Keysight Streamline Series
USB Vector Network Analyzers
P937xA Up to 26.5 GHz
P500xA & P502xA Up to 53 GHz

Compact Form. Zero compromise.
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Keysight Streamline Series: Exceptional Performance in a Small Package

Balance deadlines, productivity, budget and bench space with the Streamline Series. You’ll move confidently across every stage of your product’s development lifecycle by leveraging accurate and repeatable measurements, automated code capability, and a consistent, intuitive user experience. With comprehensive Keysight Services including calibration, education and consulting, these instruments enhance your solution to help you accelerate technology adoption and lower costs.

This configuration guide describes standard configurations, options, accessories, upgrade kits and compatible peripherals for the Keysight Streamline Series vector network analyzer (VNA).

### P937xA Series
- **P9370A**: 300 kHz to 4.5 GHz, 2-port
- **P9371A**: 300 kHz to 6.5 GHz, 2-port
- **P9372A**: 300 kHz to 9 GHz, 2-port
- **P9373A**: 300 kHz to 14 GHz, 2-port
- **P9374A**: 300 kHz to 20 GHz, 2-port
- **P9375A**: 300 kHz to 26.5 GHz, 2-port

### P500xA Series
- **P5000A**: 9 kHz to 4.5 GHz, 2-port
- **P5001A**: 9 kHz to 6.5 GHz, 2-port
- **P5002A**: 9 kHz to 9 GHz, 2-port
- **P5003A**: 9 kHz to 14 GHz, 2-port
- **P5004A**: 9 kHz to 20 GHz, 2-port
- **P5005A**: 100 kHz to 26.5 GHz, 2-port
- **P5006A**: 100 kHz to 32 GHz, 2-port
- **P5007A**: 100 kHz to 44 GHz, 2-port
- **P5008A**: 100 kHz to 53 GHz, 2-port

### P502xA Series
- **P5020A**: 9 kHz to 4.5 GHz, 4 or 6-port
- **P5021A**: 9 kHz to 6.5 GHz, 4 or 6-port
- **P5022A**: 9 kHz to 9 GHz, 4 or 6-port
- **P5023A**: 9 kHz to 14 GHz, 4 or 6-port
- **P5024A**: 9 kHz to 20 GHz, 4 or 6-port
- **P5025A**: 100 kHz to 26.5 GHz, 4-port
- **P5026A**: 100 kHz to 32 GHz, 4-port
- **P5027A**: 100 kHz to 44 GHz, 4-port
- **P5028A**: 100 kHz to 53 GHz, 4-port
## Keysight Streamline Series Vector Network Analyzer Configurations

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Test port connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P937xA Series</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P9370A</td>
<td>300 kHz to 4.5 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P9371A</td>
<td>300 kHz to 6.5 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P9372A</td>
<td>300 kHz to 9 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P9373A</td>
<td>300 kHz to 14 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P9374A</td>
<td>300 kHz to 20 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P9375A</td>
<td>300 kHz to 26.5 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td><strong>P500xA Series</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P5000A</td>
<td>9 kHz to 4.5 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5001A</td>
<td>9 kHz to 6.5 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5002A</td>
<td>9 kHz to 9 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5003A</td>
<td>9 kHz to 14 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5004A</td>
<td>9 kHz to 20 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5005A</td>
<td>100 kHz to 26.5 GHz, 2-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5006A</td>
<td>100 kHz to 32 GHz, 2-port</td>
<td>2.4 mm (f)</td>
</tr>
<tr>
<td>P5007A</td>
<td>100 kHz to 44 GHz, 2-port</td>
<td>2.4 mm (f)</td>
</tr>
<tr>
<td>P5008A</td>
<td>100 kHz to 53 GHz, 2-port</td>
<td>1.85 mm (f)</td>
</tr>
<tr>
<td><strong>P502xA Series</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P5020A</td>
<td>9 kHz to 4.5 GHz, 4 or 6-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5021A</td>
<td>9 kHz to 6.5 GHz, 4 or 6-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5022A</td>
<td>9 kHz to 9 GHz, 4 or 6-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5023A</td>
<td>9 kHz to 14 GHz, 4 or 6-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5024A</td>
<td>9 kHz to 20 GHz, 4 or 6-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5025A</td>
<td>100 kHz to 26.5 GHz, 4-port</td>
<td>3.5 mm (f)</td>
</tr>
<tr>
<td>P5026A</td>
<td>100 kHz to 32 GHz, 4-port</td>
<td>2.4 mm (f)</td>
</tr>
<tr>
<td>P5027A</td>
<td>100 kHz to 44 GHz, 4-port</td>
<td>2.4 mm (f)</td>
</tr>
<tr>
<td>P5028A</td>
<td>100 kHz to 53 GHz, 4-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 P500xA or P502xA Series. Option 2xx indicates two test ports, option 4xx indicates four test port and option 6xx indicates six test ports. To add options to a product, order the corresponding item number (ex. P500xA-2xx).

<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>Option 200</td>
<td></td>
<td>X</td>
<td></td>
<td>Not available for the P937xA or P502xA Series.</td>
</tr>
<tr>
<td>Option 400</td>
<td></td>
<td></td>
<td>X</td>
<td>Not available for the P937xA or P500xA Series.</td>
</tr>
<tr>
<td>Option 600</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Hardware options

<table>
<thead>
<tr>
<th>Description</th>
<th>For P937xA Series</th>
<th>For P500xA Series</th>
<th>For P502xA Series</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add pulse modulation hardware</td>
<td>N/A</td>
<td>P500xA-021</td>
<td>P502xA-021</td>
<td>This option enables the internal pulse modulator on the analyzer's source. S97025A application software is required for pulsed-RF measurements.</td>
</tr>
<tr>
<td>Add spectrum analysis hardware</td>
<td>N/A</td>
<td>P500xA-090</td>
<td>P502xA-090</td>
<td>S97090A application software is required for spectrum analysis.</td>
</tr>
</tbody>
</table>
## Application software

<table>
<thead>
<tr>
<th>Description</th>
<th>For P937xA Series</th>
<th>For P500xA and P502xA Series</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic fixture removal</td>
<td>S97007A</td>
<td>S97007A</td>
<td></td>
</tr>
<tr>
<td>Time domain analysis</td>
<td>S97010A</td>
<td>S97010A</td>
<td></td>
</tr>
<tr>
<td>Basic pulsed-RF measurements</td>
<td>N/A</td>
<td>S97025A</td>
<td>Requires hardware option 021 when internal pulse modulators are needed.</td>
</tr>
<tr>
<td>Noise figure measurements with vector correction</td>
<td>N/A</td>
<td>S97029A</td>
<td>Standard receivers are used.</td>
</tr>
<tr>
<td>Scalar mixer/converter measurements</td>
<td>S97082A</td>
<td>S97082A</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>Embedded-LO capability</td>
<td>N/A</td>
<td>S97084A</td>
<td></td>
</tr>
<tr>
<td>Gain-compression measurements</td>
<td>N/A</td>
<td>S97086A</td>
<td></td>
</tr>
<tr>
<td>Spectrum analysis</td>
<td>N/A</td>
<td>S97090A</td>
<td>Requires hardware option 090.</td>
</tr>
<tr>
<td>Multiport calibrated measurements</td>
<td>S97551A</td>
<td>S97551A</td>
<td>Provides multiport calibrated measurements using two USB VNAs.</td>
</tr>
</tbody>
</table>

## Calibration options

<table>
<thead>
<tr>
<th>Description</th>
<th>For P937xA Series</th>
<th>For P500xA Series</th>
<th>For P502xA Series</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 17025 compliant calibration</td>
<td>P937xA-1A7</td>
<td>P500xA-1A7</td>
<td>P502xA-1A7</td>
<td></td>
</tr>
<tr>
<td>Commercial calibration certificate with test data</td>
<td>P937xA-UK6</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

1. Supported software license types: node-locked perpetual (1FP), node-locked 12 month (1FL). 1FP is the only type that can be ordered as part of the instrument. The other types have to be ordered as separate items and installed from the web after the receipt of the instruments.
2. When configuring a multiport VNA using multiple USB VNAs, the Y1701A is recommended for each additional multiport interconnection.
3. The P937xA and P50xxA Series can not be combined in multiport configurations.
4. A 4-port ECal module (i.e. N4431/32/33) is recommended for multiport measurements (n > 4).
## Accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>For P937xA Series</th>
<th>For P500xA Series</th>
<th>For P502xA Series</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessory and tool kit</td>
<td>Y1281A</td>
<td>Y1281A</td>
<td>Y1281A</td>
<td>Includes the tools for SMA and SMB connector removal.</td>
</tr>
<tr>
<td>Rack mount kit</td>
<td>Y1700A-001</td>
<td>Y1700A-001</td>
<td>Y1700A-002</td>
<td>Order Option 001 for 2-port USB VNA (P937xA or P500xA Series). Order Option 002 for 4 or 6-port USB VNA (P502xA Series).</td>
</tr>
<tr>
<td>Multiple USB instruments configuration kit</td>
<td>Y1701A-001</td>
<td>Y1701A-002 or 003</td>
<td>Y1701A-002 or 003</td>
<td>Includes interconnect cables for configurations using two USB VNAs. Add one kit for each additional VNA.</td>
</tr>
<tr>
<td>Hard transit case</td>
<td>Y1710A</td>
<td>Y1710A</td>
<td>Y1710A</td>
<td></td>
</tr>
<tr>
<td>PXI adapter module</td>
<td>N/A</td>
<td>Y1731A-001</td>
<td>Y1731A-001</td>
<td>Includes PXI module to enable coaxial connections with control signals of the of the P500xA or P502xA Series USB VNA; Equipped with twelve SMB connectors. Includes 2 flexible control cables.</td>
</tr>
</tbody>
</table>

1. Order Y1701A Option 002 for P500xA or P502xA Series up to 20 GHz. Order Y1701A Option 003 for greater than 20 GHz models.

2. If P500xA Series and P502xA Series USB VNAs are connected for a multiport VNA, order Y1701A Option 102 Latch kit for connecting 1-slot to 2-slot USB instruments.
Measurement Application Software

Solid black series name indicates the feature is available on that series, while gray series name with strikethrough indicates the feature is not available on that series. For example:

**P500xA Series**: Available on P500xA series

**P937xA Series**: Not available on P937xA Series

**Automatic fixture removal (S97007A)**

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
</table>

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 (S97010A)**

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
</table>

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 (S97025A)**

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
</table>

This application enables internal pulse generators of P500xA or P502xA Series 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 USB VNAs are complete pulsed-RF measurement solutions, eliminating the need for external test sets and pulse generators. S97025A 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 (S97029A)

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
</table>

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 S97029A. An external preamplifier and filter(s) is required for devices with < 30 dB of excess noise (gain plus noise figure in dB). S97029A controls Keysight N469x Series ECal modules configured as impedance tuners for use with the USB 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 (S97082A)

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
</table>

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. S97082A 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.

S97082A is compatible with S97084A, which enables measurements of converters with internal LOs.

Embedded LO capability (S97084A)

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
</table>

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. S97084A is intended to work with S97082A measurement applications.

1. 8509x, N443x or N755xA Series ECal modules are not supported.
Gain compression measurements (S97086A)

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
</table>

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.

Spectrum analysis (S97090A)

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
</table>

The spectrum analyzer (SA) application adds high-performance microwave spectrum analysis to USB VNAs. 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 S97090A software requires option 090 spectrum analysis hardware.

Multiport calibrated measurements (S97551A)

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
</table>

Keysight USB VNA offers a capability to extend the number of ports for your measurements by using up to two instruments. When multiple instruments are used, they are configured for multiport operation. The instruments may be identified by the firmware as one VNA by an external PC. At least one VNA instrument connected to your PC must have one S97551A license to maintain N-port capabilities with multiple instruments. 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 P5002A (9 GHz) and a P5005A (26.5 GHz) would have a maximum frequency of 9 GHz when performing 4-port measurements. This behavior extends to other measurement application software (S97xxxA). In a multiport configuration, only one instrument must have a valid license for these capabilities to function in multiport mode.

Each instrument is connected into the array with Keysight cables. A Y1701A Multiple USB instruments configuration kit should be ordered for connection of two P937xA (with Y1701A Option 001) or two P50xxA instruments (with Y1701A Option 002 or 003). A single Y1281A accessory and tool kit should be ordered for easier cable connections.

While all models of the P500xA and P502xA Series can be connected for multiport configurations, the P937xA and P500xA (or P502xA) can not be combined to configure a multiport VNA due to hardware difference.
Material measurements

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
</table>

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: $\varepsilon_r'$, $\varepsilon_r''$, tand, $\mu_r'$, $\mu_r''$, tand$\mu_r$, and Cole-Cole.

N1930B Physical Layer Test System (PLTS) Software

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
</table>

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.
Upgrading Your System

Upgrade kits are available to add options after initial purchase. To upgrade the USB VNAs, order the corresponding item number. To add application software, order the appropriate standalone model numbers (S97xxxA).

For P937xA Series

<table>
<thead>
<tr>
<th>Description</th>
<th>P9370A</th>
<th>P9371A</th>
<th>P9372A</th>
<th>P9373A</th>
<th>P9374A</th>
<th>P9375A</th>
<th>User installable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extend analyzer’s frequency range to 6.5 GHz</td>
<td>P9370AU-706</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>Extend analyzer’s frequency range to 9 GHz</td>
<td>P9370AU-709</td>
<td>P9371AU-709</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>Extend analyzer’s frequency range to 14 GHz</td>
<td>P9370AU-714</td>
<td>P9371AU-714</td>
<td>P9372AU-714</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>Extend analyzer’s frequency range to 20 GHz</td>
<td>P9370AU-720</td>
<td>P9371AU-720</td>
<td>P9372AU-720</td>
<td>P9373AU-720</td>
<td>N/A</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>Extend analyzer’s frequency range to 26.5 GHz</td>
<td>P9370AU-726</td>
<td>P9371AU-726</td>
<td>P9372AU-726</td>
<td>P9373AU-726</td>
<td>P9374AU-726</td>
<td>N/A</td>
<td>No</td>
</tr>
</tbody>
</table>
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>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>3.5 mm</td>
<td>Female 101</td>
<td>Male 102</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Type-N 50 Ω</td>
<td>203 204</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7-16</td>
<td>205 206</td>
</tr>
</tbody>
</table>

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>
</thead>
<tbody>
<tr>
<td>Four 3.5 mm (f)</td>
<td>101</td>
<td>201</td>
<td>301</td>
<td>401</td>
</tr>
<tr>
<td>Four Type-N 50 Ω (f)</td>
<td>102</td>
<td>202</td>
<td>302</td>
<td>402</td>
</tr>
<tr>
<td>3.5 mm (f)</td>
<td>103</td>
<td>203</td>
<td>303</td>
<td>403</td>
</tr>
<tr>
<td>3.5 mm (m)</td>
<td>104</td>
<td>204</td>
<td>304</td>
<td>404</td>
</tr>
<tr>
<td>Type-N 50 Ω (f)</td>
<td>105</td>
<td>205</td>
<td>305</td>
<td>405</td>
</tr>
<tr>
<td>Type-N 50 Ω (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>
<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 3.5 mm (f)</td>
<td>101</td>
<td>201</td>
<td>301</td>
<td>401</td>
</tr>
<tr>
<td>3.5 mm (f)</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

¹. Special rugged female connector specifically for connecting to the network analyzer test port, but does not mate with a standard male connector.
85134H 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 mm to 3.5 mm

**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)

---

1. Special rugged female connector specifically for connecting to the network analyzer test port, but does not mate with a standard male connector.
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>
<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>
</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 3.5 mm to Type-N (f)
- 85054-60030 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.
PC Requirements for USB VNA control

<table>
<thead>
<tr>
<th>Requirement</th>
<th>For P937xA Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating systems</td>
<td>Windows 7 or Windows 10 (64-bit)</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>
<tr>
<td>USB</td>
<td>USB 3.0 port directly connected to Intel chipset</td>
</tr>
</tbody>
</table>

Literature Information

Keysight P937xA Series USB Vector Network Analyzer – Data Sheet, 5992-2765EN

Keysight P500xA Series USB Vector Network Analyzer – Data Sheet, 5992-3606EN

Keysight Vector Network Analyzer – Selection Guide, 5980-7603EN

Electric Calibration (ECal) Modules – Technical Overview, 5963-7343E

Web Resources

[www.keysight.com/find/usb-vna](http://www.keysight.com/find/usb-vna)

[www.keysight.com/find/na](http://www.keysight.com/find/na)

[www.keysight.com/find/vnasoftware](http://www.keysight.com/find/vnasoftware)

[www.keysight.com/find/ecal](http://www.keysight.com/find/ecal)