M980xA Series
PXle Vector Network Analyzer

2/4/6-port, 9 kHz to 20 GHz
2-port, 100 kHz to 53 GHz

Drive Down the Size of Test
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Keysight PXI Vector Network Analyzer: Drive Down the Size of Test

As the margins for multiport devices become tighter, your test equipment needs to be one step ahead. The Keysight M980xA PXIe Vector Network Analyzer (VNA) meets the most demanding multiport challenges with exceptional measurement performance and a fast cycle time so you can do more in less time. Gain deeper insights into your devices with the widest available portfolio of measurement applications for PXI VNAs, including spectrum analysis, noise figure measurements, and more.

This configuration guide describes standard configurations, options, accessories, upgrade kits and compatible peripherals for the Keysight M980xA Series PXIe VNA.

M980xA Series

- M9800A  9 kHz to 4.5 GHz, 2/4/6-port
- M9801A  9 kHz to 6.5 GHz, 2/4/6-port
- M9802A  9 kHz to 9 GHz, 2/4/6-port
- M9803A  9 kHz to 14 GHz, 2/4/6-port
- M9804A  9 kHz to 20 GHz, 2/4/6-port
- M9805A  100 kHz to 26.5 GHz, 2-port
- M9806A  100 kHz to 32 GHz, 2-port
- M9807A  100 kHz to 44 GHz, 2-port
- M9808A  100 kHz to 53 GHz, 2-port
Keysight M980xA Vector Network Analyzer Configurations

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Test port connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>M9800A</td>
<td>9 kHz to 4.5 GHz, 2/4/6-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>M9801A</td>
<td>9 kHz to 6.5 GHz, 2/4/6-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>M9802A</td>
<td>9 kHz to 9 GHz, 2/4/6-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>M9803A</td>
<td>9 kHz to 14 GHz, 2/4/6-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>M9804A</td>
<td>9 kHz to 20 GHz, 2/4/6-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>M9805A</td>
<td>100 kHz to 26.5 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>M9806A</td>
<td>100 kHz to 32 GHz, 2-port</td>
<td>2.4 mm (f)</td>
</tr>
<tr>
<td>M9807A</td>
<td>100 kHz to 44 GHz, 2-port</td>
<td>2.4 mm (f)</td>
</tr>
<tr>
<td>M9808A</td>
<td>100 kHz to 53 GHz, 2-port</td>
<td>1.85 mm (f)</td>
</tr>
</tbody>
</table>

Test set options

Choose one of the frequency models, and one test set option for the M980xA Series. Option 200 indicates two test ports. Option 400 indicates four test ports. Option 600 indicates six test ports. To add options to a product, order the corresponding item number (M980xA-xxx).

<table>
<thead>
<tr>
<th>Description</th>
<th>2-port</th>
<th>4-port</th>
<th>6-port</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>For M9800A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 200</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 400</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 600</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>For M9805A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 200</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Hardware options

<table>
<thead>
<tr>
<th>Option Number</th>
<th>Description</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 021</td>
<td>Add pulse modulation hardware</td>
<td>This option enables the internal pulse modulator on the analyzer’s source. S95025A application software is required for pulsed-RF measurements.</td>
</tr>
<tr>
<td>Option 090</td>
<td>Add spectrum analysis hardware</td>
<td>S95090A application software is required for spectrum analysis.</td>
</tr>
</tbody>
</table>
Application software

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>S95007A</td>
<td>Automatic fixture removal</td>
<td></td>
</tr>
<tr>
<td>S95010A</td>
<td>Time domain analysis</td>
<td></td>
</tr>
<tr>
<td>S95025A</td>
<td>Basic pulsed-RF measurements</td>
<td>Requires hardware option 021.</td>
</tr>
<tr>
<td>S95029A</td>
<td>Noise figure measurements with vector correction</td>
<td>Standard receivers are used.</td>
</tr>
<tr>
<td>S95082A</td>
<td>Scalar mixer/converter measurements</td>
<td>Provides ability to independently set the frequency of internal sources and receivers, and to configure external sources. Provides SMC measurement class.</td>
</tr>
<tr>
<td>S95084A</td>
<td>Embedded LO capability</td>
<td></td>
</tr>
<tr>
<td>S95086A</td>
<td>Gain-compression measurements</td>
<td></td>
</tr>
<tr>
<td>S95090A</td>
<td>Spectrum analysis</td>
<td>Requires hardware option 090.</td>
</tr>
<tr>
<td>S95551A</td>
<td>Multiport calibrated measurements</td>
<td>Provides multiport calibrated measurements using multiple PXI modules.</td>
</tr>
<tr>
<td>S94701A, S94702A, KS8400A</td>
<td>Automated Measurement Expert (AMX)</td>
<td>A smart software solution for automated multiport S-parameter measurements with the PXI VNAs. Order each software model and install in a PC or PXI embedded controller.</td>
</tr>
</tbody>
</table>

1. Supported software license types: node-locked perpetual (1FP), node-locked 12 month (1FL), transportable perpetual (1TP) and transportable 12 month (1FL). All license options have to be ordered as separate items and installed in a PC or PXI embedded controller. Order one software license per host PC.

2. When configuring a multiport VNA using multiple M980xA modules, the Y1730A is recommended for each additional multiport interconnection.

3. A 4-port ECal module (i.e. N4431/32/33) is recommended for multiport measurements (n > 4).

Calibration options

<table>
<thead>
<tr>
<th>Option Number</th>
<th>Description</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1A7</td>
<td>ISO 17025 compliant calibration</td>
<td>Provides a complete set of measurements which test the unit to manufacturer's published specifications. Includes calibration label, ISO 17025 calibration certificate and data report, and measurement uncertainties and guardbands on all customer specifications. Conforms to ISO 17025 and ISO 9001.</td>
</tr>
<tr>
<td>Option A6J</td>
<td>ANSI Z540 compliant calibration</td>
<td>Provides a complete set of measurements which test the unit to manufacturer's published specifications. Includes pre- and post-adjustment data and measurement uncertainty information compliant with the ANSI/NCSL Z540 standard</td>
</tr>
</tbody>
</table>

Startup assistance

<table>
<thead>
<tr>
<th>Option Number</th>
<th>Description</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS-S10</td>
<td>Startup assistance, hourly</td>
<td>Provides setup and training onboarding services that reduces complexity associated with initial setup and enables users to get to measurements fast. Can be delivered remotely.</td>
</tr>
<tr>
<td>PS-S20</td>
<td>Startup assistance, daily</td>
<td>Provides setup and training onboarding services that reduces complexity associated with initial setup and enables users to get to measurements fast. Can be delivered remotely.</td>
</tr>
</tbody>
</table>
## Additional PXI modules

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>M9161D</td>
<td>PXI solid state dual SP4T switch module, 50 MHz to 20 GHz</td>
<td>Used as an RF source switch to isolate the M980xA's source signal during noise figure measurements.</td>
</tr>
<tr>
<td>M9379A</td>
<td>RF amp module, 50 MHz to 13.5 GHz</td>
<td>Includes two amplifiers, RF switches, and a programmable step attenuator designed to operate with the M980xA. When used as an external preamp, the M9379A improves the M980xA's noise floor for noise figure measurements up to 13.5 GHz.</td>
</tr>
<tr>
<td>M9341A¹</td>
<td>Digital I/O</td>
<td>Includes a 24-bit digital I/O connector and triggering ports to provide communication signals between the M980xA and an external handler.</td>
</tr>
<tr>
<td>M9341B¹</td>
<td>Digital and Analog I/O</td>
<td>Includes a 24-bit digital I/O and an 8-bit digital I/O to allow users to control the device under test (DUT) directly with serial or parallel digital signals. The M9341B has four analog input connectors to allow sensing of DC voltages from the DUT. The measured DC voltage can be displayed on the firmware. The M9341B also supports two variable DC source outputs to control the DUT, while the DC source current can be monitored during measurements.</td>
</tr>
</tbody>
</table>

1. For more information on the M9341A/B, see the data sheet, literature number 5992-1856EN.

## Accessories

<table>
<thead>
<tr>
<th>Model/Option</th>
<th>Description</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1730A</td>
<td>Interconnect cables for multiport configuration</td>
<td>Includes 1 semi-rigid cable and 1 flexible control cable for connecting 2 M980xA (Option 200) together. Add one kit for each additional M980xA.</td>
</tr>
<tr>
<td>Y1730A-001</td>
<td>Interconnect cables for multiport configuration of 1-slot M980xA (Opt. 200)</td>
<td>Includes 2 semi-rigid cables and 1 flexible control cable for connecting M980xA Option 400 or 600 and the adjacent module. Add one kit for each additional M980xA.</td>
</tr>
<tr>
<td>Y1730A-002</td>
<td>Interconnect cables for multiport configuration of 2-slot M980xA (Opt. 400 or 600)</td>
<td>Includes 1 semi-rigid cable and 1 flexible control cable for connecting M980xA with multiple PXI chassis. Includes 1 set of spacers between two chassis.</td>
</tr>
<tr>
<td>Y1730A-003</td>
<td>Interconnect cables for multiport configuration of M980xA with multiple PXI chassis</td>
<td>Includes semi-rigid cables required to configure a multiport VNA with &gt; 7 M980xA modules.</td>
</tr>
<tr>
<td>Y1731A</td>
<td>PXI adapter module</td>
<td>Includes PXI module to enable coaxial connections with control signals of the M980xA; Equipped with twelve SMB connectors. Includes 2 flexible control cables.</td>
</tr>
<tr>
<td>Y1731A-001</td>
<td>I/O adapter module</td>
<td>Includes PXI module to enable coaxial connections with control signals of the M980xA; Equipped with twelve SMB connectors. Includes 2 flexible control cables.</td>
</tr>
<tr>
<td>5012-9084</td>
<td>SMB (f) to MCX (m) cable assembly, 300 mm</td>
<td>For connection with external reference ports of the M980xA.</td>
</tr>
<tr>
<td>5012-9085</td>
<td>SMB (f) to MCX (m) cable assembly, 1000 mm</td>
<td>For connection with external reference ports of the M980xA.</td>
</tr>
</tbody>
</table>

1. Additional power divider(s) is necessary to distribute LO signal among PXI modules in multiport configurations. Order one 11636B power divider for multiport configurations using 8 to 13 M980xA modules. Order two 11636B power dividers for configurations with 14 to 17 M980xA modules. For more detail of multi-module configurations, refer to M980xA Multi-module Installation guide.
Chassis and Accessories

Step 1. Select a chassis

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M9010A</td>
<td>10-slot PXIe chassis</td>
</tr>
<tr>
<td>M9018A</td>
<td>18-slot PXIe chassis Gen 2</td>
</tr>
<tr>
<td>M9018B</td>
<td>18-slot PXIe chassis Gen 2</td>
</tr>
<tr>
<td>M9019A</td>
<td>18-slot PXIe chassis Gen 3</td>
</tr>
</tbody>
</table>

1. Select the right PXI chassis depending on required DC output power.
2. The M9005A PXIe chassis is not supported for the operation with the M980xA Series.
3. The M9018A PXIe chassis supports the operation with maximum six M980xA modules.

Step 2. Choose enough slot blocker kits and EMC filter panels to fill every open slot. Recommended to achieve data sheet specifications.

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1212A</td>
<td>Slot blocker kit: 5 slots</td>
</tr>
<tr>
<td>Y1213A</td>
<td>PXI EMC filter panel kit: 5 slots</td>
</tr>
</tbody>
</table>

1. Non-EMC filler panes are included with the M9018B or M9019A PXIe 18-slot chassis.

Step 3. Choose a rack mount kit (optional)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1271A</td>
<td>Rack mount kit for M9010A and Y1217A rail kit</td>
</tr>
<tr>
<td>Y1215C</td>
<td>Rack mount kit for M9018B or M9019A 18-slot PXIe chassis</td>
</tr>
<tr>
<td>Y1216B</td>
<td>Rack mount kit for M9018B or M9019A 18-slot PXIe chassis</td>
</tr>
</tbody>
</table>

1. For more information on the rack mount kit, see the chassis data sheet, literature number 5992-1481EN.

Step 4. Choose an air inlet kit (optional). Recommended for rack mounted systems with less than 1U space below chassis.

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1214B</td>
<td>Air inlet kit: M9018B or M9019A 18-slot chassis</td>
</tr>
</tbody>
</table>

1. For more information, please visit www.keysight.com/find/m9018b

Find us at www.keysight.com
Select Controller (either embedded controller or via PC)

**Step 1. Select embedded controller**

M9037A High-performance embedded controller, Gen 3
Intel i7-4700EQ quad-core processor, 2.4 GHz, 8 thread, 4 GB RAM
Select M9037A for the best performance if you have memory intensive applications, multiple applications running in parallel or if a lot of data is sent to the PC from the PXIe chassis. Features removable SSD drive for security and x8 PCIe® connector on front for connection to second chassis.

1. The M9010A 10-slot chassis or M9018B / M9019A 18-slot chassis includes empty space to the left of the 1st functional slot. The embedded controller occupies that empty space and the 1st functional slot.

**Step 2. Upgrade from standard memory size (optional)**

<table>
<thead>
<tr>
<th>M9037A-M08</th>
<th>Memory upgrade from 4 GB to 8 GB RAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>M9037A-M16</td>
<td>Memory upgrade from 4 GB to 16 GB RAM</td>
</tr>
</tbody>
</table>

**Step 3. Select an operating system**

<table>
<thead>
<tr>
<th>M9037A-WE3</th>
<th>Microsoft Windows Embedded Standard 7 (32-bit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M9037A-WE6</td>
<td>Microsoft Windows Embedded Standard 7 (64-bit)</td>
</tr>
<tr>
<td>M9037A-W16</td>
<td>Microsoft Windows 10 IoT Enterprise LTSB (64-bit)</td>
</tr>
</tbody>
</table>
To use your desktop PC as a controller \(^1, 2\)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M9048A</td>
<td>PCIe Host Adapter: Gen 2, x8</td>
</tr>
<tr>
<td>M9048B</td>
<td>PCIe Host Adapter: Single Port (x8), Gen 3</td>
</tr>
<tr>
<td>M9049A</td>
<td>PCIe Host Adapter: Dual Port (x16), Gen 3</td>
</tr>
<tr>
<td>Y1202A</td>
<td>PCIe cable</td>
</tr>
</tbody>
</table>

- \(^1\) For list of qualified external controllers, please see Test Computer List Technical Note literature number 5990-7632EN.
- \(^2\) For more detailed chassis configuration information including multi-chassis, see Interface Modules and Adapters for PXIe and AXIe Systems literature number 5992-0377EN.
- \(^3\) The M9021A can only be used with the Keysight M9018B.
**Measurement Application Software**

**Automatic fixture removal (S95007A)**

Many devices do not have coaxial connectors and are put in fixtures in order to measure them in a coaxial environment. Accurately removing the effects of the fixture is required to get a good measurement of the device under test (DUT). This application adds a powerful application wizard to guide you through characterizing a fixture and removing it from the measurement. Devices can be single-ended or differential. Files can be saved in a variety of formats for later use in ENA, PNA, PXI VNA, USB VNA, ADS, and PLTS.

**Time domain analysis (S95010A)**

This application enables the analyzer to view reflection and transmission responses in time or distance. Use time domain to tune filters, gate out the response of fixtures and cables, characterize the impedance of transmission lines and more.

**Basic pulsed-RF measurements (S95025A)**

This application enables internal pulse generators that can be used to control the internal pulse modulators, and it provides an integrated pulse application that uses the wideband-detection method. The software requires hardware option 021 pulse modulator hardware.

The pulse application provides an easy way to set up point-in-pulse measurements with pulse width as narrow as 1 us, and pulse-profile measurements with 40 ns minimum timing resolution. Using the built-in pulse modulators, the M980xA PXIe VNA is a complete pulsed-RF measurement solution, eliminating the need for external test sets and pulse generators. S95025A also controls external pulse generators and modulators and can synchronize to external master pulses. The Y1731A PXI Adapter Module is recommended if using external master pulses or external pulse modulators.

**Noise figure measurements with vector correction (S95029A)**

This software application enables high-accuracy noise figure and noise-power measurements of amplifiers utilizing Keysight’s unique vector-source-correction technique that uses a source-impedance tuner to remove the effects of imperfect system-source match. This approach yields accuracy that surpasses that provided by the Y-factor method and other cold-source implementations, especially for in-fixture, on-wafer, and automated-test environments. A scalar-calibrated method is also available that offers less accuracy but is faster and does not require an impedance tuner.
The instrument’s standard receivers are used for noise figure measurements with the S95029A. An external preamplifier and filter(s) is required for devices with < 30 dB of excess noise (gain plus noise figure in dB). S95029A controls Keysight N469x Series’ ECal modules configured as impedance tuners for use with the M980xA PXIe VNA.

For calibration, a standard mechanical cal kit or ECal module is required for the S-parameter portion of the cal (an ECal used as a tuner cannot be shared for calibration). To calibrate a standard receiver for noise figure measurements, a power meter is required. All calibration accessories must be ordered separately.

**Scalar mixer/converter measurements (S95082A)**

With a simple setup and calibration, this application delivers the highest accuracy for scalar conversion-loss/gain measurements by combining one-port and power-meter calibrations to remove mismatch errors. S95082A provides an intuitive and easy-to-use user interface for setting up mixer and converter measurements, with single or dual conversion stages. It can control external signal generators for use as LO signals. Supported external sources include the Keysight ESG, PSG, EXG, and MXG Series, as well as other SCPI-controlled signal generators.

S95082A is compatible with S95084A, which enables measurements of converters with internal LOs.

**Embedded LO capability (S95084A)**

This application tunes the analyzer’s receivers to the output frequency of the converter under test without the need for access to internal LOs or a common reference signal. S95084A is intended to work with S95082A measurement applications.

**Gain compression measurements (S95086A)**

The gain compression application (GCA) provides input power, output power, gain, and phase at the compression point of an amplifier over a specified frequency range. GCA's SMART Sweep is very fast and easy-to-use. GCA also includes a guided calibration that corrects for absolute power levels, frequency response, and mismatch errors.

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1. 8509x, N443x or N755xA Series ECal modules are not supported.
**Spectrum analysis (S95090A)**

The spectrum analyzer (SA) application adds high-performance microwave spectrum analysis to the M980xA. With fast stepped-FFT sweeps resulting from optimized data processing, the SA application provides quick spurious searches over broad frequency ranges. Simultaneous spectrum measurements can be done using test and reference receivers. This multi-channel SA can be used with the internal swept-signal generators for efficient measurements of spurious signals emanating from mixers and frequency converters. The SA application employs source-power and receiver-response calibration as well as fixture de-embedding, providing in-fixture and on-wafer spectrum measurements with the highest level of accuracy. Optional external attenuators should be connected with the VNA's test ports to avoid receiver compression when measuring large signals.

The S95090A software requires option 090 spectrum analysis hardware.

**Multiport calibrated measurements (S95551A)**

Keysight M980xA PXIe VNA offers a capability to extend the number of ports for your measurements by using multiple PXI modules. With the S95551A, multiple PXI modules may be installed in one or two PXI chassis and identified by the M980xA firmware as one VNA under a single controller. Operations with a single PXI module with 2-, 4- or 6-ports do not require the S95551A for full calibrated measurements.

The frequency of the multiport array is determined by the lowest frequency instrument configured in the array. For example, a 4-port analyzer configuration using a M9800A (4.5 GHz) and a M9804A (20 GHz) would have a maximum frequency of 4.5 GHz when performing 4-port measurements. This behavior extends to other measurement application software (S95xxxA).

Each M980xA module is connected into the array with Keysight cables. A Y1730A Interconnect Cables for Multiport Configuration should be ordered for each additional module and a single Y1281A accessory and tool kit should be ordered for easier cable connections.

**Material Measurements**

The Keysight N1500A materials measurement suite streamlines the process of measuring complex permittivity and permeability with a vector network analyzer. Various type of measurements, such as transmission line and free space, arch reflectivity, resonant cavity, and coaxial probe are available as options. The easy-to-use software guides the user through setup and measurement, instantly converting S-parameter network analyzer data into the data format of your choice and displaying the results within seconds. Results can be charted in a variety of formats: \( \varepsilon' \), \( \varepsilon'' \), tand, \( \mu' \), \( \mu'' \), tand\( \mu \), and Cole-Cole.
N1930B Physical Layer Test System (PLTS) Software

The PLTS software platform has become an industry standard for calibration, measurement, and analysis of linear passive interconnects such as cables, connectors, backplanes, and printed circuit boards. Utilizing either a vector network analyzer (VNA) or a time domain reflectometer (TDR), fast and accurate measurements can be obtained without in-depth knowledge of microwave measurement techniques. Refer to www.keysight.com/find/plts or the technical overview (literature number 5989-6841EN) for more details.

Automatic Measurement Expert (AMX)

This software package is a smart software solution for automated multiport S-parameter measurements with the M980xA. The S94701A AMX test plan builder provides an interactive GUI which helps you edit your multiport DUT test plans and generate test sequence files for the network analyzers. The S94702A and KS8400A software running on the analyzer executes the test sequences according to the optimized test sequence files generated by the S94701A.

Upgrading your system

Upgrade kits are available to add options after initial purchase. To upgrade the M980xA PXIe VNAs, order the corresponding item number. To add application software, order the appropriate standalone mode numbers (S95xxxA).
Measurement Accessories

A complete list of RF and microwave test accessories is available on our Web site: www.keysight.com/find/mta

Accessories are available in these connector types:

50 Ω Type-N, 3.5 mm, 7 mm, 2.4 mm, 2.92 mm, 1.85 mm, 1.0 mm, and waveguide. Test port cables and a calibration kit should be added for a complete measurement system. A verification kit is used to verify corrected system performance.

Cable and adapter sets

Keysight offers cables in the following types:

- Single cables in semi-rigid and flexible
- Cable sets in semi-rigid and flexible

There are also adapter sets available that protect the test port and convert the port to the desired connector interface. These kits contain:

- One male adapter
- One female adapter

To attain the best mechanical rigidity for device connection, use a single cable and the appropriate special adapter set. To attain the greatest flexibility for device connection, use a cable set.
**Calibration kits**

**Coaxial measurements**

Mechanical calibration kits include standards, such as opens, shorts and loads, which are measured by the network analyzer for increased measurement accuracy.

Choose a calibration kit for each connector type to be used.

**Economy**, includes:

- Open standards (male and female)
- Short standards (male and female)
- Fixed-termination standards (male and female)

**Standard**, includes the devices in the economy kit and adds:

- Sliding load standards (male and female) or a series of offset shorts

**Precision**, includes the devices in the economy kit and adds:

- 50 Ω airline(s) for TRL calibration
- TRL adapters

Electronic calibration (ECal) kits replace mechanical calibration standards with one solid-state calibration module that is controlled by the network analyzer via USB, to present many different impedances to the test ports. A full two-port calibration can be performed quickly with a single connection. This technique reduces operator errors and connector wear and abrasion.

For more information about ECal modules, refer to the technical overview 5963-3743E (N4690, 85090, N4430 and N7550 Series).

**Waveguide measurements**

For waveguide measurements, Keysight offers mechanical calibration kits that include:

- Waveguide-to-coax adapters (X, P, K, R, Q, U, V)
- Precision waveguide section
- Flush short circuit
- Fixed terminations
- Straight section
For devices with 3.5 mm or SMA connectors

Mechanical calibration kits

85033E economy: DC to 9 GHz. Includes:

- 85033-60016 3.5 mm (m) load
- 85033-60017 3.5 mm (f) load
- 85033-60018 3.5 mm (m) open
- 85033-60019 3.5 mm (f) open
- 85033-60020 3.5 mm (m) short
- 85033-60021 3.5 mm (f) short
- 8710-1761 torque wrench

Option 85033E-100 adds:

- 85027-60005 3.5 mm (f) to 3.5 mm (f) adapter

Option 85033E-200 adds:

- 85027-60007 3.5 mm (m) to 3.5 mm (m) adapter

Option 85033E-300 adds:

- 85027-60006 3.5 mm (m) to 3.5 mm (f) adapter

Option 85033E-400 adds:

- 1250-1744 3.5 mm (f) to 50 Ω Type-N (m) adapter
- 1250-1743 3.5 mm (m) to 50 Ω Type-N (m) adapter
- 1250-1745 3.5 mm (f) to 50 Ω Type-N (f) adapter
- 1250-1750 3.5 mm (m) to 50 Ω Type-N (f) adapter

Option 85033E-500 adds:

- 1250-1746 3.5 mm (m) to 7 mm adapter (two included)
- 1250-1747 3.5 mm (f) to 7 mm adapter (two included)
85052B standard: DC to 26.5 GHz. Includes:

•  00902-60003 3.5 mm (m) fixed load
•  00902-60004 3.5 mm (f) fixed load
•  00911-60019 3.5 mm (m) sliding load
•  00911-60020 3.5 mm (f) sliding load
•  85052-60006 3.5 mm (m) short
•  85052-60007 3.5 mm (f) short
•  85052-60008 3.5 mm (m) open
•  85052-60009 3.5 mm (f) open
•  85052-60012 3.5 mm (f) to 3.5 mm (f) adapter
•  85052-60013 3.5 mm (f) to 3.5 mm (m) adapter
•  85052-60014 3.5 mm (m) to 3.5 mm (m) adapter

85052C precision TRL: DC to 26.5 GHz. Includes:

•  00902-60003 3.5 mm (m) fixed load
•  00902-60004 3.5 mm (f) fixed load
•  85052-60006 3.5 mm (m) short
•  85052-60007 3.5 mm (f) short
•  85052-60008 3.5 mm (m) open
•  85052-60009 3.5 mm (f) open
•  85052-60032 3.5 mm (f) to 3.5 mm (f) adapter
•  85052-60033 3.5 mm (m) to 3.5 mm (m) adapter
•  85052-60034 3.5 mm (f) to 3.5 mm (m) adapter
•  85052-60035 3.5 mm short TRL line
•  85052-60036 3.5 mm long TRL line

85052D economy: DC to 26.5 GHz. Includes:

•  00902-60003 3.5 mm (m) fixed load
•  00902-60004 3.5 mm (f) fixed load
•  85052-60006 3.5 mm (m) short
•  85052-60007 3.5 mm (f) short
•  85052-60008 3.5 mm (m) open
•  85052-60009 3.5 mm (f) open
•  85052-60012 3.5 mm (f) to 3.5 mm (f) adapter
•  85052-60013 3.5 mm (f) to 3.5 mm (m) adapter
•  85052-60014 3.5 mm (m) to 3.5 mm (m) adapter
Electronic calibration (ECal) modules

85093C RF ECal: 300 kHz to 9 GHz, 2-ports. Standard module includes:

- Option 00F: Both 3.5 mm connectors are female
- Option 00M: Both 3.5 mm connectors are male
- Option M0F: One female and one male connector, both 3.5 mm
- Option 00A adds:
  - 85052-60012 3.5 mm (f) to 3.5 mm (f) adapter
  - 85052-60014 3.5 mm (m) to 3.5 mm (m) adapter
- Option 150: Replaces standard storage container with a wooden box

85093C mixed-connector options

<table>
<thead>
<tr>
<th>Port A option</th>
<th>Port B option</th>
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<tbody>
<tr>
<td>Connector type</td>
<td>Female</td>
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<tr>
<td>3.5 mm</td>
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N4431B ECal: 300 kHz to 13.5 GHz, 4-ports.

<table>
<thead>
<tr>
<th>Connector type</th>
<th>Port A option</th>
<th>Port B option</th>
<th>Port C option</th>
<th>Port D option</th>
</tr>
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<tbody>
<tr>
<td>Four 3.5 mm (f)</td>
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<td></td>
<td></td>
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<tr>
<td>Four Type-N 50 Ω (f)</td>
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<td>020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5 mm (f)</td>
<td>101</td>
<td>201</td>
<td>301</td>
<td>401</td>
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<tr>
<td>3.5 mm (m)</td>
<td>102</td>
<td>202</td>
<td>302</td>
<td>402</td>
</tr>
<tr>
<td>Type-N 50 Ω (f)</td>
<td>103</td>
<td>203</td>
<td>303</td>
<td>403</td>
</tr>
<tr>
<td>Type-N 50 Ω (m)</td>
<td>104</td>
<td>204</td>
<td>304</td>
<td>404</td>
</tr>
<tr>
<td>7-16 (f)</td>
<td>105</td>
<td>205</td>
<td>305</td>
<td>405</td>
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<tr>
<td>7-16 (m)</td>
<td>106</td>
<td>206</td>
<td>306</td>
<td>406</td>
</tr>
</tbody>
</table>
- Option 150: Replaces standard storage container with a wooden box

N4433A ECal: 300 kHz to 20 GHz, 4-ports.

<table>
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<tr>
<th>Connector type</th>
<th>Port A option</th>
<th>Port B option</th>
<th>Port C option</th>
<th>Port D option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four 3.5 mm (f)</td>
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<td>010</td>
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<tr>
<td>3.5 mm (f)</td>
<td>101</td>
<td>201</td>
<td>301</td>
<td>401</td>
</tr>
<tr>
<td>3.5 mm (m)</td>
<td>102</td>
<td>202</td>
<td>302</td>
<td>402</td>
</tr>
</tbody>
</table>
- Option 150: Replaces standard storage container with a wooden box
N4691D Microwave ECal, DC or 300 kHz to 26.5 GHz, 2-ports. Includes:

- Option F0F: Both 3.5 mm connectors are female
- Option M0F: One female and one male connector, both 3.5 mm
- Option M0M: Both 3.5 mm connectors are male
- Option 0DC: DC to 26.5 GHz
- Option 003: 300 kHz to 26.5 GHz
- Option 00A adds:
  - 85052-60012 3.5 mm (f) to 3.5 mm (f) adapter
  - 85052-60014 3.5 mm (m) to 3.5 mm (m) adapter

N755XA Series Economy ECal, 2-ports:

- N7550A DC to 4 GHz, 2-ports
- N7551A DC to 6.5 GHz, 2-ports
- N7552A DC to 9 GHz, 2-ports
- N7553A DC to 14 GHz, 2-ports
- N7554A DC to 18 GHz, 2-ports
- N7555A DC to 26.5 GHz, 2-ports

N755xA Series includes:

- Option 3FF: Both 3.5 mm connectors are female
- Option 3MF: One female and one male connector, both 3.5 mm
- Option 3MM: Both 3.5 mm connectors are male
- Option 150: Plastic storage box
- N7550X-151: 3.5 mm or 2.92 mm torque wrench
Cables

85131C¹ single, semi-rigid:
- 3.5 mm (f) to PSC-3.5 mm (f), 81 cm, 32 inches

85131D¹ set, semi-rigid:
- 85131-60009 One 3.5 mm (f) to 3.5 mm (m), 53 cm, 21 inches
- 85131-60010 One 3.5 mm (f) to PSC-3.5 mm (f), 53 cm, 21 inches

85131E¹ single, flexible:
- 3.5 mm (f) to PSC-3.5 mm (f), 96.5 cm, 38 inches

85131F¹ set, flexible:
- 85131-60012 One 3.5 mm (f) to 3.5 mm (m), 62.2 cm, 24.5 inches
- 85131-60013 One 3.5 mm (f) to PSC-3.5 mm (f), 62.2 cm, 24.5 inches

85131H¹ single, flexible:
- 3.5 mm (f) to 3.5 mm (m), 62.2 cm, 24.5 inches

85134E¹ single, flexible:
- PSC-3.5 mm (f) to 2.4 mm (f), 96 cm, 38 inches

85134F¹ set, flexible:
- 85134-60004 One 2.4 mm (f) to PSC-3.5 mm (f), 53 cm, 21 inches
- 85134-60003 One 2.4 mm (f) to PSC-3.5 mm (m), 53 cm, 21 inches

85134H¹ single, flexible:
- 2.4 mm (f) to PSC-3.5 mm (m), 53 cm, 21 inches

N4419AK20 single, flexible:
- 3.5 mm (m) to 3.5 mm (f), 91.4 cm, 36 inches

Z5623A-K20 single, flexible:
- 3.5 mm (m) to 3.5 mm (m), 91.4 cm, 36 inches

Adapter sets
- 85130D 3.5 mm¹ to 3.5 mm

¹ Special rugged female connector specifically for connecting to the network analyzer test port, but does not mate with a standard male connector.
For devices with Type-N connectors

**Mechanical calibration kits**

85032F standard, DC to 9 GHz Includes:

- 85032-60017 Type-N (m) fixed load
- 85032-60018 Type-N (f) fixed load
- 85032-60013 Type-N (m) open
- 85032-60014 Type-N (f) open
- 85032-60016 Type-N (m) short
- 85032-60015 Type-N (f) short

Option 85032F-100 adds:

- 85032-60021 Type-N (f) to Type-N (f) adapter

Option 85032F-200 adds:

- 85032-60019 Type-N (m) to Type-N (m) adapter

Option 85032F-300 adds:

- 85032-60020 Type-N (m) to Type-N (f) adapter

Option 85032F-500 adds:

- 85054-60001 Type-N (f) to 7 mm adapter (two included)
- 85054-60009 Type-N (m) to 7 mm adapter (two included)

85054B standard: DC to 18 GHz. Includes:

- 00909-60011 Type-N (m) fixed lowband load
- 00909-60012 Type-N (f) fixed lowband load
- 85054-60025 Type-N (m) short
- 85054-60026 Type-N (f) short
- 85054-60027 Type-N (m) open
- 85054-60028 Type-N (f) open
- 85054-60031 Type-N (f) to 7mm adapter
- 85054-60032 Type-N (m) to 7mm adapter
- 85054-60037 Type-N (f) to Type-N (f) adapter
- 85054-60038 Type-N (m) to Type-N (m) adapter
- 85054-80010 Type-N (f) sliding load
- 85054-80009 Type-N (m) sliding load
- 85054-60050 Type-N (f) connector gage
- 85054-60052 Type-N (f) gage master
- 85054-60051 Type-N (m) connector gage
- 85054-60053 Type-N (m) gage master
85054D economy: DC to 18 GHz. Includes:

- 85054-60025 Type-N (m) short
- 85054-60026 Type-N (f) short
- 85054-60027 Type-N (m) open
- 85054-60028 Type-N (f) open
- 85054-60031 Type-N (f) to 7mm adapter
- 85054-60032 Type-N (m) to 7mm adapter
- 85054-60037 Type-N (f) to Type-N (f) adapter
- 85054-60038 Type-N (m) to Type-N (m) adapter
- 85054-60046 Type-N (m) fixed load
- 85054-60047 Type-N (f) fixed load

Electronic calibration (ECal) modules

85092C RF ECal: 300 kHz to 9 GHz, 2 ports. Includes:

- Option 00F: both Type-N connectors are female
- Option 00M: both Type-N connectors are male
- Option M0F: one female and one male connector, both Type-N
- Option 00A adds:
  - 85054-60037 Type-N (f) to Type-N (f) adapter
  - 85054-60038 Type-N (m) to Type-N (m) adapter

N4432A ECal: 300 kHz to 18 GHz, 4-ports.

<table>
<thead>
<tr>
<th>Connector type</th>
<th>Port A option</th>
<th>Port B option</th>
<th>Port C option</th>
<th>Port D option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four Type-N 50 Ω (f)</td>
<td>020</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5 mm (f)</td>
<td>101</td>
<td>201</td>
<td>301</td>
<td>401</td>
</tr>
<tr>
<td>3.5 mm (m)</td>
<td>102</td>
<td>202</td>
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<td>402</td>
</tr>
<tr>
<td>Type-N 50 Ω (f)</td>
<td>103</td>
<td>203</td>
<td>303</td>
<td>403</td>
</tr>
<tr>
<td>Type-N 50 Ω (m)</td>
<td>104</td>
<td>204</td>
<td>304</td>
<td>404</td>
</tr>
</tbody>
</table>

- Option 150: Replaces standard storage container with a wooden box
N4690D Microwave ECal, DC or 300 kHz to 18 GHz, 2-ports. Includes:

- Option F0F: Both Type-N connectors are female
- Option M0F: One female and one male connector, both Type-N connectors
- Option M0M: Both Type-N connectors are male
- Option 0DC: DC to 18 GHz
- Option 003: 300 kHz to 18 GHz
- Option 00A adds:
  - 85054-60037 Type-N (f) to Type-N (f) adapter
  - 85054-60038 Type-N (m) to Type-N (m) adapter

N755XA Series Economy ECal, 2-ports:

- N7550A DC to 4 GHz, 2-ports
- N7551A DC to 6.5 GHz, 2-ports
- N7552A DC to 9 GHz, 2-ports
- N7553A DC to 14 GHz, 2-ports
- N7554A DC to 18 GHz, 2-ports

N755xA Series includes:

- Option NFF: Both Type-N connectors are female
- Option NMF: One female and one male connector, both Type-N
- Option NMM: Both Type-N connectors are male
- Option 150: Plastic storage box
- N7550X-152: Type-N torque wrench

Cables

- N6314A 50 Ω Type-N RF cable, DC to 12.4 GHz Includes:
  - 8120-8862 one 610 mm (24 in) cable with male connectors
- N6315A 50 Ω Type-N RF cable, DC to 12.4 GHz Includes:
  - 8121-0027 one 610 mm (24 in) cable with both female and male connectors
Adapter sets

- 11853A 50 Ω Type-N accessory kit. Includes:
  - 1250-1472 Type-N (f) to Type-N (f) adapter (two included)
  - 1250-1475 Type-N (m) to Type-N (m) adapter (two included)
  - 11511A Type-N (f) short
  - 11512A Type-N (m) short

- 11878A Type-N to 3.5 mm adapter kit. Includes:
  - 1250-1744 3.5 mm (f) to 50 Ω Type-N (m) adapter
  - 1250-1743 3.5 mm (m) to 50 Ω Type-N (m) adapter
  - 1250-1745 3.5 mm (f) to 50 Ω Type-N (f) adapter
  - 1250-1750 3.5 mm (m) to 50 Ω Type-N (f) adapter

- 11524A 7 mm to Type-N (f) adapter

- 11525A 7 mm to Type-N (m) adapter

- 85130C 3.5 mm to Type-N Includes:
  - 85054-60029 NMD-3.5 mm to Type-N (f)
  - 85054-60030 NMD-3.5 mm to Type-N (m)

For devices with 7 mm connectors

Mechanical calibration kits

- 85050B standard: DC to 18 GHz. Includes:
  - 00909-60008 7 mm coax termination
  - 85050-60006 7 mm fixed broadband load
  - 85050-80007 7 mm short
  - 85050-80010 7 mm open
  - 85050-80011 7 mm sliding load

- 85050C precision TRL: DC to 18 GHz. Includes:
  - 00909-60008 7 mm coax termination
  - 85050-60003 7 mm to 7 mm airline
  - 85050-60005 7 mm to 7 mm TRL adapter
  - 85050-60006 7 mm fixed broadband load
  - 85050-80008 7 mm short
  - 85050-80009 7 mm short with collect
  - 85050-80010 7 mm open
85050D economy: DC to 18 GHz. Includes:

- 85050-60006 7 mm fixed broadband load
- 85050-80007 7 mm short
- 85050-80010 7 mm open

Electronic calibration (ECal) modules

N4696D Microwave ECal: DC or 300 kHz to 18 GHz, 2-ports, 7 mm connectors. Includes:

- Option 0DC: DC to 18 GHz
- Option 003: 300 kHz to 18 GHz

For devices with waveguide

Mechanical calibration kits

X-Band

X11644A standard, WR-90: 8.2 to 12.4 GHz. Includes:

- 00896-60008 X-band standard section
- 00910-60003 X-band termination
- 11644-20018 X-band short
- 11644-20021 X-band shim
- X281C adapter (included in calibration kit): WR-90 to 7 mm

P Band

P11644A standard, WR-62: 12.4 to 18 GHz. Includes:

- 00896-60007 P-band standard section
- 00910-60002 P-band termination
- 11644-20017 P-band short
- 11644-20020 P-band shim
- P281C adapter (included in calibration kit): WR-62 to 7 mm
K Band
K11644A standard, WR-42: 18 to 26.5 GHz. Includes:
- 00896-60006 K-band standard section
- 00910-60001 K-band termination
- 11644-20016 K-band short
- 11644-20019 K-band shim
- K281C adapter (included in calibration kit): WR-42 to 3.5 mm (f) Option 012 WR-42 to 3.5 mm (m)

R Band
R11644A standard, WR-28: 26.5 to 40 GHz. Includes:
- 00914-20028 R-band termination
- 11644-20005 R-band short
- 11644-20003 R-band shim
- 11644-60001 R-band 10 cm straight waveguide
- 11644-60016 R-band 5 cm straight waveguide

Q Band
Q11644A standard, WR-22: 33 to 50 GHz. Includes:
- 11644-60005 Q-band termination
- 11644-20004 Q-band short
- 11644-20001 Q-band shim
- 11644-60002 Q-band 10 cm straight waveguide
- 11644-60017 Q-band 5 cm straight waveguide

U Band
U11644A standard, WR-19: 40 to 60 GHz. Includes:
- 11644-60006 U-band termination
- 11644-20004 U-band short
- 11644-20002 U-band shim
- 11644-60003 U-band 10 cm straight waveguide
- 11644-60018 U-band 5 cm straight waveguide
Verification kits

All Keysight verification kits include:

- Precision Z0 airline or match thru
- Mismatched airline or mismatch thru
- Fixed attenuators (except 85059V)
- Traceable measured data and uncertainties

85051B 45 MHz to 18 GHz 7 mm kit

Includes attenuators, airline and mismatch airline with data on a USB drive for use in confirming calibrated system performance, traceable to national standards. Test procedure is provided in the service manual.

85053B 300 kHz to 26.5 GHz 3.5 mm kit

Includes attenuators, airline and mismatch airline with data on a USB drive for use in confirming calibrated system performance, traceable to national standards. Test procedure is provided in the service manual.

85055A 300 kHz to 18 GHz Type-N kit

Includes attenuators, airline and mismatch airline with data on a USB drive for use in confirming calibrated system performance, traceable to national standards. Test procedure is provided in the service manual.

85057B 45 MHz to 50 GHz 2.4 mm kit

Includes attenuators, airline and mismatch airline with data on a USB drive for use in confirming calibrated system performance, traceable to national standards. Test procedure is provided in the service manual.

85058V 45 MHz to 67 GHz 1.85 mm kit

Includes attenuators, match thru and mismatch thru with data on a USB drive for use in confirming calibrated system performance, traceable to national standards. Test procedure is provided in the service manual.
System Requirements for M980xA Control

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Requirement Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating systems</td>
<td>Windows 7 SP1 or Windows 10 (64-bit only)</td>
</tr>
<tr>
<td>Processor speed</td>
<td>Intel i5 6th generation or newer/Intel Xeon E3 v3 or newer</td>
</tr>
<tr>
<td>Available memory</td>
<td>4 GB minimum, 16 GB recommended</td>
</tr>
<tr>
<td>Available disk space</td>
<td>2 GB available disk space minimum</td>
</tr>
<tr>
<td>Display resolution</td>
<td>1024 X 768 minimum</td>
</tr>
</tbody>
</table>

1. For a list of computers compatible with Keysight M9018A PXie chassis, refer to Tested Computer Technical Note. (5990-7632EN)

Literature Information

- Keysight M980xA Series PXie Vector Network Analyzer – Data Sheet 5992-3597EN
- Keysight Vector Network Analyzer – Selection Guide 5989-7603EN

Web Resources

- www.keysight.com/find/pxivna
- www.keysight.com/find/na
- www.keysight.com/find/ecal

Learn more at: www.keysight.com

For more information on Keysight Technologies’ products, applications or services, please contact your local Keysight office. The complete list is available at:

www.keysight.com/find/contactus