

# Streamline/PXIe VNA to VDI VNAX Adapter Module (VNAX-AM) Operational Manual



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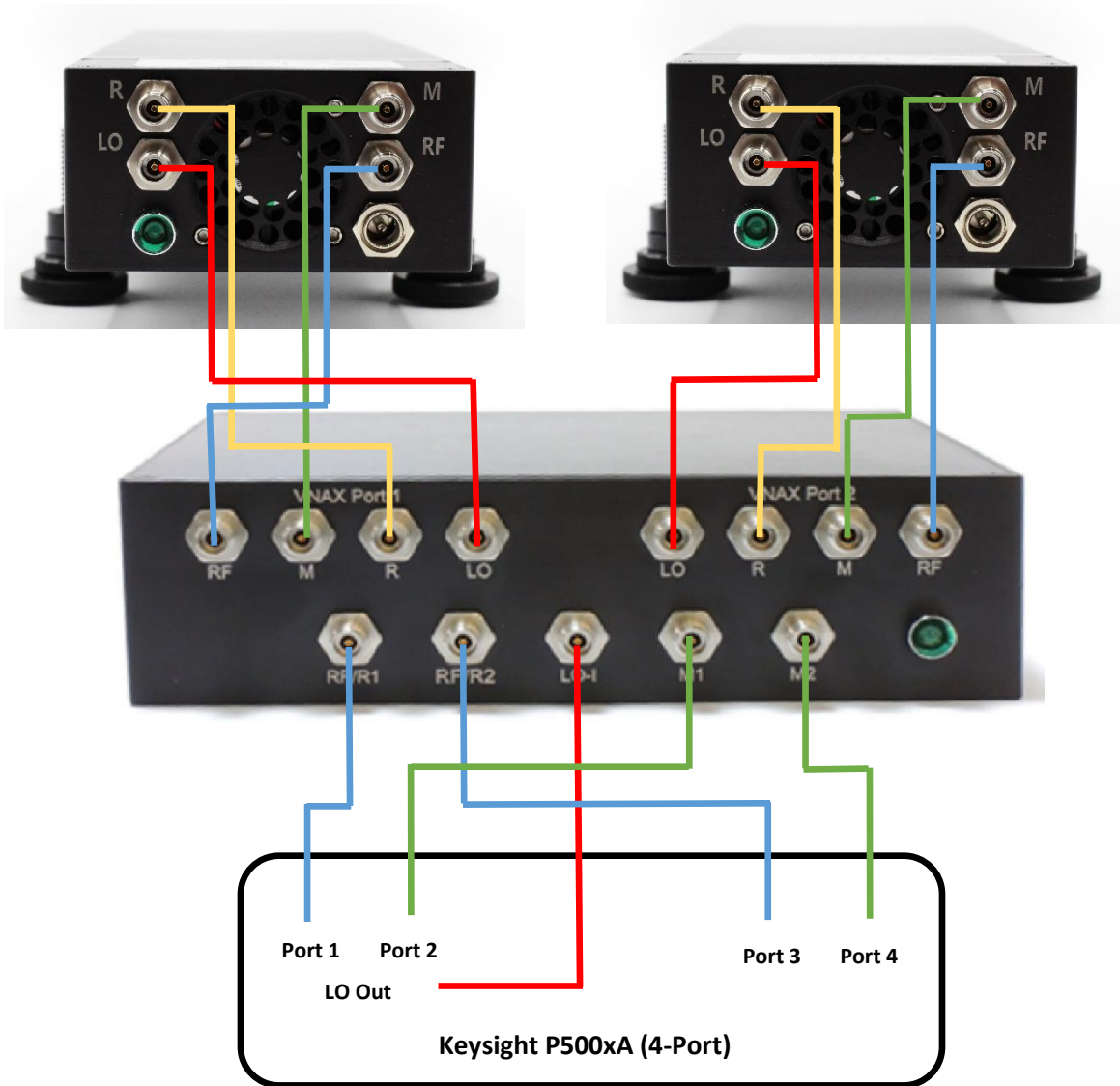
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# VNAX-AM Configuration


The VNAX-AM (Streamline / PXIe VNA to VDI VNAX Adapter Module) can be used to connect a standard configuration VNAX to a Keysight Streamline (P500xA) or PXIe VNA (M9xxxA) – 20 GHz or higher frequency. Keysight PXIe VNAs may be used instead of the Keysight Streamline VNAs. Contact Keysight to ensure that the VNA is configured properly for use with VDI VNAX-AM and VNAX Modules.

## Typical Hardware Configuration with VNAX-AM and Standard VNAX Modules




# Safety and Operational Guidelines

 Read all instructions and information in this product manual before connecting an Extension Module to its power supply or a VNA. Operational procedures must be followed for proper function. If you have questions, contact VDI before supplying power to or otherwise operating any VDI Module.

 VDI assumes the customer is familiar with microwave, millimeter wave and VDI products in general. The user is expected to understand all safety guidelines, health hazards and general advisories that may exist and are associated with the use of this product. VDI is not responsible for any human hazards that may exist or may occur while using this device.

## RF Drive Limitations

 Power inputs to the RF Input and LO Input ports of Extension Modules are noted on labels on every VNAX Module. See VDI-707.1 for more information; these values provide optimal performance. Irreversible damage can result if input power exceeds stated damage threshold.

## Virginia Diodes, Inc. (VDI) accepts no liability for damage or injury resulting from or caused by:

- Improper use, disassembly or use for other purposes than those for which the VNAX-AM was designed.
- Use outside common safety, health or general advisories pertaining to microwave, millimeter wave and VDI products.
- Repairs carried out by persons other than VDI or its assigned agents.
- Tampering with or altering power cords or other cabling.

## RF Cable Care

- Use a torque of 90 cNm when making coaxial connections. Avoid sharp bends in cables (RF, IF, LO, etc).

## General Operating Practices and Recommendations

- VDI VNAX-AM is intended to be used in typical laboratory conditions (10-85% R.H. and altitude <2000m).
- To set up VDI's VNA Extension Modules on a PNA/PNA-X, please refer to VDI-707.1 – VNAX Product Manual.
- Use of any attachments and accessories not authorized by VDI or that do not meet VDI's specifications may void VDI's limited warranty and could pose a hazard to the operator, or cause lasting damage to the device.
- Disassembling the VDI VNAX-AM cause lasting damage to components and pose a hazard to the operator.
- Applying liquids (other than the TexWipe wipes / cloths used for cleaning) can cause lasting damage to the module.
- Check with VDI before any measurement connection is attempted beyond those described in this manual or if it may exceed commonly accepted standards of practice.
- A VNAX-AM is intended for use only with a power supply module or AC/DC converter supplied with the device by VDI. Use of other power supplies or converters could damage the device or injure the operator.



VNAX-AM General Specifications			
Description		Specification	Connector
VNAX Port 1	RF Output Port	5-20 GHz, 12 dBm typical	2.9mm (f)
	LO Output Port	5-20 GHz, 12 dBm typical	2.9mm (f)
	M/R Input Ports	4-13 MHz, -30dBm (est.)	2.9mm (f)
VNAX Port 2	RF Output Port	5-20 GHz, 12 dBm typical	2.9mm (f)
	LO Output Port	5-20 GHz, 12 dBm typical	2.9mm (f)
	M/R Input Ports	4-13 MHz, -30dBm (est.)	2.9mm (f)
Streamline / PXIe VNA Ports	LO-I Input Port	-17 to +5dBm (est.)	2.9mm (f)
	RF/R1 Port (R1 Output)	4-13 MHz, 0dBm (max.)	2.9mm (f)
	RF/R1 Port (RF1 Input)	5-20 GHz, -4 to +2dBm (est.)	2.9mm (f)
	RF/R2 Port (R2 Output)	4-13 MHz, 0dBm (max.)	2.9mm (f)
	RF/R2 Port (RF2 Input)	5-20 GHz, -4 to +2dBm (est.)	2.9mm (f)
	M1/M2 Output Ports	4-13 MHz, 0dBm (max.)	2.9mm (f)
Power Supply	AC Input	100-240VAC, <3.5A, 50-60Hz	U.S. or E.U.
	DC Output	9V / 4A	2.1mm I.D. x 5.5mm O.D. x 9.5mm (f)
Operating Temperature	Typical / Recommended	25°C / 20-30°C	-

## Part Numbers for Ordering:

VNAX-AM-20: Connecting to Streamline VNAs with 3.5mm ports. Interconnect cables are 2.9mm(m) on VNAX-AM side and 2.9mm(m) on Streamline VNA side.

VNAX-AM-40: Connecting to Streamline VNAs with 2.4mm or 1.85mm ports. Interconnect cables are 2.9mm(m) on VNAX-AM side and 2.4mm(m) on Streamline VNA side.

## Setup Procedure on a 4-Port Keysight Streamline VNA (P5004A)

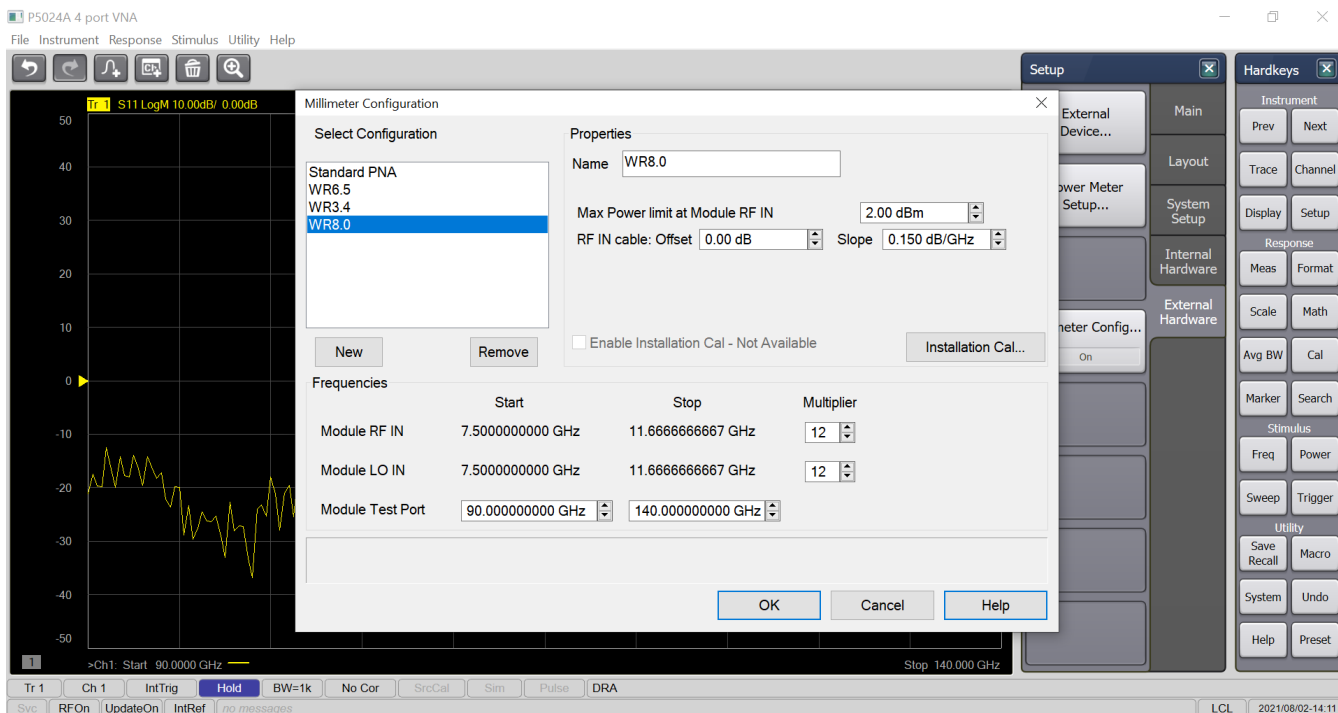
Setting up the Streamline VNA to use VNAX systems is similar to setting up a PNA/PNA-X with a Millimeter-Wave Controller. The instructions provided here are shown for a 4-port 20 GHz Keysight Streamline VNA using the hardware shown above. Instructions for other Streamline VNAs may be possible. Contact VDI for more information on performance and compatibility for various configurations and frequency bands.

### Update Firmware

- VDI recommends installing the newest firmware.
- Download the latest production release for the specific model.
- Once the firmware finishes downloading, right-click on the firmware file and choose [Install].
- Restart the Network Analyzer application

### Setup Keysight Streamline VNA

- [Instrument] > [Setup] > [External Hardware] > [Millimeter Config...]

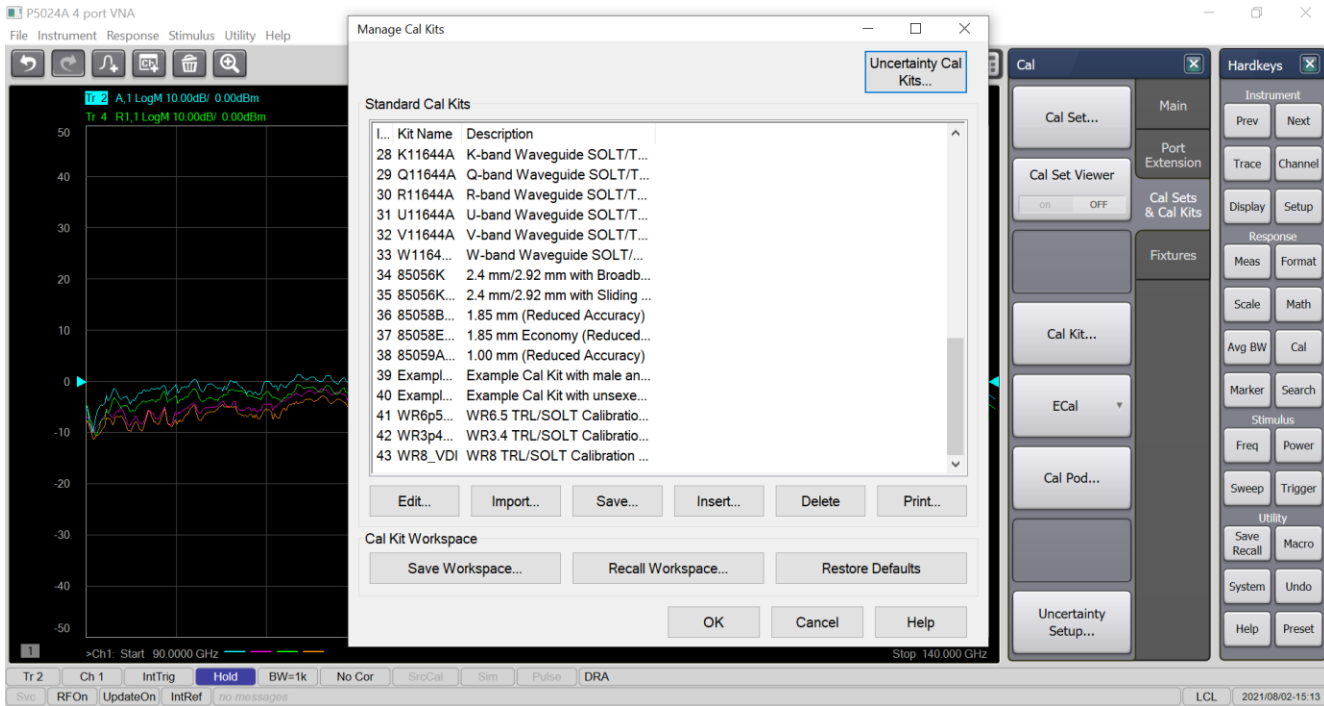


- To add a new waveguide band (e.g. WR-8.0, 90-140 GHz), Click 'New'
- Enter appropriate Start Frequency, Stop Frequency, Multiplication Factors, etc.
- To operate without VDI VNAX Modules (i.e. Base VNA Frequencies), click on 'Standard PNA'
  - o For operating the base Streamline VNA, please review the appropriate Keysight datasheet.

# Setup Procedure

## Load Calibration Kit Files

- Minimize the Network Analyzer Application (File > Minimize Application)
- Obtain the most recent version of the Calibration Kit File from VDI. Calibration Kit Definitions are included in each Calibration Kit, on a USB Drive
- Unzip the Calibration Kit File
- Maximize the Network Analyzer Application
- Navigate to [Response] > [Cal] > [Cal Sets & Cal Kits] > [Cal Kit...]

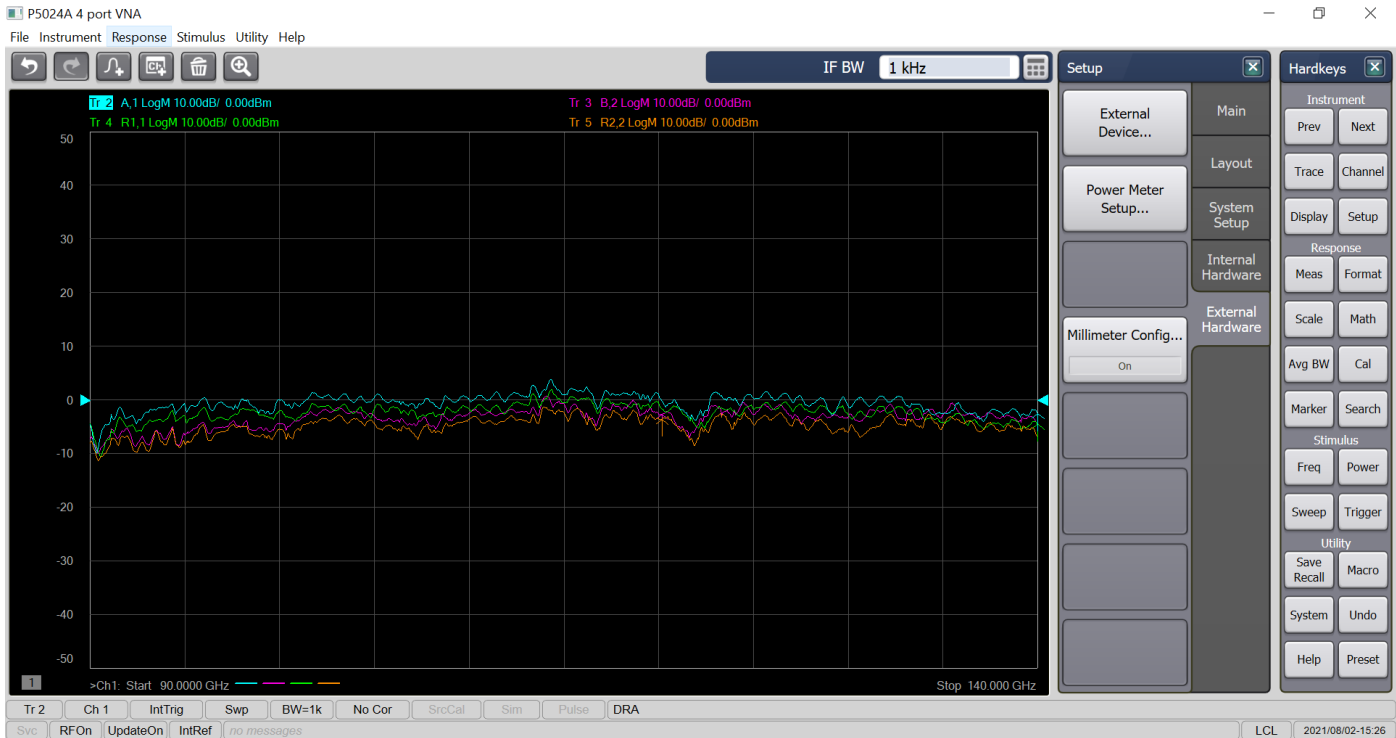


- [Import...]
- Navigate to the file location of the Waveguide Calibration Definition file then press [Open]
  - o Note: File type may default to .xkt in the browse window. VDI Calibration Kits are .ckt files.
- Verify that the appropriate Calibration Kit has successfully loaded and are on the list on the 'Manage Cal Kits' window. Then press [OK]

# Setup Procedure – VNAX Functional Check

## Check Wave Quantities

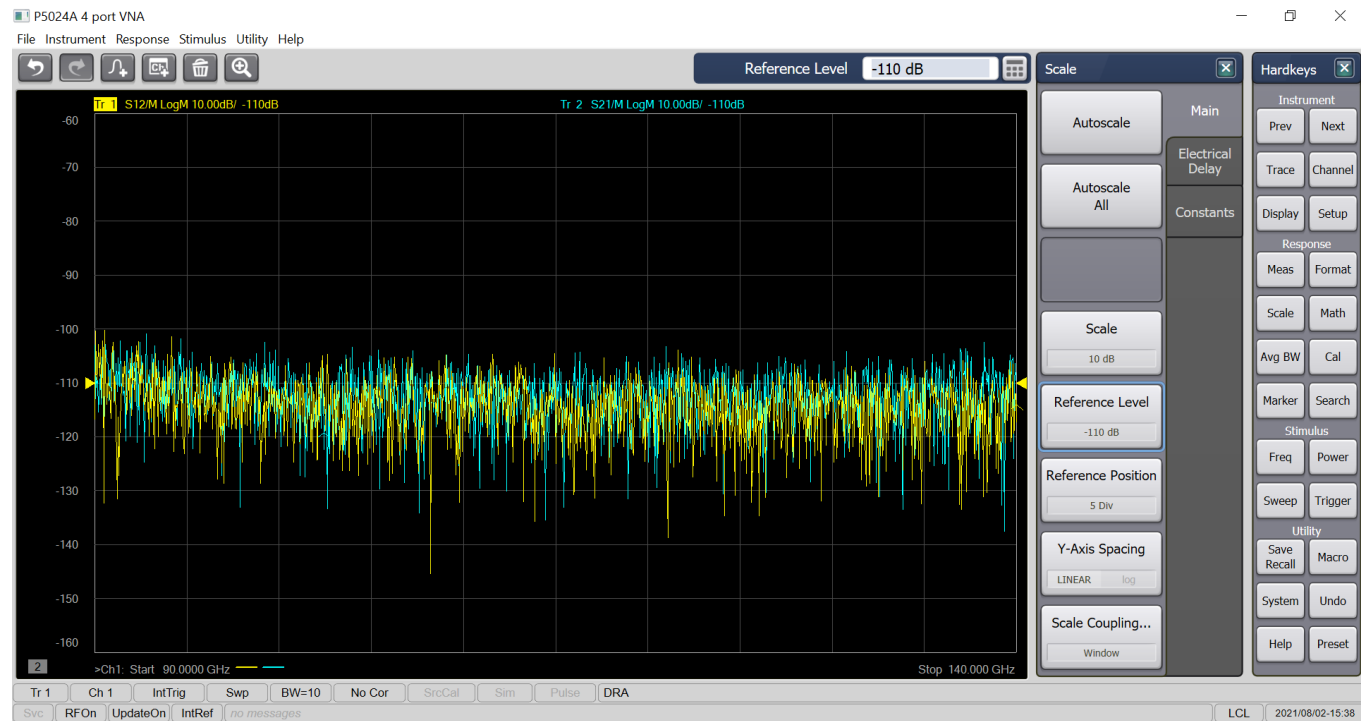
- Navigate to [Stimulus] > [Sweep] > [Number of Points]. Set this to 1201.
- Navigate to [Response] > [Avg BW] > [IF Bandwidth...]. Set this to 1kHz.
- Navigate to [Instrument] > [Trace] > [New Trace...]
- Click on 'Receivers' tab, then click [A,1], [B,2], [R1,1], and [R2,2].
- Click on 'Apply' and 'OK'
- Terminate the waveguide test ports of the two VDI VNAX Modules with Short Circuits
- Plug In Power Supply to VNAX Module
- Turn on RF Power from VNA
- Compare the traces on screen to the sample performance plot provided below. The shapes of the curves should be similar if the system is working properly.
  - o All four traces should be of similar shape and level.
  - o Peak levels should be between 0dB and 15dB.
  - o Traces should reasonably flat and not have substantial dropouts or edge effects.
- VDI recommends saving wave quantity traces as a reference of system performance.



# Setup Procedure

## Check Dynamic Range

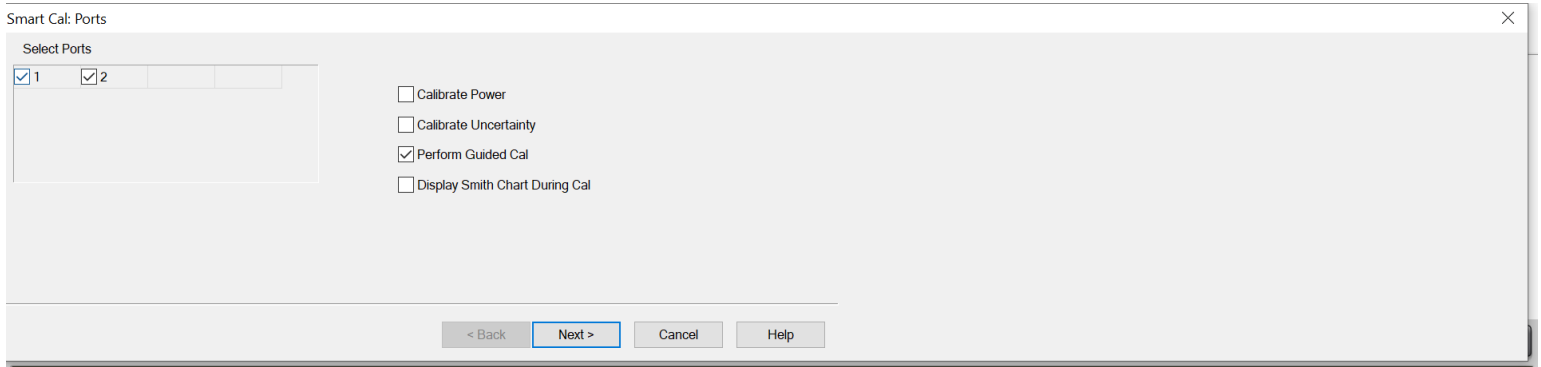
- Navigate to [Stimulus] > [Sweep] > [Number of Points]. Set this to 1201.
- Navigate to [Response] > [Avg BW] > [IF Bandwidth...]. Set this to 10Hz.
- Navigate to [Instrument] > [Trace] > [New Trace...]
- Click on 'S-Parameters' tab, then click on [S21] and [S12].
- Click 'Apply' and 'OK'.
- Connect waveguide test ports directly together
- Plug In Power Supply to VNAX Module
- Turn on RF Power from VNA
- After one sweep completes, [Response] > [Math] > [Memory] > [Normalize] on both S21 and S12 traces. The resulting graph on screen should be flat at 0dB.
- Disconnect the waveguide test ports of the Extension Modules and terminate them with Short Circuits.
- The plot below is an example of a typical single sweep dynamic range for WR8.0 (90-140 GHz). The dynamic range plots shown on our website are a ten sweep RMS average. The data shown on your screen will have larger amplitude variation, but same average level.



# Setup Procedure – Calibration

## Calibration Procedure for 2-Port Cal

- VDI typically performs calibrated measurements using 1kHz RBW and 1001 points. These values should be optimized based on the goals of the measurement.
- [Response] > [Cal] > [Smart Cal...]
- Click on '1' and '2' and 'Perform Guided Cal' as shown below. Then click 'Next'.



Smart Cal: Ports

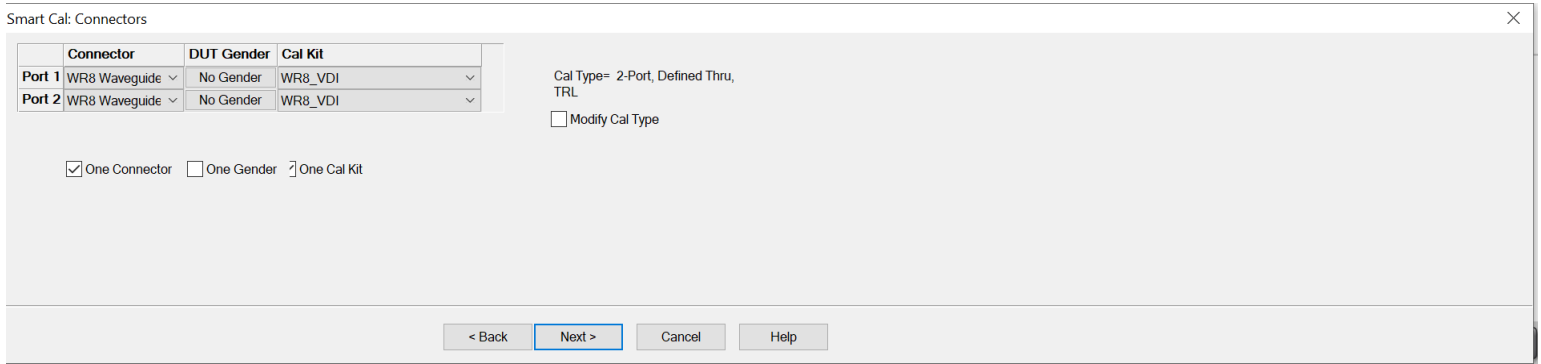
Select Ports

<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/>	<input type="checkbox"/>
---------------------------------------	---------------------------------------	--------------------------	--------------------------

Calibrate Power  
 Calibrate Uncertainty  
 Perform Guided Cal  
 Display Smith Chart During Cal

< Back   Next >   Cancel   Help

- Click on the calibration kit definitions for the appropriate waveguide band as shown below. Then click 'Next'.



Smart Cal: Connectors

	Connector	DUT Gender	Cal Kit
Port 1	WR8 Waveguide	No Gender	WR8_VDI
Port 2	WR8 Waveguide	No Gender	WR8_VDI

Cal Type= 2-Port, Defined Thru, TRL  
 Modify Cal Type

One Connector    One Gender    One Cal Kit

< Back   Next >   Cancel   Help

- Then follow the on screen instructions and measure the calibration standards when prompted.
- Click 'Finish' when complete.

# Addendum — Product Updates and Company Contacts

Virginia Diodes' wide selection of Vector Network Analyzer (VNA) Extension Modules deliver industry-leading performance.

The Virginia Diodes staff of engineering and physical science professionals works to continually improve our products. We also depend upon feedback from colleagues and customers. Ideas to simplify Extension Module operations, improve performance or add capabilities are always welcome. Be certain that Virginia Diodes has your latest contact details including a phone number and an email address to receive update advisories.



## Contact VDI:

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