Figure 7 N5252AW12 System in Transport Case



## System Setup



## System Setup for N5252A

The M9374A modules are installed into the M9005A chassis at the factory, with the interconnects as shown in [Figure 7](#) below. Two modules are installed for Option 200 ([Figure 1](#)) and four modules for Option 400 ([Figure 2](#)). N5252A includes a PCIe desktop adapter.

Figure 8 M9005A PXIe Chassis with four M9374A Modules (Option 400)



1. Connect the supplied power cord to the M9005A chassis, but do not apply power until the system setup is complete.
2. Ensure reference jumper cables, trigger jumper cables, and 50  $\Omega$  loads are installed.

### NOTE

The 50  $\Omega$  terminator at LO Out on the first slot M9374A will be removed and used to terminate LO O on VDI Extender #2.

# 2-Port Setup

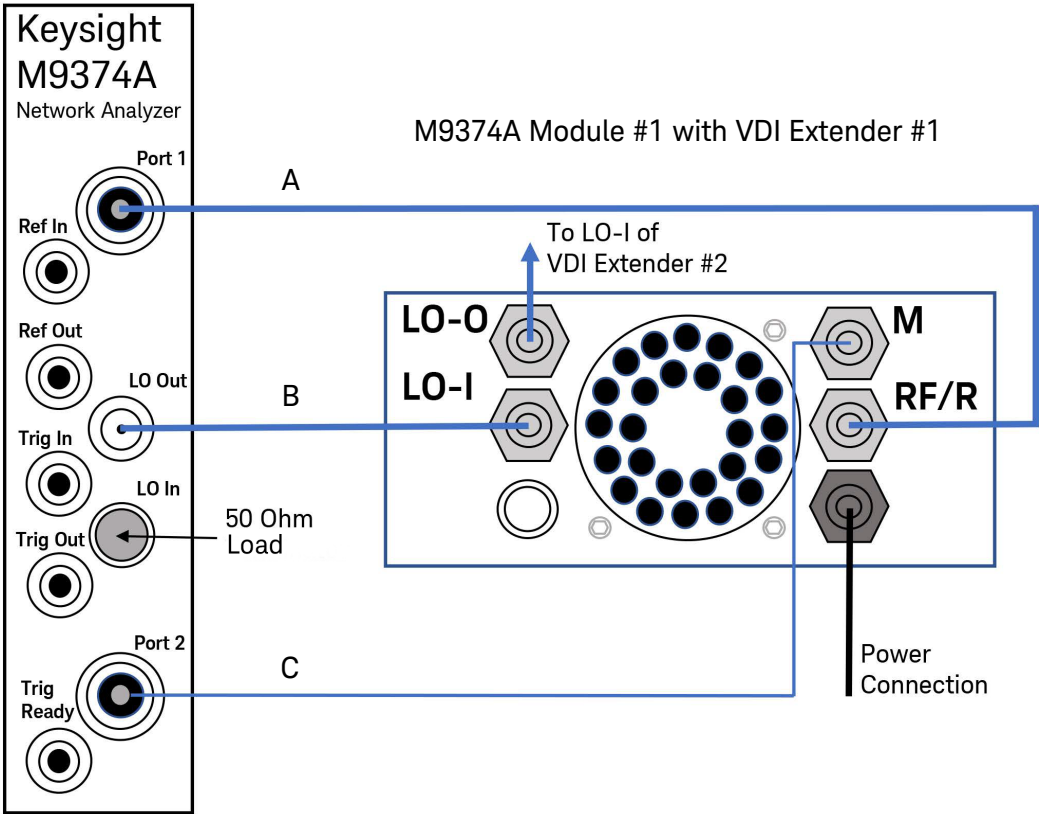
## Port 1 Configuration

- 1. Remove the 50 ohm load from LO Out on M9374A Module #1.
- 2. Install the three cables between M9374A Module #1 and VDI Extender #1. See Table 7 and Figure 9.
- 3. If not already installed, install a 50  $\Omega$  load to LO In on M9374A Module #1. See Figure 9.
- 4. Connect VDI Extender #1 (LO-O) to VDI Extender #2 (LO-I) with an RF/LO cable. See Figure 9.
- 5. Connect the power cord to VDI Extender #1. See Figure 9.

Table 7 Port 1 Configuration Cable Connections

Figure Reference	Cable Type <sup>1</sup>	M9374A Module #1		VDI Extender #2
A	RF/LO	Port 1	to	RF/R
B	RF/LO	LO Out	to	LO-I
C	IF	Port 2	to	M

Figure 9 Port 1 Configuration



1. RF/LO cables are thicker than the IF cables and are marked RF/LO or IF at the end of the cables.

## Port 2 Configuration

1. Install the two cables between M9374A Module #2 and VDI Extender #2. See [Table 8](#) and [Figure 10](#).
2. If not already installed, install two 50  $\Omega$  loads to LO In and LO Out on M9374A Module #2. If not already installed, install a reference jumper and a trigger jumper on Modules #1 and #2. See [Figure 10](#).
3. Add a 50  $\Omega$  load (use the load removed from Module #1) to LO-O on VDI Extender #2. See [Table 8](#) and [Figure 10](#). If Option 400 is to be used, connect VDI Extender #2 (LO-O) to VDI Extender #3 (LO-I) with an RF/LO cable.
4. Connect the power cord to VDI Extender #2. See [Figure 10](#).

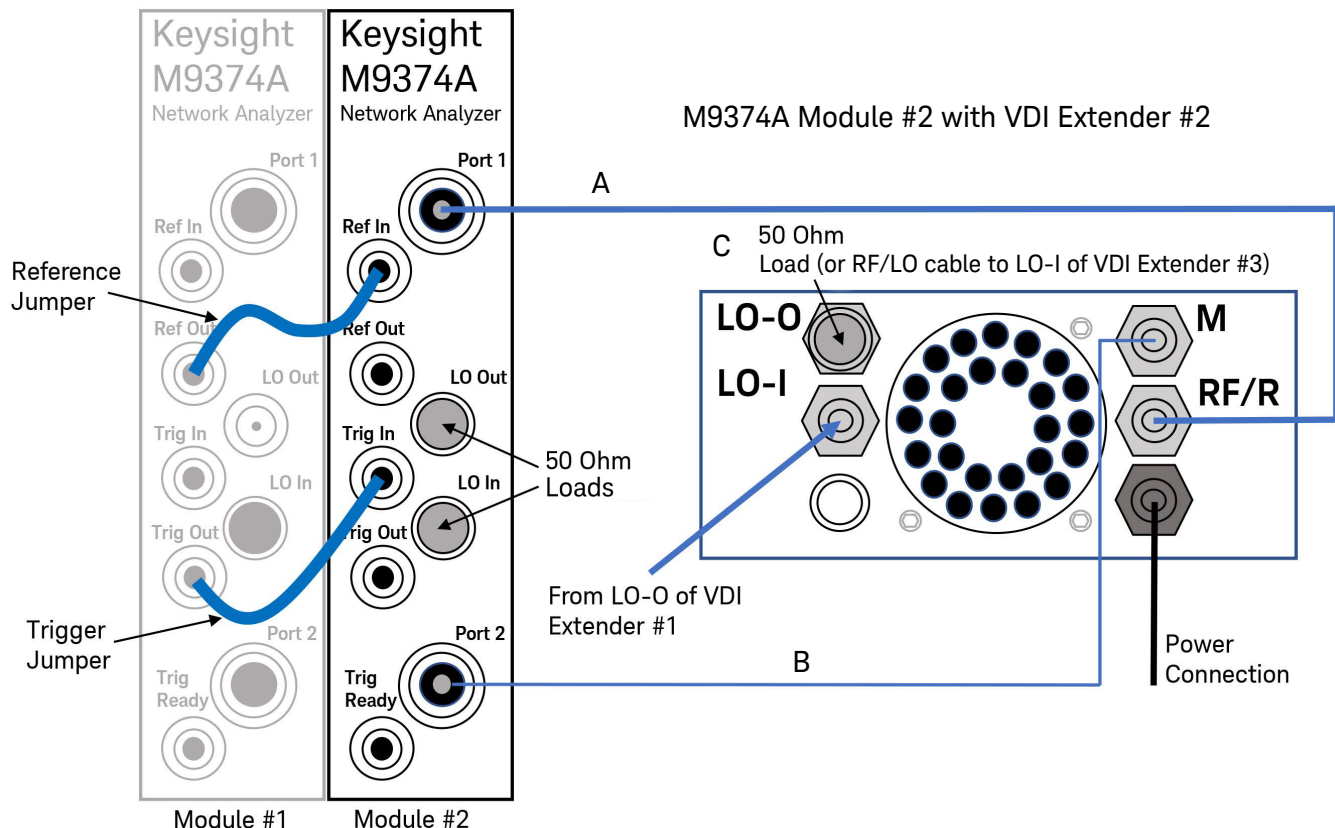
### NOTE

An RF cable up to 5 meters in length can be used for an LO-O to LO-I connection between extenders. The M9374A LO Out can only support 1.2 meter cable lengths.

**Table 8** Port 2 Configuration Cable Connections

Figure Reference	Cable Type <sup>1</sup>	M9374A Module #2	VDI Extender #2
A	RF/LO	Port 1	to RF/R
B	IF	Port 2	to M
C	50 $\Omega$ Load (or RF/LO for Option 400)	-	LO-O

**Figure 10** Port 2 Configuration



1. RF/LO cables are thicker than the IF cables and are marked RF/LO or IF at the end of the cables.

## 4-Port Setup

### Port 3 Configuration - Option 400 Only

1. Install the two cables between M9374A Module #3 and VDI Extender #3. See [Table 9](#) and [Figure 11](#).
2. If not already installed, install two 50  $\Omega$  loads to LO In and LO Out on M9374A Module #3. If not already installed, install a reference jumper and a trigger jumper on Modules #2 and #3. See [Figure 11](#).
3. Confirm Port 2 LO-O is connected to Port 3 LO-I.
4. Connect VDI Extender #3 (LO-O) to VDI Extender #4 (LO-I) with an RF/LO cable. See [Figure 11](#).
5. Connect the power cord to VDI Extender #3. See [Figure 11](#).

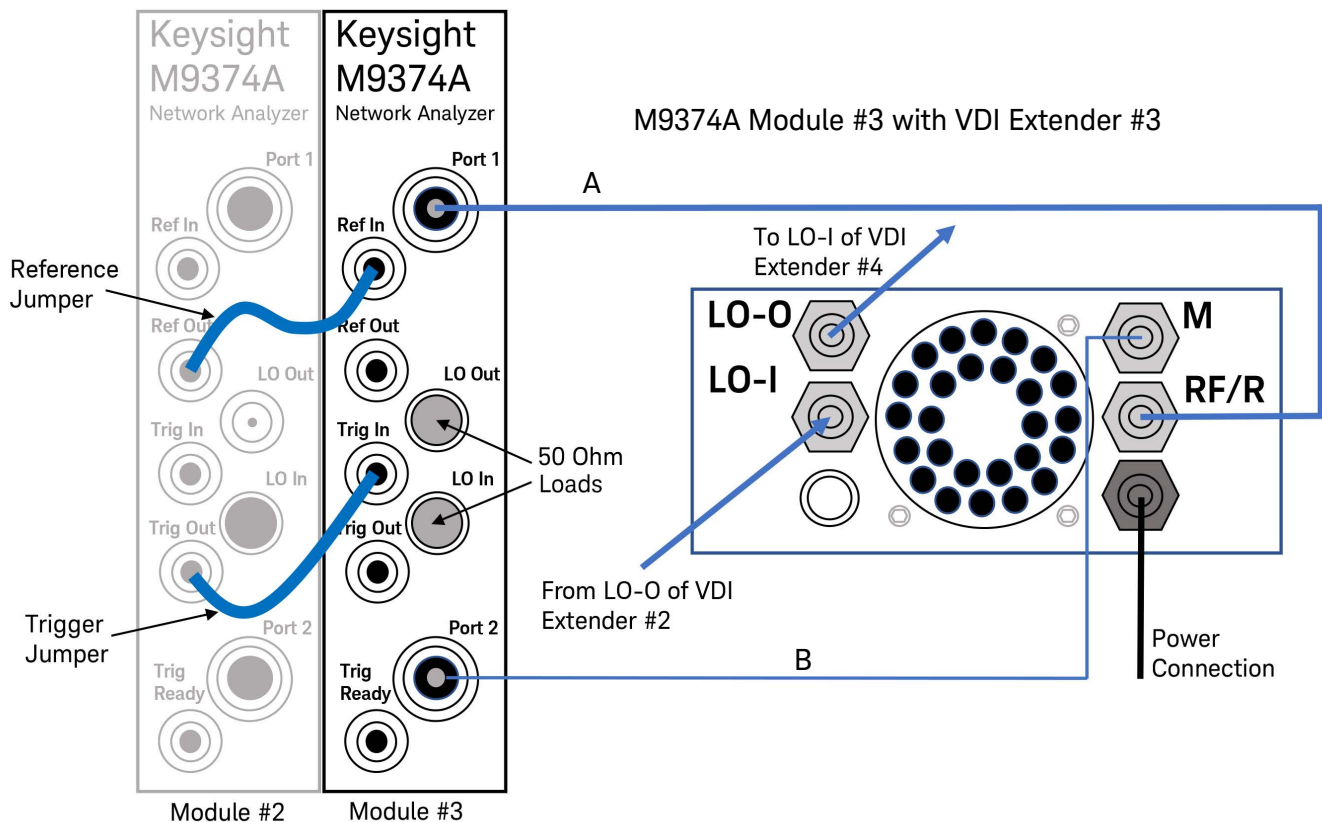
#### NOTE

An RF cable up to 5 meters in length can be used for an LO-O to LO-I connection between extenders. The M9374A LO Out can only support 1.2 meter cable lengths.

Table 9 Port 3 Configuration Cable Connections

Figure Reference	Cable Type <sup>1</sup>	M9374A Module #3		VDI Extender #3
A	RF/LO	Port 1	to	RF/R
B	IF	Port 2	to	M

Figure 11 Port 3 Configuration



1. RF/LO cables are thicker than the IF cables and are marked RF/LO or IF at the end of the cables.



## Port 4 Configuration - Option 400 Only

1. Install the two cables between M9374A Module #4 and VDI Extender #4. See [Table 10](#) and [Figure 12](#).
2. If not already installed, install two 50  $\Omega$  loads to LO In and LO Out on M9374A Module #4. If not already installed, install a reference jumper and a trigger jumper on Modules #3 and #4. See [Figure 12](#).
3. Install a 50  $\Omega$  load (use the load removed from Module #1) to VDI Extender #4 (LO-O). See [Figure 12](#).
4. Connect the power cord to VDI Extender #4. See [Figure 12](#).

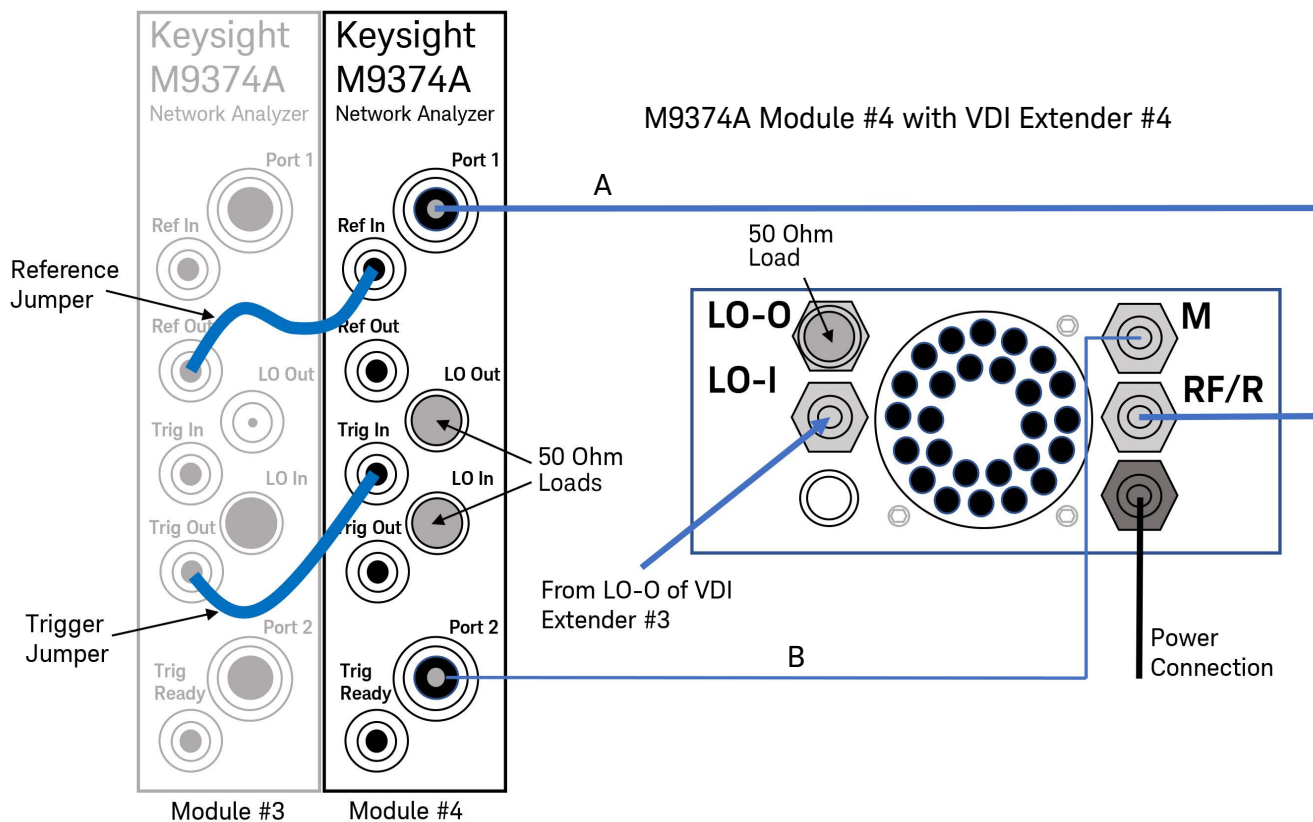
### NOTE

An RF cable up to 5 meters in length can be used for an LO-O to LO-I connection between extenders. The M9374A LO Out can only support 1.2 meter cable lengths.

Table 10 Port 4 Configuration Cable Connections

Figure Reference	Cable Type <sup>1</sup>	M9374A Module #4		VDI Extender #4
A	RF/LO	Port 1	to	RF/R
B	IF	Port 2	to	M

Figure 12 Port 4 Configuration



1. RF/LO cables are thicker than the IF cables and are marked RF/LO or IF at the end of the cables.

## Computer Setup and Software Installation for N5252A

1. Install the M9005A-002 PCIe desktop adapter into your tower PC expansion slot. For an example, consult the [Keysight M9048A PCIe Desktop Adapter Installation Guide](#) (which is a similar installation).
2. Connect the supplied interface cable (M9005-61301) to the cable port on the back of the M9005A chassis (MXI-Express x1), then connect the other end of the cable to the PCIe desktop adapter connection port on the back of the PC. Consult the [M9005A User Guide](#) for details.

### Software Installation

There are three software items that need to be installed onto your computer:

- Keysight IO Libraries Suite
  - Keysight M9005A PXIe Chassis driver software
  - Vector Network Analyzer software – Network Analyzer application
1. **Keysight IO Libraries Suite** – Download and install the [Keysight IO Libraries Suite](#) from Keysight's website.
  2. **Keysight M9005A PXIe Chassis drivers** – Refer to the Keysight M9005A PXIe Chassis User Guide (M9005-90001) "Getting Started with the System" section for installation instructions. The driver software can be installed from the M9005 PXIe Chassis Product Software and Information CD included with the shipment, or from the [M9005 PXIe Chassis Driver page](#) on Keysight's website.
  3. **Vector Network Analyzer software (Network Analyzer application)** – To download your application firmware, visit the [Keysight N5252A and N5253E system product page](#).
  4. Once the software has been installed, refer to "Turning on Your System" below.

#### CAUTION

Disable "Sleep Mode" on your PC when running the Network Analyzer application. Leaving it on will cause the application to crash.

---

### Turning On Your System

#### NOTE

Turn on the M9005A chassis first, before turning on your computer. Turning on the chassis first will normally turn on the system computer by itself. If not, check the M9005A connections to your computer.

---

## System Setup for N5253E

This section will aid in connecting your system. For computer setup and software, see [Computer Setup and Software Installation for N5253E on page 27](#).

1. Connect the P500xA Series USB VNA to your computer with the supplied USB-C 3.0 cable. Refer to the [P5000A Series Quick Start Guide](#).
2. Connect the supplied power cord to the VNA power supply and to the VNA, but do not apply power until the system setup is complete.
3. Ensure the jumper cable (LO In to LO Out), black control cable (CTRL S to CTRL M), and 50  $\Omega$  load (LO In) are installed. See Figure 13 and 14 below and the configuration drawings in the next three pages for details.

### NOTE

To use your VNA as a standard 20 or 50 GHz VNA, test set cables are available for separate purchase. See the recommended cables in the [Banded Millimeter Wave Analysis Technical Overview](#).

Figure 13 P5024/8A - Jumper Cable and Control Cable Connections<sup>1</sup>



1. P5028A shown

Figure 14 P5004A to P5008A - Jumper Cable and Control Cable Connections



5. Proceed to [N5253E Configuration on page 27](#) to connect your extenders.

## N5253E1 Configuration

1. Install the RF/LO and IF cables from Ports 1, 2, 3, and 4 of the P5024A to VDI Extenders #1 and #2. See [Table 11](#) and [Figure 15](#).
2. Install RF/LO cable from LO Out of P5024A (remove 50 Ohm load and set aside for now) and connect to LO/I of VDI Extender #2. See [Table 11](#) and [Figure 15](#).
3. Install 50  $\Omega$  load to LO-O on VDI Extender #1. See [Figure 15](#).
4. Connect VDI Extender #1 (LO-I) to VDI Extender #2 (LO-O) with an RF/LO cable. See [Table 11](#) and [Figure 15](#).
5. Connect the power cords to VDI Extenders. See [Figure 15](#).

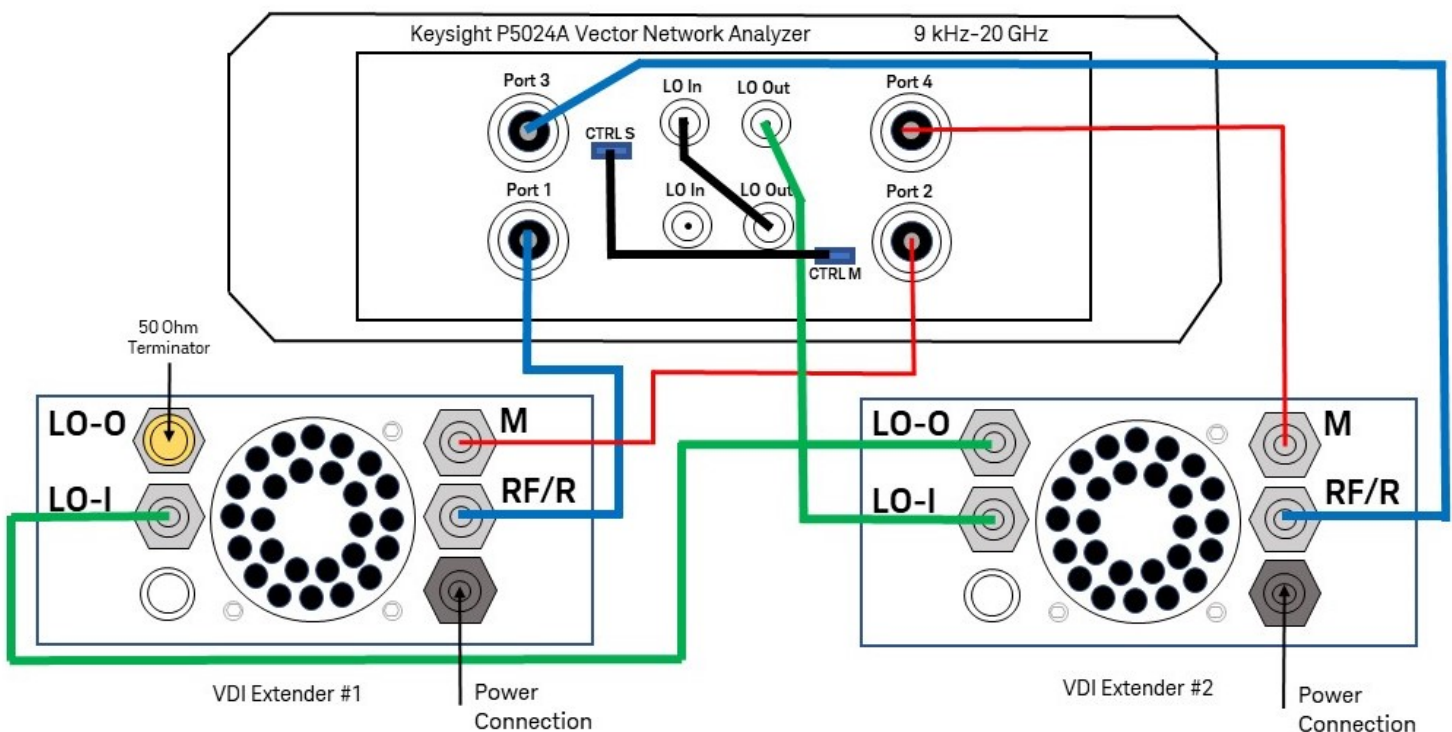
### NOTE

You can build a 4-port system with the purchase of another N5253E1 system and duplicating the setup below and connecting CTRL S to CTRL M.

**Table 11** Cable Connections for P5024A to VNAX Extenders

Figure Reference	Cable Type <sup>1</sup>	P5024A VNA		VDI Extender #1	VDI Extender #2
Blue	RF/LO	Port 1	to	RF/R	--
Red	IF	Port 2	to	M	--
Blue	RF/LO	Port 3	to	--	RF/R
Red	IF	Port 4	to	--	M
Green	RF/LO	LO Out	to	--	LO-I
Green	RF/LO	--	LO-I	to	LO-O
Black	Control	CTRL M to CTRL S			
Black	SMA	LO In to LO Out			

**Figure 15** N5253E1 Configuration



1. RF/LO cables are thicker than the IF cables and are marked RF/LO or IF at the end of the cables.

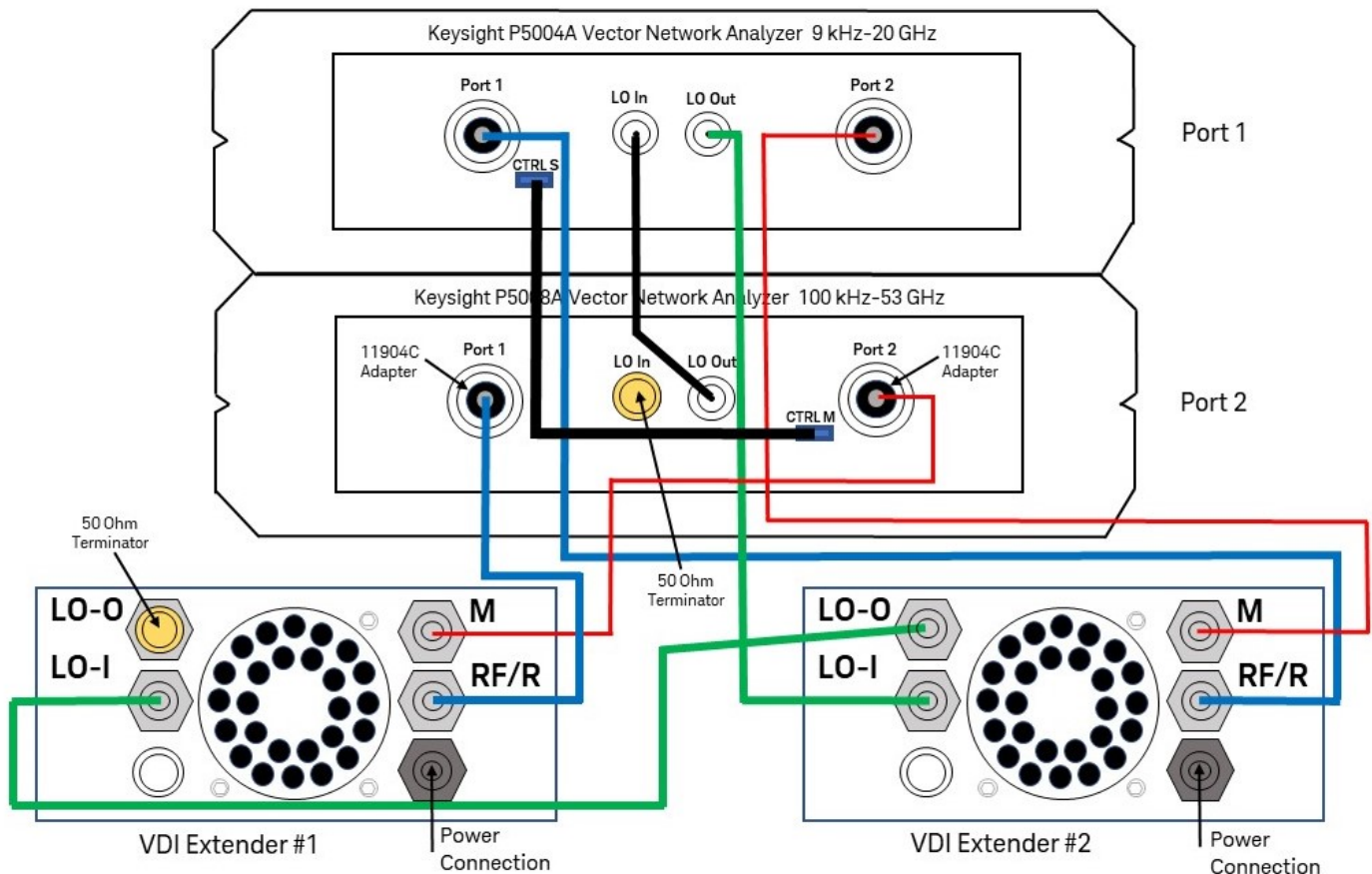
## N5253E2 Configuration

1. Install the RF/LO and IF cables from Ports 1 and 2 of the P5004A and P5008A to VDI Extenders #1 and #2. Install RF/LO cable from LO Out of P5004A to LO-I of VDI Extender #2. See [Table 12](#) and [Figure 16](#). Use 11904C adapters on the P5008A.
2. If not already installed, install a 50  $\Omega$  load to LO In on P5008A and LO-O on VDI Extender #1. See [Figure 16](#).
3. Connect VDI Extender #1 (LO-I) to VDI Extender #2 (LO-O) with an RF/LO cable. See [Table 12](#) and [Figure 16](#).
4. Connect the power cords to VDI Extenders. See [Figure 16](#).

**Table 12 Cable Connections for P5004A and P5008A to VNAX Extenders**

Figure Reference	Cable Type <sup>1</sup>	P5004A VNA	P5008A VNA <sup>2</sup>	VDI Extender #1	VDI Extender #2
Blue	RF/LO	Port 1	to	--	RF/R
Blue	RF/LO		Port 1	to	RF/R
Red	IF	Port 2	to	--	M
Red	IF		Port 2	to	M
Green	RF/LO	LO Out	to	--	LO-I
Green	RF/LO			LO-I	to
Black	Control	CTRL S	to	CTRL M	
Black	SMA	LO In	to	LO Out	

**Figure 16 N5253E2 Configuration**





## N5253E3 Configuration

1. Install 11904C adapters on Ports 1 through 4 of the P5028A, then install RF/LO and IF cables from Ports 1, 2, 3, and 4 of the P5028A to VDI Extenders #1 and #2. See [Table 13](#) and [Figure 17](#).
2. Install RF/LO cable from LO Out of P5028A (remove 50 Ohm load and set aside for now) and connect to LO/I of VDI Extender #2. See [Table 13](#) and [Figure 17](#).
3. Install 50  $\Omega$  load to LO-O on VDI Extender #1. See [Figure 17](#).
4. Connect VDI Extender #1 (LO-I) to VDI Extender #2 (LO-O) with an RF/LO cable. See [Table 13](#) and [Figure 17](#).
5. Connect the power cords to VDI Extenders. See [Figure 17](#).

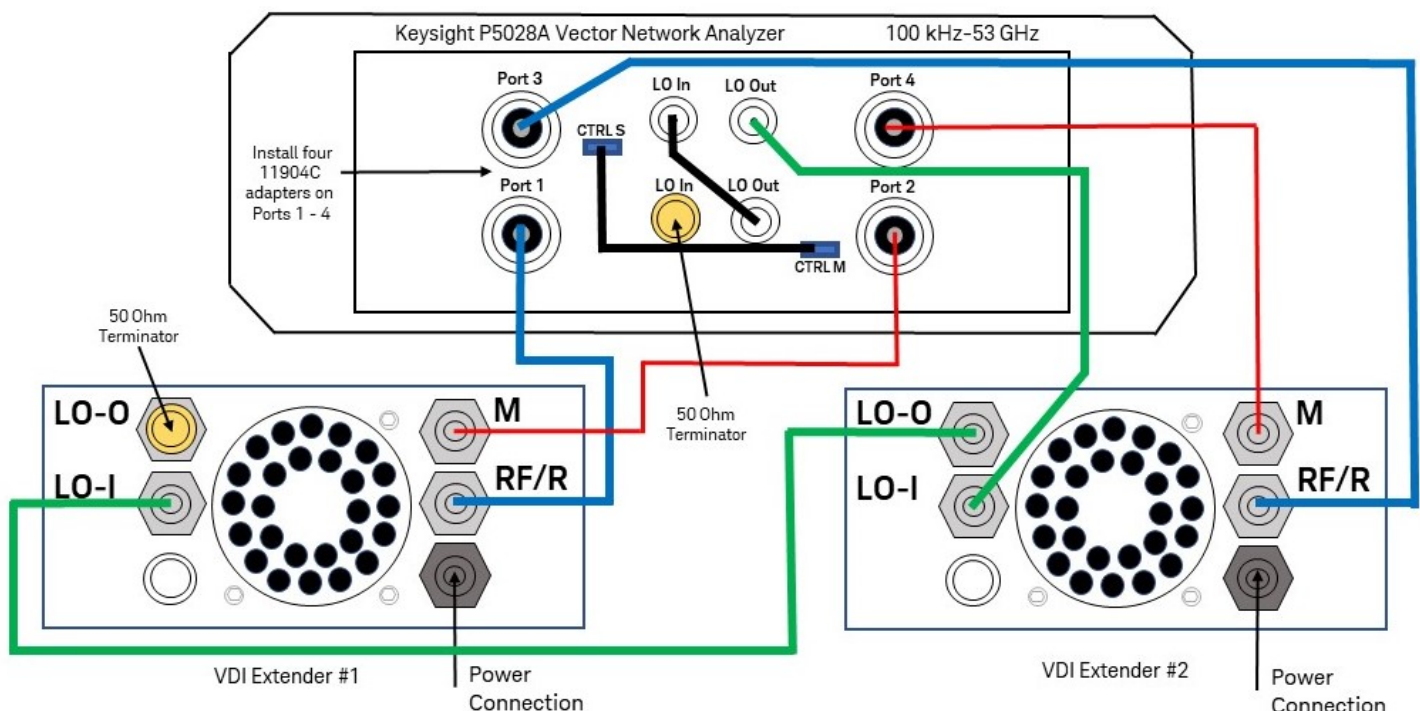
### NOTE

You can build a 4-port system with the purchase of another N5253E3 system and duplicating the setup below.

**Table 13** Cable Connections for P5028A to VNAX Extenders

Figure Reference	Cable Type <sup>1</sup>	P5028A VNA <sup>2</sup>		VDI Extender #1		VDI Extender #2
Blue	RF/LO	Port 1	to	RF/R	--	
Red	IF	Port 2	to	M	--	
Blue	RF/LO	Port 3	to	--	RF/R	
Red	IF	Port 4	to	--	M	
Green	RF/LO	LO Out	to	--	LO-I	
Green	RF/LO	--		LO-I	to	LO-O
Black	Control	CTRL M to CTRL S				
Black	SMA	LO In to LO Out				

**Figure 17** N5253E3 Configuration



1. RF/LO cables are thicker than the IF cables and are marked RF/LO or IF at the end of the cables.
2. Connections to the P5008A require 11904C adapters.

## Computer Setup and Software Installation for N5253E

There are two software items that need to be installed onto your computer:

- Keysight IO Libraries Suite
- Vector Network Analyzer software (Rev. **A.15.20.05** or greater)

Refer to the [P5000A Series USB-Vector Network Analyzer Quick Start Guide \(9018-04801\)](#).

1. **Keysight IO Libraries Suite** - Download and install the [Keysight IO Libraries Suite](#) from Keysight's website.
2. **Vector Network Analyzer software** - To download your application firmware, visit the [P5000A Keysight Streamline USB Vector Network Analyzer, 4.5 GHz product page](#).

### CAUTION

Disable "Sleep Mode" on your PC when running the Network Analyzer application. Leaving it on will cause the application to crash.

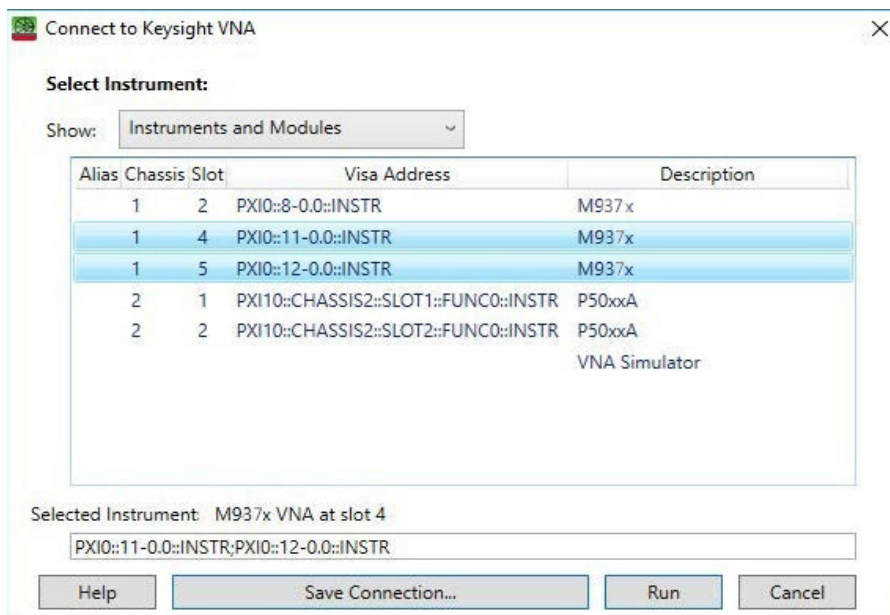
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## Configuring Your System for N5252A, N5253E, and Alternative Systems

### For N5252A

Turn on the M9005A chassis, which should turn on your computer. Run the Network Analyzer Application, which will start with the selection of the VNA. In the window, select your VNA cards as shown in [Figure 18](#) below. Select "Save Connection..." then select "Run" to connect to your computer.

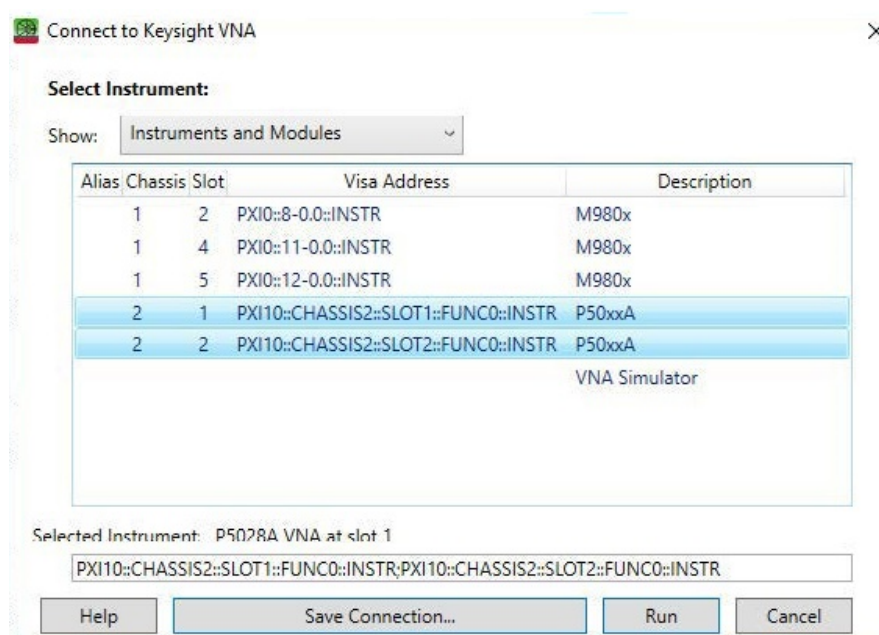
Figure 18 N5252A Connecting to VNA



### For N5253E and Alternative Systems

Run the Network Analyzer Application, which will start with the selection of the VNA. In the window, select your VNA cards as shown in [Figure 19](#) below. Select "Save Connection..." then select "Run" to connect to your computer.

Figure 19 N5253E Connecting to VNA





In the Network Analyzer (VNA) application, select **Setup > External Hardware > Millimeter Config > New** > then enter the name (N5252A or N5253E) as desired. See [Table 14](#) and [Figure 20](#) below for the settings that should be used.

**Table 14 Configuration Settings**

Module <sup>1</sup>	N5252AW06 <sup>2</sup> WR6.5 (D-Band)	N5252AW10 <sup>2</sup> WR10 (W-Band)	N5252AW12 WR12 (E-Band)	N5252AW15 <sup>2</sup> WR15 (V-Band)
LO Multiplier	12	6	6	6
RF Multiplier	12	6	6	6
Test Port (GHz)	110-170	75-110	60-90	50-75

1. Refer to the label on the extender for the LO Multiplier, RF Multiplier, and Test Port (GHz).
2. If using an alternative configuration, see [page 43](#) or the [N5252AWxx Quick Start Guide](#) for details.

**Figure 20 N5252A or N5253E Configuration**

The screenshot shows the 'Millimeter Configuration' dialog box. On the left, under 'Select Configuration', a list contains 'Standard PNA', 'N5252A' (highlighted in blue), and 'N5253E'. Below this list are 'New' and 'Remove' buttons. On the right, the 'Properties' section includes a 'Name' field with 'N5252A (or N5253E)', a 'Max Power limit at Module RF IN' field set to '2.00 dBm', an 'RF IN cable: Offset' field set to '0.00 dB', and a 'Slope' field set to '0.150 dB/GHz'. There is an unchecked checkbox for 'Enable Installation Cal - Not Available' and an 'Installation Cal...' button, which is pointed to by a yellow arrow. At the bottom, there is a 'Frequencies' table with columns for 'Start', 'Stop', and 'Multiplier'. The table contains three rows: 'Module RF IN' (10.0000000000 GHz to 15.0000000000 GHz, multiplier 6), 'Module LO IN' (10.0000000000 GHz to 15.0000000000 GHz, multiplier 6), and 'Module Test Port' (60.0000000000 GHz to 90.0000000000 GHz). At the bottom right are 'OK', 'Cancel', and 'Help' buttons.

When your selections are made, select "OK" and restart as a "Millimeter Wave System." After the restart is complete, return to the Select Configuration window above and select "Installation Cal" ([Figure 20](#)).

## Installation Calibration

An Installation Calibration is required. The Installation Calibration can be turned off if needed. Perform a receiver check before attempting the Installation Calibration (see [page 32](#)).

### Important Notes:

- Improves power level control and performance.
- The Installation Calibration should be done each time a change is made to the physical configuration, e.g., a cable change, a change in a millimeter extender, or a change in a VNA module.
- The Installation Calibration does NOT provide any calibration of the VNA receivers.
- The Installation Calibration is applied system-wide. It can be enabled and disabled, but only on a system-wide basis. It cannot be enabled or disabled on a channel-by-channel basis.

In the Network Analyzer application screen, open the Millimeter Configuration window by selecting **Preset > Setup > External Hardware > Millimeter Config...**

In the Millimeter Configuration window, open the Installation Cal Status window by selecting **Installation Cal...** (see [Figure 20](#) on [page 29](#)).

Please note that the Model entry in the table column will always show **Not Available**, as the banded mm-wave extenders do not have components to report model information to the VNA. See [Figure 21](#) below.

Select **Calibrate** and enter the Port 1 maximum output power (see [Figure 22](#)). Connect a load to Port 1 module and select **Measure**. The maximum power can be found for each extender on the USB drives included.

Once the calibration is completed, select **Finish** and continue with Port 2 (see [Figure 22](#)).

The calibration date will be updated with the current date on your computer.

Click on the **Help** button (see [Figure 21](#) below) for step-by-step instructions on how to perform the Installation Calibration.

Figure 21 Installation Cal Status Window

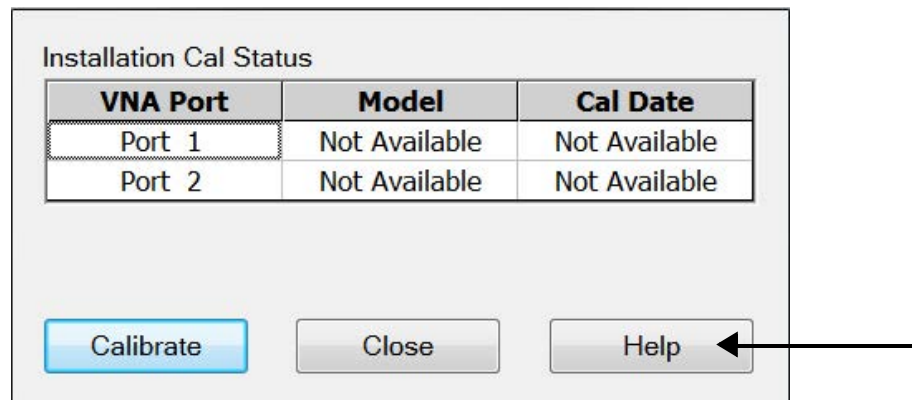


Figure 22 Installation Calibration Steps

The figure displays three sequential screenshots of the 'Millimeter Installation Cal' dialog box, illustrating the calibration process.

**Calibration Step 1 of 2:** The dialog prompts the user to 'Enter Port 1 millimeter module's max output power', with a value of '15.00 dBm' entered in the input field. It instructs the user to 'Connect a load to Port 1 millimeter module, then press "Measure"'. The 'Measure >' button is highlighted.

**Calibration Step 2 of 2:** The dialog prompts the user to 'Enter Port 2 millimeter module's max output power', with a value of '15.00 dBm' entered in the input field. It instructs the user to 'Connect a load to Port 2 millimeter module, then press "Measure"'. The 'Measure >' button is highlighted.

**Installation Calibrations complete:** The dialog informs the user that 'Installation Calibrations complete' and instructs them to 'Press "Finish" to exit Installation Cals.'. The 'Finish' button is highlighted.

## System Check for N5252A and N5253E

The following system checks will confirm the system is connected and operating correctly: **Receiver Check**, **Dynamic Range Check**, and **Stability Check**.

Note that all system checks have a 2 dB default power setting.

Refer to the **Help** menu for assistance.

### Receiver Check

#### 2-Port System Receiver Check

1. Leave the ports open. Select **Preset**.
2. Enter power level +20 dBm<sup>1</sup> to get max test port power output.
3. Select **System > Service > Diagnostics > Receiver Display**

Table 15      2-Port Receiver Check

Display Window	Measurement
A,1	-20 ±10 dB
B,2	-20 ±10 dB
R1,1	-5 ±10 dB
R2,2	-5 ±10 dB

4. See [Figure 23](#) on [page 33](#) for a display example.

#### 4-Port System Receiver Check

1. Leave the ports open. Select **Preset**.
2. Enter power level +20 dBm<sup>1</sup> to get max test port power output.
3. Select **System > Service > Diagnostics > Receiver Display**

Table 16      4-Port Receiver Check

Display Window	Measurement
A,1	-20 ±10 dB
B,2	-20 ±10 dB
C,3	-20 ±10 dB
D,4	-20 ±10 dB
R1,1	-5 ±10 dB
R2,2	-5 ±10 dB
R3,3	-5 ±10 dB
R4,4	-5 ±10 dB

4. See [Figure 24](#) on [page 33](#) for a display example.
5. **Note:** if receiver level is low, remove DC input to VDI extender module and reconnect to module.

---

1. Entering +20 dBm in the VNA menu will result in approximately +13 dBm of output at the waveguide test port.

Figure 23 2-Port Receiver Check

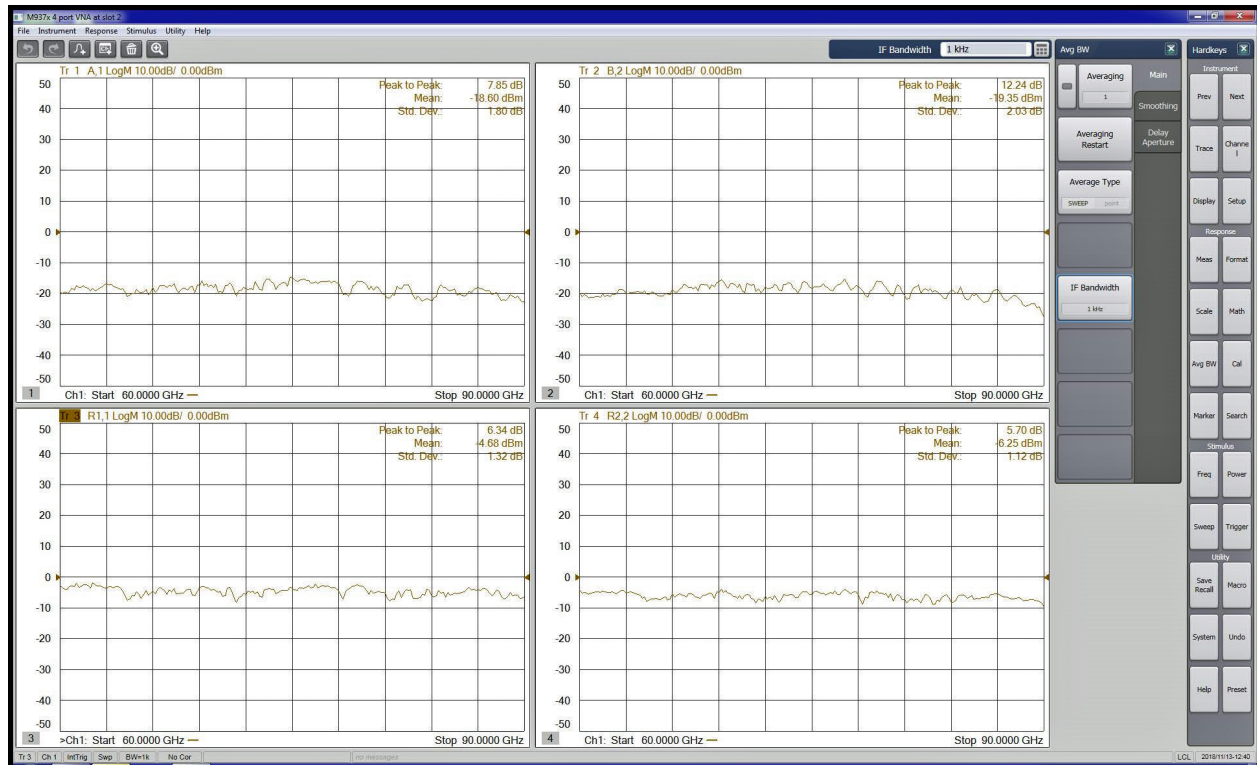
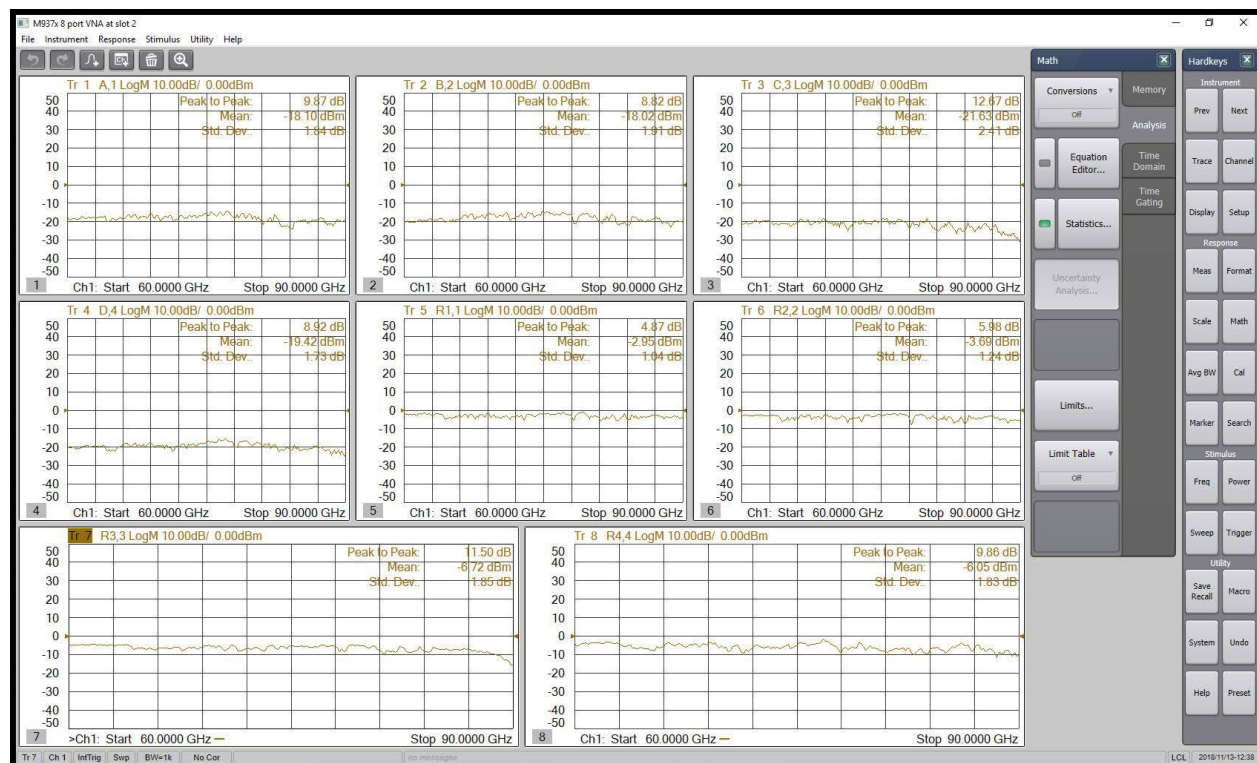


Figure 24 4-Port Receiver Check

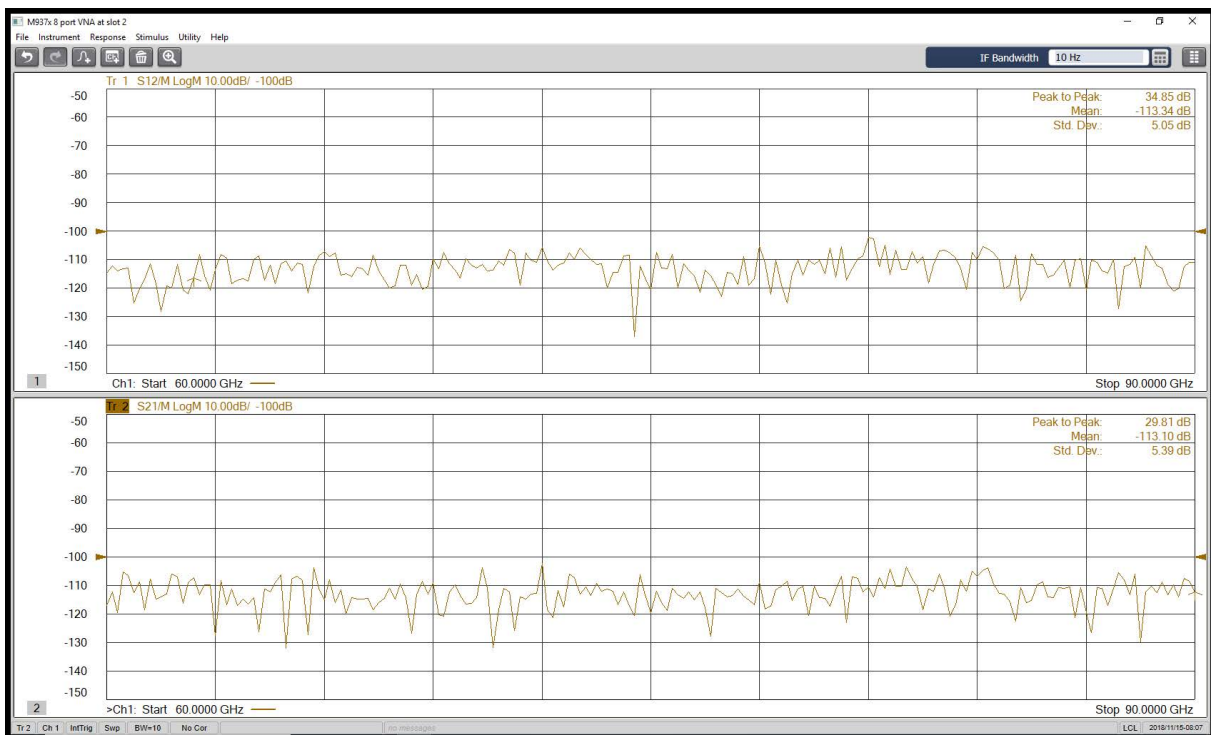


## Dynamic Range Check for N5252A and N5253E

### 2-Port System

1. Connect the millimeter wave extender waveguide Ports 1 and 2 together with supplied captive screws and 5/64 ball driver from the cal kit..
2. Select **Preset**.
3. Set the power level to +20 dBm<sup>1</sup>.
4. Ensure that the following traces are each set up in a display window (turn on "Statistics" for each trace and refer to the mean value):
  - a. S12 - Trace
  - b. S21 - Trace
5. Normalize the S12 and S21 traces.
6. Set IF BW to 10 Hz.
7. Separate the VNA extenders and connect a load to the waveguide test port of each port.
8. Set the scale reference level to -100 dB in each window.
9. See [Figure 25](#) below for a display example.
10. Verify the mean value is  $\geq -100$  dB for each trace.

Figure 25 2-Port Dynamic Range Check with Statistics



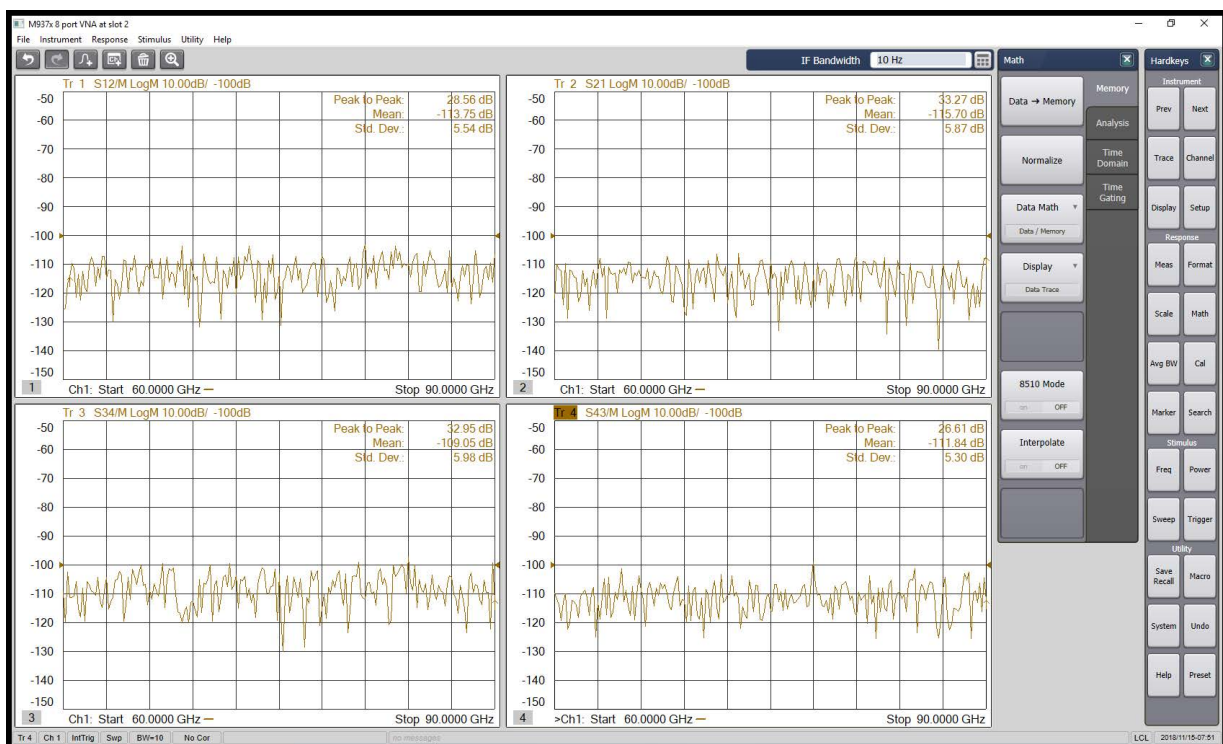
1. Entering +20 dBm in the VNA menu will result in approximately +13 dBm of output at the waveguide test port.



## 4-Port System

1. Connect the VNA extender waveguide Ports 1 and 2 together and Ports 3 and 4 together.
2. Select Preset.
3. Set the power level to +20 dBm<sup>1</sup>.
4. Ensure that the following four traces are each setup in a display window (turn on "Statistics" for each trace):
  - a. S12 - Trace Uncorrected Thru
  - b. S21 - Trace Uncorrected Thru
  - c. S34 - Trace Uncorrected Thru
  - d. S43 - Trace Uncorrected Thru
5. Normalize the S12, S21, S34 and S43 traces.
6. Set IF BW to 10 Hz.
7. Separate the VNA extenders and connect a flush short (or load) from the cal kit to the waveguide test port of each extender. (Note that dynamic range is best measured with loads, but shorts can be used).
8. Set the scale reference level to -100 dB for each window.
9. Verify the mean value is  $\geq -100$  dB for each trace.
10. See [Figure 26](#) below for a display example.

**Figure 26** 4-Port Dynamic Range Check with Statistics

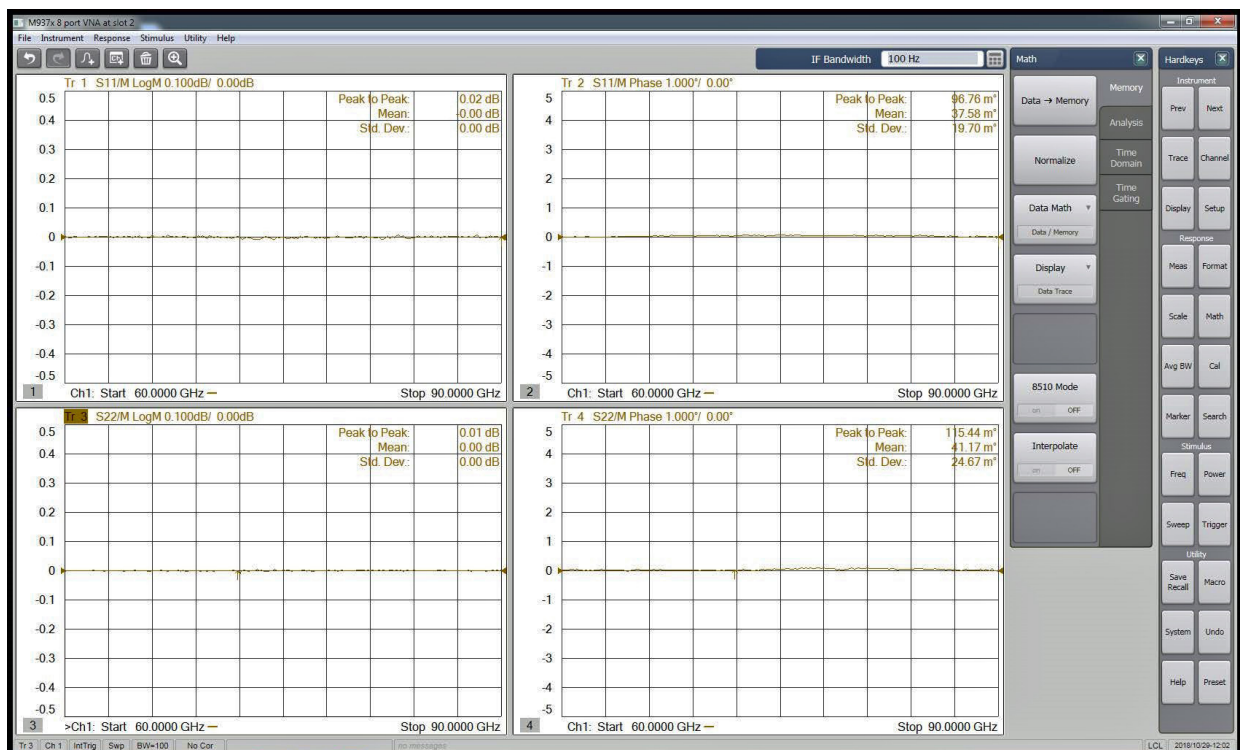


1. Entering +20 dBm in the VNA menu will result in approximately +13 dBm of output at the waveguide test port.

## Stability Check for N5252A and N5253E

1. Attach a flush short to the port of the mm-wave extender to be tested.  
(Note that two ports can be tested at a time with the cal kit).
2. Select Preset.
3. Set IF Bandwidth to 100 Hz.
4. Setup traces in separate display windows, with four windows for 2-Port and eight windows for 4-Port. For Port 1 and 2, setup the following traces:
  - S11 scale format log mag, scale 0.1 dB
  - S11 scale format phase, scale 1 degree
  - S22 scale format log mag, scale 0.1 dB
  - S22 scale format phase, scale 1 degree.
5. Normalize each trace and turn on "Statistics."
6. If the system has been on for less than one hour, some drift is expected.  
Measurements are to be made in a stable temperature environment.
  - Amplitude stability and trace noise:  $\pm .15$  dB<sup>1</sup>
  - Phase drift and noise:  $\pm 2$  degrees<sup>1</sup>
7. See [Figure 27](#) below for a display example.

**Figure 27** 2-Port Function Check - Stability and Trace Noise (100 Hz)



1. Values are typical.



8. For a 4-Port configuration (N5252A-400) stability and noise check, attach flush shorts to mm-wave extenders Port 3 and Port 4.
9. Set IF BW to 100 Hz.
10. Setup traces in separate windows:
  - S33 scale format log mag, scale 0.1 dB
  - S33 scale format phase, scale 1 degree
  - S44 scale format log mag, scale 0.1 dB
  - S44 scale format phase, scale 1 degree
12. See [Figure 27](#) for a display example.
13. Note that traces will be labeled on display as S33 and S44.

## System Calibration

### NOTE

Not performing an installation calibration will result in a source power calibration failure.

To improve the accuracy of your system, this section of the User's Guide will outline the process for performing a Smart Cal for a system calibration. Refer to the Help menu for details.

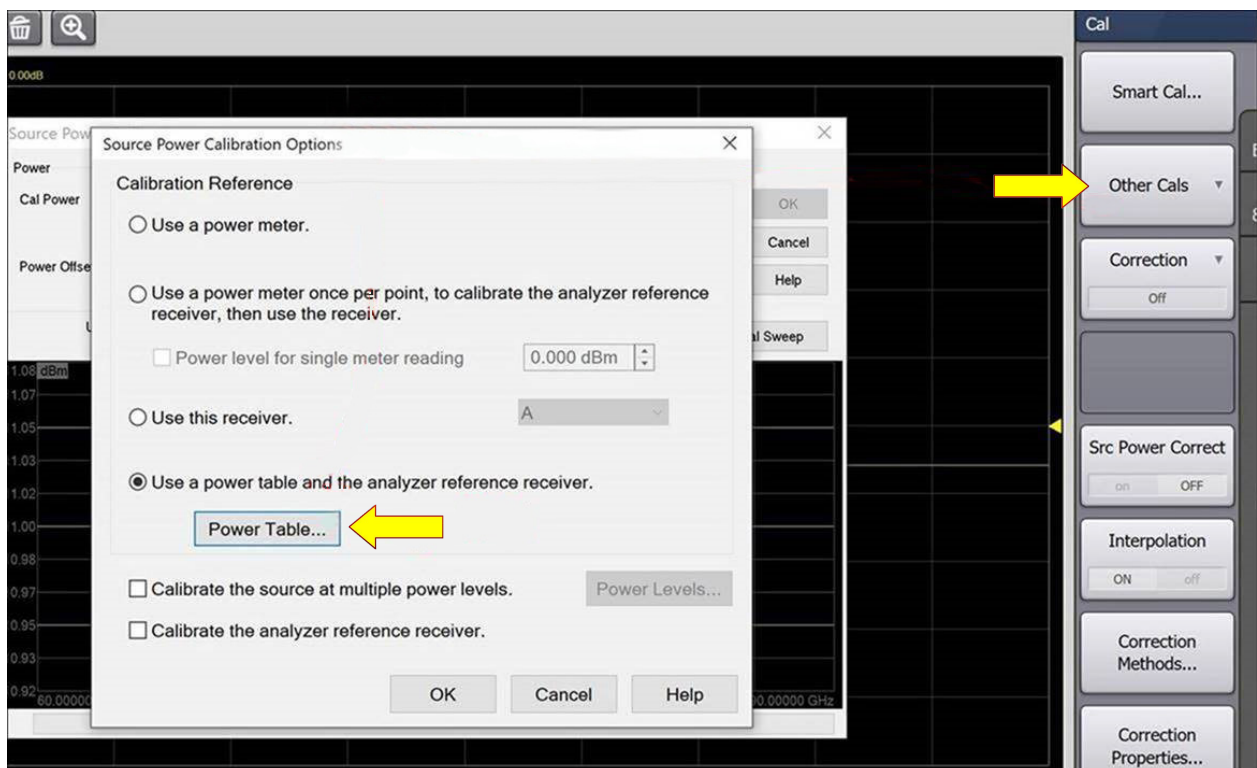
### Smart Cal

Equipment Required:

- WR12 Calibration Kit (N52562AC12)
- (Optional) Waveguide Power Meter with an E8486A-200 Power Sensor or equivalent (Ensure power sensor calibration table is loaded)
- User should use a power meter for the cal, but if it's not available then use the ".prn" files.

Please note that ".prn" files are provided on the USB drive with the N5252AW12 extenders. Each extender has a .prn file provided on the USB drive with factory (VDI) measured output power data. To enter the .prn file, select **Cal > Other Cals > Source** from the screen and select **Power Table** (Figure 28), then load the file from the USB drive.

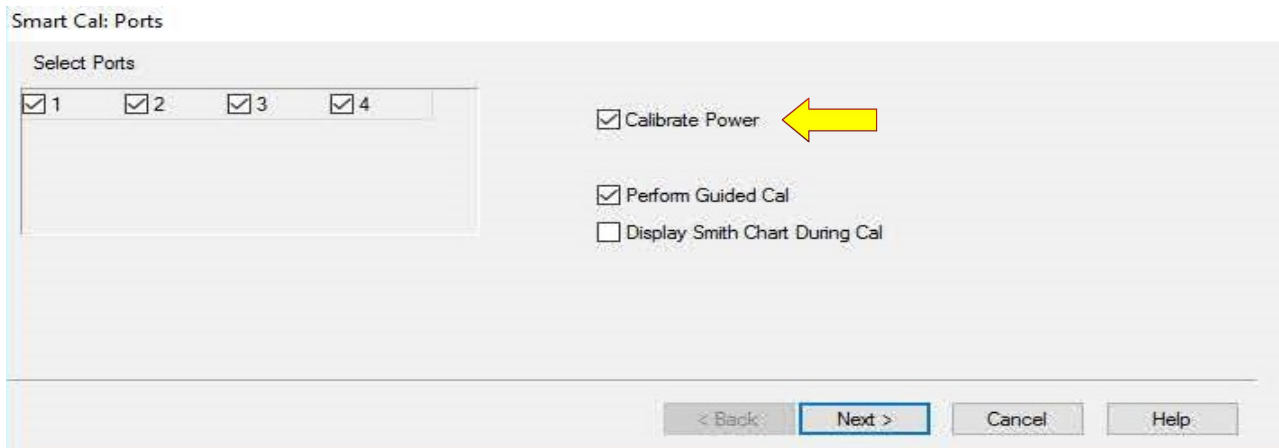
Figure 28 Entering Power Data Files from the USB Drive



Procedure:

1. Load the cal kit file into your computer. The cal kit file is located on the USB drive that came with the cal kit. Plug the USB drive into the USB port on your PC.
2. Select **Cal > Cal Sets & Cal Kits > Cal Kit...**
3. Select Import and open the WR12\_VDI calibration kit file on the USB (.ckt or .xkt).
4. Select **Preset**
5. Confirm system is in mm-wave mode frequency and setup the number of points in sweep (default is 201).
6. Select **Cal > Other Cals > Smart Cal**
7. Select the box for "Calibrate Power" (see Figure 28 below) if you have a power meter and E-Band sensor or are using the power data from the extender USB.
8. Due to the RF and LO multiplication, you may need to calibrate the VNA source to get the best leveling and power control.

Figure 29 Smart Cal GUI



9. Refer to the **Help** menu to complete the Smart Cal.
10. Once the Smart Cal is complete, save the calibration if desired.

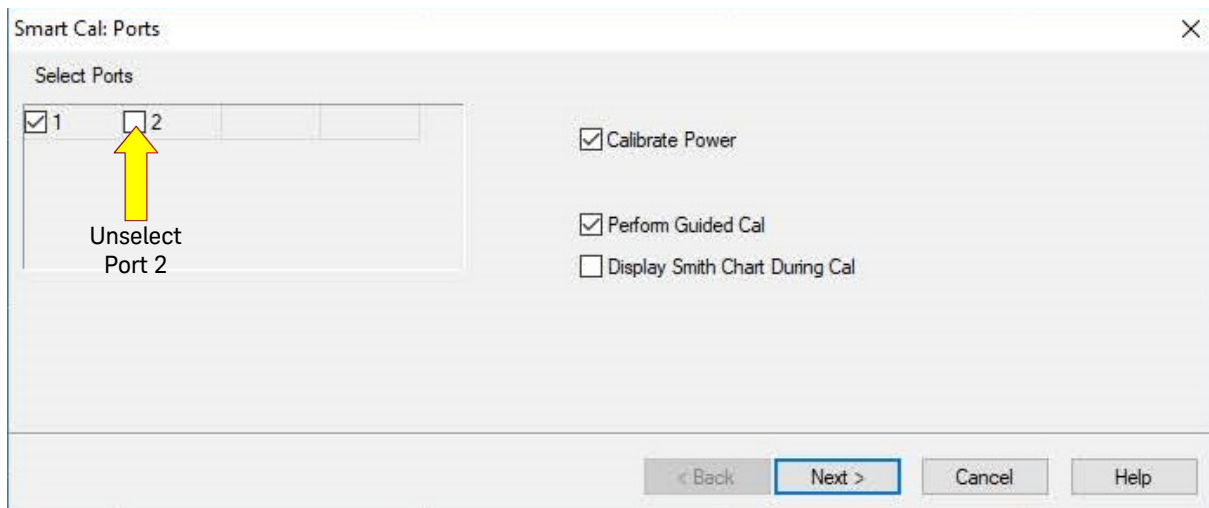
**NOTE**

For 1-Port systems, Smart Cal GUI will show two ports (see [Figure 30 on page 40](#)). Only select Port 1. Selecting both ports will cause the calibration to not complete.

**NOTE**

Port 1 systems will show Port 2 selections. Do not select Port 2 in a calibration if the system is configured for a 1 Port system. If the traces are selected for Port 2, measured values will be invalid (-200 dB). Only reflection measurements are valid for the 1 Port system. Thru measurements require Port 2, which will not be functional. Refer to [Figure 30](#) below.

Figure 30 1-Port System Calibration



## Receiver Power Check

### NOTE

Power accuracy is dependent the accuracy of your power sensor.

---

After calibration, the reference receivers will show power at the test ports.

### Power Level Control and Max Power Level Check

1. Set up two traces, making sure "Statistics" is turned on.
  - a. For 1-Port and 2-Port: a1,1 and a2,2 (or R1,1 and R2,2 receiver)
  - b. For 3-Port and 4-port: a3,3 and a4,4 (or R3,3 and R4,4 receiver)
2. Measure the power level at +2 dBm (default). Verify the traces are measuring 2 dBm (mean),  $\pm 1$  dB.
3. Set the power level to 0 dBm. Verify the traces are measuring 0 dBm (mean),  $\pm 1$  dB.
4. Set the power level to 13 dBm. Verify the traces are measuring a mean of 13 dBm,  $\pm 1$  dBm.
5. See [Figure 31](#) for a display example for 2-port, or [Figure 32](#) for 4 -port.

Figure 31 2-Port Function Check - Power

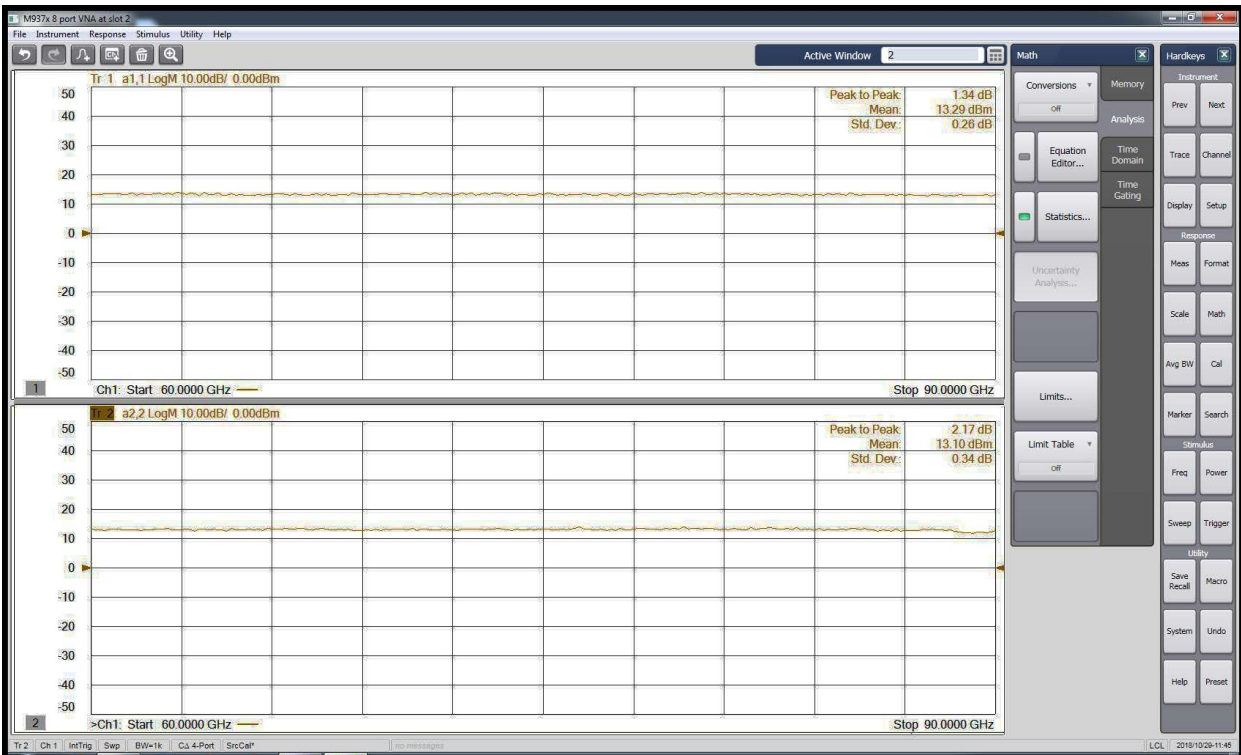


Figure 32 4-Port Function Check - Power



## Alternative System Configurations

Alternative system configurations can be configured with PXI or USB VNA. Refer to the [Banded Millimeter Wave Network Analysis Technical Overview](#) for more details:

1. System configuration with P937x (see [Figures 33 and 34](#)).
2. 4-Port system configuration with Streamline USB VNA (see [Figures 37 and 38](#)).
3. System configuration with N5252APXI test set and PXI or Streamline VNA with N5262BWxx standard extenders (see [Figures 35 and 36](#)).

For alternative system configurations with the P9374/75A VNA, the firmware will need to be changed to **A.14.10.13**. Refer to the [N5252A Support page](#) for drivers, firmware, and software. The S97551B (Option 551) multiple instruments measurement is required for one of the Streamline VNA in the system to operate.

### N5252A/N5253Ex E-Band Bundle Alternative Configurations

- The N5252A and N5253E2 allow a 1-port system to be configured. Two 1-port systems can be configured and operated separately. The VNA application will still show two ports, even when a second port is not configured. Only use 1-port in calibration and measurements. The N5253E1 and N5253E3 can be used to make 1-port measurements, but cannot be configured into two 1-port systems.
- A 4-port system can be configured with N5253E1 or N5253E3 by adding one more 4-port Streamline VNA and another pair of the frequency extenders.

### Frequency Extenders for WR15 to WR3.4 mm-Wave Frequency Bands

- N5252AWxx frequency extenders are available for V, E, W, and D (WR6.5) bands.
- N5262BWxx frequency extenders with the N5252APXI test set can be configured up to WR3.4.
- N5262ACxx waveguide calibration kits are available for each band (C15 - C03).
- VNAs need to be  $\geq 14$  GHz for WR15 (V Band) and  $\geq 20$  GHz for higher frequency bands.

### Streamline and PXI VNA Requirements

- Software license S97560B is required for P50xxA to allow configuration for a mm-wave VNA (not required for P937x).
- Software license S97551B is required for systems with two Streamline VNAs such as N5253E2 or 4-port configurations with two P502xAs.
- You cannot configure a 4-port system with multiple P500xA or P937xA 2-port Streamline VNAs, as only two USB connections are allowed.
- You can configure a 4-port system with two P502xA 4-port VNAs.
- You can use P937xAs for up to WR6.5 band systems and P50xxAs for up to WR3.4 band systems.
- P502xA cannot be configured into two separate 1-port systems.

### PXI-VNA System Configuration

- Software license S95560B is required for M980xA to allow configuration for a mm-wave VNA (not required for M937x).
- Software license S95551B is required for systems with multiple M980xA PXIe VNA modules. Similarly, Option 551 is required for systems with multiple M937x PXIe VNA modules.
- You can configure a 4-port system with multiple M937x or M980xA PXIe VNAs.
- You can configure a 4-port system with two P502xA 4-port VNAs.
- You can use M937xAs for up to WR6.5 band systems and M980xAs for up to WR3.4 band systems.
- M980xA with Option 400 or 600 cannot be configured into two separate 1-port systems.



Figure 33 System with P-Series P937xA Streamline USB Network Analyzers



Two P9374/5 VNAs are required for a 2-port configuration. You can build a 1-port configuration with one VNA.

For M9374/5 and P9374/5A, see [Table 7](#) and [Table 8 \(pages 18 and 19\)](#) for a 2-port configuration as an N5252A. For P937x P-Series Streamline (2-port), Ref and Trigger jumpers are required as shown in [Figure 33](#) above.

Option 551 is required in one VNA, even for a 1-port system.

Figure 34 Alternative System Configuration with P9374/5A



Figure 35 Alternative System Configuration with P5028A and N5252APXI<sup>1</sup>



Figure 36 Alternative System Configuration with M9005A and N5252APXI<sup>1</sup>



1. See [Keysight N5252APXI 2-Port VNA to VNAX Adapter Module Product Note \(N5252-90004\)](#) for more information.

Figure 37 Alternative 4-Port System Configuration with P5024A and P5028A

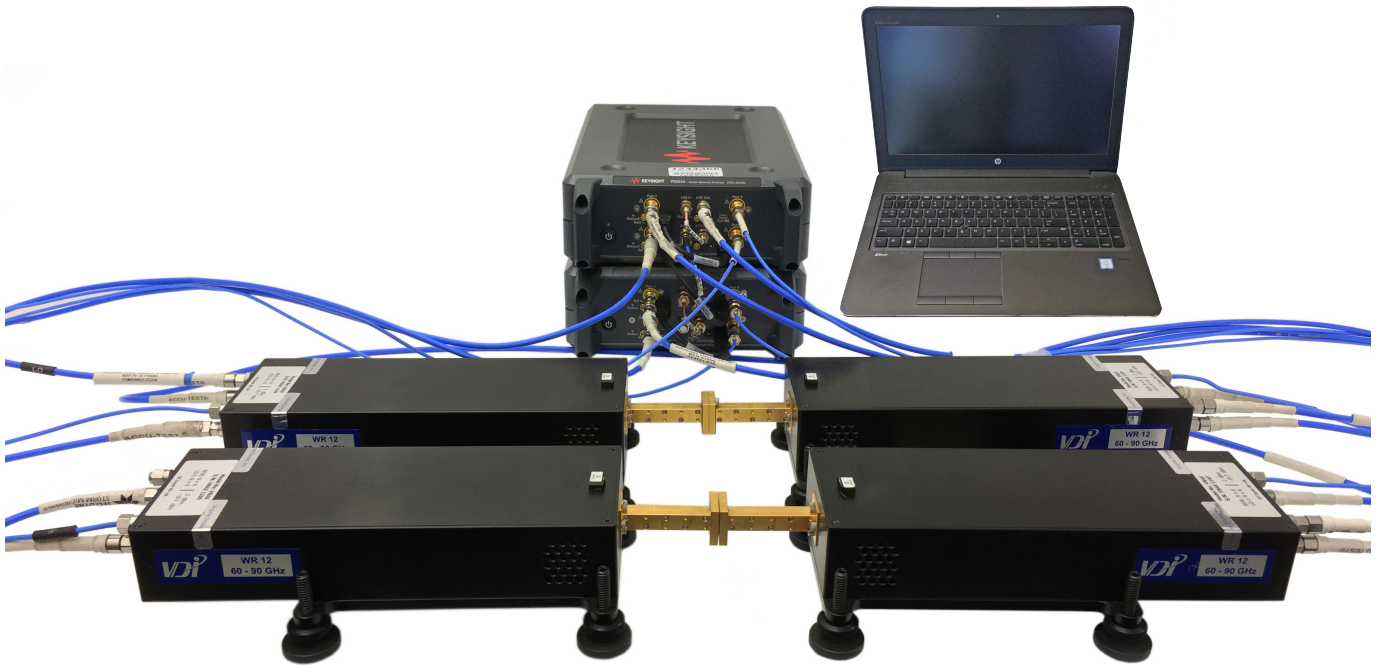


Figure 38 Closeup of Cable Connections of P5024A and P5028A for 4-Port Configuration



**NOTE**

The configurations shown in Figures 34 through 37 require a personal computer with USB for operation.

## Troubleshooting, Maintenance, and Support



# Troubleshooting Your System

The following section will help to resolve common system problems and determine which product needs service. If a failure is confirmed, refer to Keysight Support Services. See "[Contacting Keysight](#)" on page 61.

## N5252A System Computer Setup Issues

### Computer Not Recognizing the M9005A Chassis

1. Ensure the M9005A-002 PXIe card is fully seated and recognized by your computer.
2. Ensure the cable between the M9005A and the PXIe card is fully connected.
3. Ensure the M9005A is turned on *before* the computer.
4. If the PC fails to turn on when the M9005A chassis is turned on, try reversing the PCIe cable (M9005-61301) connection from the PC to the M9005A chassis. Also, try turning the connector 180 degrees, as the connector key does not prevent the cable from being installed upside down.
5. Refer to the [Keysight M9005A PXIe Chassis User Guide](#) for more information.

## System Performance Issues

### Receiver Check Failure<sup>1</sup>

If the system fails the receiver check (see [page 32](#)), first confirm that the millimeter configuration is set up correctly. Verify the following for an E-Band system:

1. Frequency range is 60 GHz to 90 GHz.
2. Multipliers are set to RF = 6 and LO = 6.
3. Default value for the maximum power limit is 2 dB (see [Figure 20](#)).

**Note:** if the receiver level is low, remove DC input to VDI extender module and reconnect to module.

4. If receiver traces are missing, recheck connections to the extender. Measure RF/Ref and LO power on cable ends and confirm if cables are good. See [Procedure to Measure VNA Output on Cables \(RF/Ref or LO\)](#) on page 50.
5. Verify the connections for each extender are correct and the power supplies are turned on (the green LED light should be lit on the rear of each extender).
6. Verify the chassis and VNA modules as a standard 20 GHz or 50 GHz VNA system. Refer to the Help menu.
7. If the VNA system works correctly, the N5252AW12 extender is likely at fault and will need to be returned for service.
8. Connect a short to the port with the issue. The measure receiver level should be higher for A1,1 , B2,2 , C3,3 , or D4,4 with a short, depending on which port is being checked. An open test port can cause misleading results. The reference receivers are dependent on the power level set.
9. Verify the R1,1, R2,2, R3,3, and R4,4 reference receivers are correct. Refer to [Receiver Power Check](#) on page 41.

1. For alternative configurations, refer to frequency range and RF/LO multipliers for the extender used.

## Procedure to Measure VNA Output on Cables (RF/Ref or LO)

1. Setup sweep type CW
2. Select frequency 75 GHz (center of WR12 band) or center of band if using an alternative configuration.
3. Points = 1
4. Set power to +20 dBm
5. Measure with power meter. Connect power meter to end of cable. Verify 2 dBm on LO/RF

### Verify Cables

RF LO and IF cables can be measured using the VNA in its standard configuration.

- RF LO cables: 10-15 GHz, 2 dB loss max
- IF cables (10 MHz): 10-15 GHz, 1 dB loss max

### NOTE

**Not performing an installation calibration will result in a source power calibration failure.**

If the receiver power check fails after calibration:

1. Ensure the Installation Calibration and Smart Cal have been completed, calibrating both source and receiver power.
2. Verify that the power sensor is accurate and not damaged, especially at the connector. See [page 54](#).
3. Verify the condition of the Calibration Kit components. If cleaning is needed, refer to [pages 53 and 54](#).
4. Ensure the power meter is setup correctly.

If the receiver power is not meeting +13 dBm,  $\pm 1$  dB, mean:

1. Confirm power input using a power meter. See **Procedure to Measure VNA Output on Cables (RF/LO or LO)** at the top of this page.
2. The VDI extenders need +2 dBm (10-15 GHz) at the RF/REF IF input to reach full power output. Verify the cable has + 2 dBm to the extender port tested when the VNA power level is set to +20 dBm.
3. Verify that the LO Input at the end of the cable is at least -7 dBm (10-15 GHz).
4. Verify the condition of the Calibration Kit components. If cleaning is needed, refer to [pages 53 and 54](#).

**Table 17 VDI Extender Characteristics**

VDI Extender Characteristics	
RF/Ref Port:	-4 to +2 dBm input, 10-15 GHz, -3 dBm max output, ~ 4 MHz
LO Input:	-10 to +13 dBm, 10-15 GHz
LO Output:	+7 to +13 dBm, 10-15 GHz
Meas. IF Output:	-1 dBm max, 4 MHz

Refer to the VDI website at <https://www.vadiodes.com/en/products/vector-network-analyzer-extension-modules> for VDI extender information.

If an extender or the Calibration Kit is suspected, it will need to be returned to the vendor for service. Both VDI extenders must be returned in their transport case.

If your issue is not component specific and is still unresolved, it is recommended that you [contact Keysight](#) for assistance or return the entire system to Keysight.

## Replacement Parts

**Table 18** Replacement Parts for the N5252A

Keysight Part Number	Description
N5260-80163	N5262AC12 Calibration Kit
N5252-80002	N5252AW12 Frequency Extenders
1810-0118	SMA 50 Ohm Load (Male)
M9005-61301	PCIe Cable 3m
M9005-66002	PCI Express Host Card (1 Port PCIe)
M9370-20018	SMB Trigger Jumper
M9370-20019	SMB Reference Jumper
Y1212-80011	PXI Air Blocker Kit
5002-3361	SMB Removal Tool
5023-1450	Socket Wrench, 5/16"

**Table 19** Replacement Parts for the N5253E

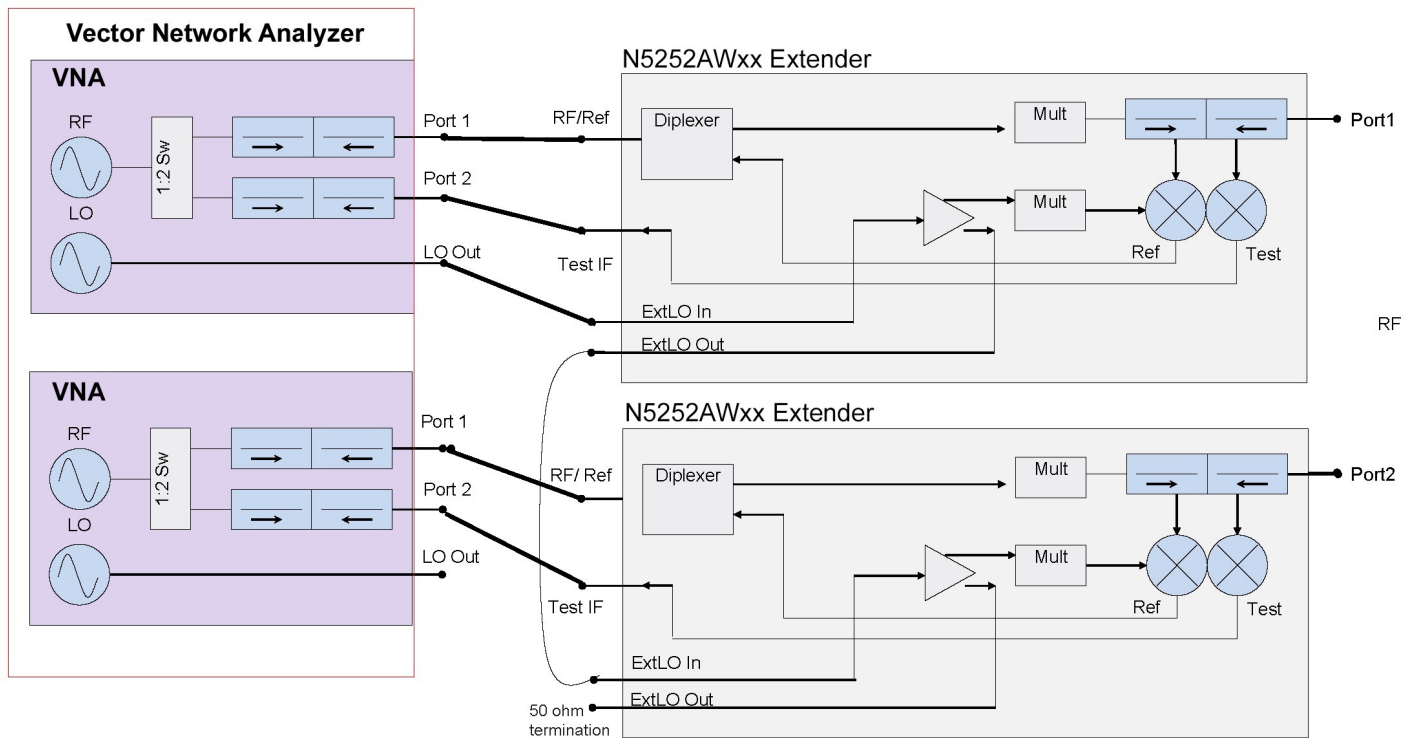
Keysight Part Number	Description
N5260-80163	N5262AC12 Calibration Kit
11904-60003	11904C Adapters 2.4(m) to 3.5(f) for E2 or E3
1810-0118	SMA 50 Ohm Load (Male)
P9375-60010	USB-C Cable
0950-6166	USB VNA Power Supply
P5000-61603	Control Cable
5002-3361	SMB Removal Tool
5023-1450	Socket Wrench, 5/16"



## Block Diagram for N5252AWxx VNAX-P Extenders

The N5252AWxx extenders have built-in diplex and LO amplifiers to connect to Port 1 and Port 2 of a VNA. For alternative configurations using N5252APXI and standard VNAX extenders, refer to the [Keysight N5252APXI 2-Port VNA to VNAX Adapter Module Product Note \(N5252-90004\)](#).

Figure 39 2-Port System Block Diagram



## Maintenance

### **WARNING**

**To prevent electrical shock, remove the chassis and VDI modules from the mains source before cleaning. If an analyzer module needs cleaning, remove it from the chassis slot. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**

---

### Physical Maintenance

Clean the system components using a dry or slightly damp cloth only.

### Electrical Maintenance

The M9005A, M9374A, M98xx, and P5000A Series products can be serviced as individual products. The VDI Calibration Kit and VDI Extenders require servicing by Virginia Diodes, Inc., and are returned to the factory by Keysight Service Centers for any service.

Vector Network Analyzers can be calibrated.

No calibration is needed for the N5252AW12, but can be operator checked.

No calibration is needed for the N5262AC12, but the cal kit components can be mechanically verified. Upon first calibration, it is recommended to store the performance data of your kit's shorts, loads, QW (quarter-wave) shims, and section to compare with if performance is in question.

The E-Band system is calibrated by the customer using the N5262AC12 Calibration Kit that comes with the system. A functional certificate is provided with N5252A only. N5253E is not configured at the factory and does not have a functional certificate.

### Caring for Waveguide (WG) Interfaces

A clean surface at millimeter-wave frequencies is much more important than at lower frequencies because any debris on the waveguide surface can potentially distort the measurement results.

Caring for WG interfaces is not difficult. Dirt and dust can be removed using the following:

- Isopropyl alcohol 99.5%<sup>1</sup>
- Lint-free cloth
- Pressurized air (for dust removal)

To remove dirt on the waveguide surface, simply put a few drops of isopropyl alcohol on a lint-free cloth and gently wipe the surface.

To remove dust, simply spray the pressurized air on the waveguide surface.

---

1. Use isopropyl alcohol only in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate, prior to assembling waveguide interfaces.

## Principles of Connector Care

Proper connector care and connection techniques are critical for accurate and repeatable measurements. Refer to [Table 20](#) below for tips on connector care.

Prior to making connections to your analyzer, carefully review the information about how to properly inspect, clean, and gauge connectors. Refer to the calibration kit documentation for detailed connector care information.

For additional connector care instruction, contact Keysight Technologies. Refer to [“Contacting Keysight” on page 61](#).

**Table 20**      **Connector Care Quick Reference Guide**

Handling and Storage	
<b>Do</b> <ul style="list-style-type: none"> <li>• Keep connectors clean</li> <li>• Extend sleeve or connector nut</li> <li>• Use plastic end-caps during storage</li> </ul>	<b>Do Not</b> <ul style="list-style-type: none"> <li>• Touch mating-plane surfaces</li> <li>• Set connectors contact-end down</li> <li>• Store connectors or adapters loose</li> </ul>
Visual Inspection	
<b>Do</b> <ul style="list-style-type: none"> <li>• Inspect all connectors carefully</li> <li>• Look for metal particles, scratches, and dents</li> </ul>	<b>Do Not</b> <ul style="list-style-type: none"> <li>• Use a damaged connector – ever</li> </ul>
Connector Cleaning	
<b>Do</b> <ul style="list-style-type: none"> <li>• Try compressed air first</li> <li>• Use isopropyl alcohol<sup>a</sup></li> <li>• Clean connector threads</li> </ul>	<b>Do Not</b> <ul style="list-style-type: none"> <li>• Use any abrasives</li> <li>• Get liquid into plastic support beads</li> </ul>
Gauge Use with Connectors	
<b>Do</b> <ul style="list-style-type: none"> <li>• Clean and zero the gauge before use</li> <li>• Use the correct gauge type</li> <li>• Use correct end of calibration block</li> <li>• Gauge all connectors before first use</li> </ul>	<b>Do Not</b> <ul style="list-style-type: none"> <li>• Use an out-of-specification connector</li> </ul>
Making Connections	
<b>Do</b> <ul style="list-style-type: none"> <li>• Align connectors carefully</li> <li>• Make preliminary connection contact lightly</li> <li>• Turn only the connector nut</li> <li>• Use a torque wrench for final connection</li> </ul>	<b>Do Not</b> <ul style="list-style-type: none"> <li>• Apply bending force to connection</li> <li>• Over tighten preliminary connection</li> <li>• Twist or screw any connection</li> <li>• Tighten past torque wrench “break” point</li> </ul>

- a. Cleaning connectors with alcohol shall only be done with the instrument's 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.

## Safety and Regulatory Information

## General Safety Considerations

### Safety Earth Ground

#### **WARNING**

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

---

#### **CAUTION**

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

---

### Before Applying Power

#### **CAUTION**

If this product is to be energized via an autotransformer make sure the common terminal is connected to the neutral (grounded side of the mains supply).

---

#### **CAUTION**

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

---

### Servicing

#### **WARNING**

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

---

**WARNING**

The opening of covers or removal of parts may expose dangerous voltages. Disconnect the instrument from all voltage sources while it is opened.

---

**WARNING**

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

---

**WARNING**

Procedures described in this document may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

---

**WARNING**

The power cord is connected to internal capacitors that may remain live for 10 seconds after disconnecting the plug from its power supply.

---

**WARNING**

For continued protection against fire hazard, replace line fuse only with same type and rating. The use of other fuses or material is prohibited.

---

**WARNING**

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 (disconnecting device).

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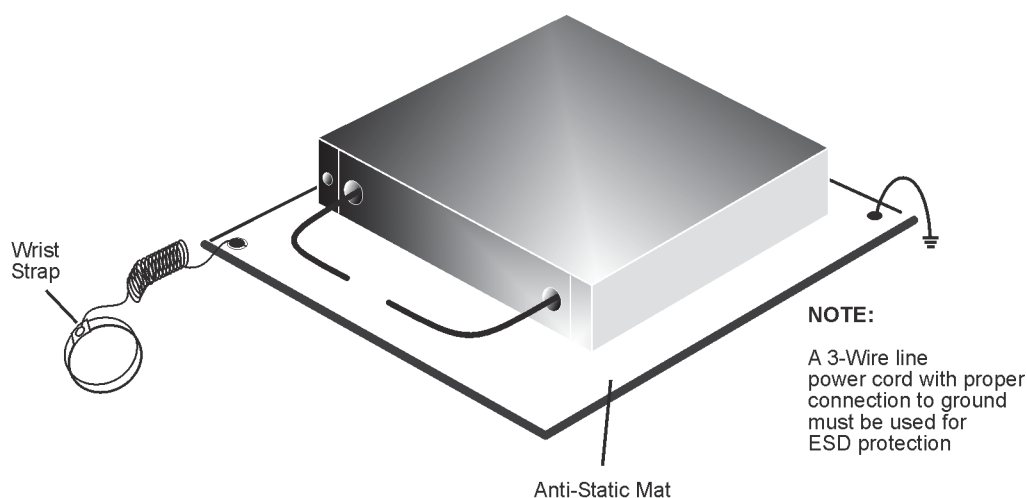
## Electrostatic Discharge Protection

Protection against electrostatic discharge (ESD) is essential while removing assemblies from or connecting cables to the system components. Static electricity can build up on your body and can easily damage sensitive internal circuit elements when discharged. Static discharges too small to be felt can cause permanent damage. To prevent damage to the instrument:

- *always* have a grounded, conductive table mat in front of your test equipment.
- *always* wear a grounded wrist strap, connected to a grounded conductive table mat, having a 1 M resistor in series with it, when handling components and assemblies or when making connections.
- *always* wear a heel strap when working in an area with a conductive floor. If you are uncertain about the conductivity of your floor, wear a heel strap.
- *always* ground yourself before you clean, inspect, or make a connection to a static-sensitive device or test port. You can, for example, grasp the grounded outer shell of the test port or cable connector briefly.
- *always* ground the center conductor of a test cable before making a connection to the analyzer test port or other static-sensitive device. This can be done as follows:
  1. Connect a short (from your calibration kit) to one end of the cable to short the center conductor to the outer conductor.
  2. While wearing a grounded wrist strap, grasp the outer shell of the cable connector.
  3. Connect the other end of the cable to the test port and remove the short from the cable.

Figure 40 below shows a typical ESD protection setup using a grounded mat and wrist strap.


















Figure 40 ESD Protection Setup





## Instrument Markings

Listed below are definitions of markings that may be found on or with the product.

	The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.
	The AC symbol indicates the required nature of the line module input power.
	This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is in the STANDBY position.
	This symbol indicates that the power line switch is in the OFF position.
	This symbol is used to identify a terminal which is internally connected to the product frame or chassis.
	The CE mark is a registered trademark of the European Community.
ccr.keysight@keysight.com	The Keysight email address is required by EU directives applicable to our product.
	UK conformity mark is a UK government owned mark. When affixed to the product it complies with all applicable regulations.
	The CSA mark is a registered trademark of the CSA International.
	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 5).
	This is a marking to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001).
	Direct Current.
<b>IP 2 0</b>	The instrument has been designed to meet the requirements of IP 2 0 for ingress and operational environment.
	The RCM mark is a registered trademark of the Australian Communications and Media Authority.
	Indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.
	This symbol 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.

## Regulatory Information

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.

**EMC** Complies with the essential requirements of the European EMC Directive 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

**Caution:** This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

- AS/NZS CISPR 11
- CAN ICES/NMB-001(A)

This ISM device complies with Canadian ICES-001.

Cet appareil ISM est conforme à la norme NMB-001 du Canada.

### NOTE

This is a sensitive measurement apparatus by design and may have some performance loss when exposed to ambient continuous electromagnetic phenomenon similar to those used in testing per IEC 61000-4-6 (3V). This occurs when the frequency of the external phenomenon is within the extenders Measure IF output frequency of approximately 4 MHz or 13 MHz. Noise floor degrades up to 50 dB. Dynamic range, stability and trace noise will also be affected. The operating environment should be shielded from this frequency interference for best performance.

## South Korean Class A EMC Declaration

If there is a "KC" mark on the instrument, then the following statement applies:

This equipment has been conformity assessed for use in business environments. In a residential environment, this equipment may cause radio interference.

※ This EMC statement applies to the equipment only for use in a business environment.

사 용 자 안 내 문
이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

※ 사용자 안내문은 “업무용 방송통신기자재”에만 적용한다.

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

Acoustic statement (European Machinery Directive)

- Acoustic noise emission
- LpA <70 dB
- Operator position
- Normal operation mode per ISO 7779

## Declaration of Conformity

A declaration of conformity is available upon request, or a copy is available on the Keysight Technologies web site at <https://regulations.about.keysight.com/DoC/>

# Keysight Support, Services, and Assistance

## Service and Support Options

The N5252A, N5253E1, N5253E2, and N5253E3 systems have a one-year return-to-Keysight warranty. Three-year and five-year warranties are available.

Contact Keysight for service (see "Contacting Keysight" below).

The VDI extenders are to be returned in the Pelican case.

## Contacting Keysight

Assistance with test and measurements needs and information or finding a local Keysight office are available on the Internet at <http://www.keysight.com/find/assist>

You can also purchase accessories or documentation items on the Internet at <http://www.keysight.com/find>

If you do not have access to the Internet, please contact your Keysight 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 whether your product is still within its warranty period.

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