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(^1)</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>

1. Keysight Streamline Series USB VNAs include: USB3.0 cable assembly (for connection with a host PC), power supply (external AC-DC adapter), and power cord.
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>X</td>
<td></td>
<td></td>
<td>Not available for the P937xA or P502xA Series.</td>
</tr>
<tr>
<td>Option 400</td>
<td></td>
<td>X</td>
<td></td>
<td>Not available for the P937xA or P500xA Series.</td>
</tr>
<tr>
<td>Option 402</td>
<td></td>
<td></td>
<td>X</td>
<td>4-port with second source Not available for the P937xA or P500xA Series.</td>
</tr>
<tr>
<td>Option 600</td>
<td></td>
<td></td>
<td></td>
<td>X Not available for the P937xA or P500xA Series.</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 modulator hardware to internal 1st source</td>
<td>N/A</td>
<td>P500xA-021</td>
<td>P502xA-021</td>
<td>This option adds the internal pulse modulator on the analyzer’s source. On the single source models, the pulse modulation works at port 1 and 2 (on 2-port models) and at all four/six ports (on 4-port/6-port models). On the second source models (P502xA-402), opt. 021 pulse modulator works only for the port 1 and 2. S97025A application software is required for pulsed-RF measurements.</td>
</tr>
<tr>
<td>Add pulse modulator hardware to internal 2nd source</td>
<td>N/A</td>
<td>N/A</td>
<td>P502xA-022</td>
<td>This option adds the internal pulse modulators on the analyzer’s source. This option is available only on the 4-port second source models (P502xA-402) and the pulse modulation works for the port 3 and 4. 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>Enhanced time domain analysis with TDR</td>
<td>N/A</td>
<td>S97011A</td>
<td>Includes all capability of S97010A</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>Vector and scalar mixer/converter measurements</td>
<td>N/A</td>
<td>S97083A</td>
<td>Provides SMC + phase measurement class. Provides vector mixer characterization.</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>Multiple instruments measurements</td>
<td>S97551A</td>
<td>S97551A</td>
<td>Provides multiport calibrated measurements using two USB VNAs.(^{2,3,4})</td>
</tr>
<tr>
<td>Multiport calibration assistant</td>
<td>N/A</td>
<td>S97552A</td>
<td>Provides a tool to flexibly define cal sets of multiport measurements. Requires one ECal module.</td>
</tr>
<tr>
<td>Multiport calibrated measurements with switch instruments</td>
<td>N/A</td>
<td>S97553A</td>
<td>Provides multiport calibrated measurements using P9164A/B or P9165A/B USB Solid-State Switch matrix.(^5)</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 cannot be combined in multiport configurations.
4. A 4-port ECal module (i.e. N4431/32/33) is recommended for multiport measurements (n > 4).
5. Only the 4-port ECal module (i.e. N4431/32/33) are supported for calibration with S97553A.
### 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>

### Training 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>Included - instrument care and operations starter training</td>
<td>N/A</td>
<td>PS-S40-01</td>
<td>PS-S40-01</td>
<td>Provides startup training service that reduces complexity associated with initial setup and enables users to get to measurements fast. Recommended topics are product overview, system setup and initial measurements. Can be delivered remotely or on-site.</td>
</tr>
<tr>
<td>Optional - technology and measurement science standard training</td>
<td>N/A</td>
<td>PS-S40-02</td>
<td>PS-S40-02</td>
<td>Provides customized technology and measurement science training. Enable users to get deeper insights into the VNA measurement theory and applications. Recommended topics are VNA theory and applications. Can be delivered on-site or in Keysight office.</td>
</tr>
<tr>
<td>Optional - premium functional and customer specific application training</td>
<td>N/A</td>
<td>PS-S40-03</td>
<td>PS-S40-03</td>
<td>Provides an integrated training experience that fits to the users' needs on applications or workflow. Custom topics based on the user needs. Discuss the training needs with the Keysight sales representative.</td>
</tr>
</tbody>
</table>
## Additional hardware

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>P9164A</td>
<td>Solid-state switch matrix module, 2x16 full crossbar, 300 kHz to 6.5 GHz</td>
<td>S97553A application software is required for multiport calibrated measurements.</td>
</tr>
<tr>
<td>P9164B</td>
<td>Solid-state switch matrix module, 2x16 full crossbar, 300 kHz to 9 GHz</td>
<td></td>
</tr>
<tr>
<td>P9165A</td>
<td>Solid-state switch matrix module, 2x8 full crossbar, 300 kHz to 6.5 GHz</td>
<td></td>
</tr>
<tr>
<td>P9165B</td>
<td>Solid-state switch matrix module, 2x8 full crossbar, 300 kHz to 9 GHz</td>
<td></td>
</tr>
</tbody>
</table>

## 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 (500 mm and 175 mm) for connection with the control port of P500xA or P502xA.</td>
</tr>
<tr>
<td>SMB (f) to MCX (m) cable assembly</td>
<td>N/A</td>
<td>Y1730A-800 or 801</td>
<td>Y1730A-800 or 801</td>
<td>For connection with 10 MHz external reference ports (Ref In/Ref Out) of the P50xxA Series. Order option 800 with 300 mm or option 801 with 1000 mm.</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.
3. The Y1731A does not require power supply. PXI chassis is not needed for the operation.
## Test cables

<table>
<thead>
<tr>
<th>Option Number</th>
<th>Description</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1740A-100</td>
<td>Cable Assembly, 3.5 mm (m) to 3.5 mm (m), 26.5 GHz, 36 inch</td>
<td></td>
</tr>
<tr>
<td>Y1740A-200</td>
<td>Cable Assembly, 2.92 mm (m) to 2.92 mm (m), 40 GHz, 36 inch</td>
<td></td>
</tr>
<tr>
<td>Y1740A-300</td>
<td>Cable Assembly, 2.4 mm (m) to 2.4 mm (m), 50 GHz, 36 inch</td>
<td></td>
</tr>
<tr>
<td>Y1740A-310</td>
<td>Cable Assembly, 2.4 mm (m) to 2.92 mm (m), 40 GHz, 36 inch</td>
<td></td>
</tr>
<tr>
<td>Y1740A-400</td>
<td>Cable Assembly, 1.85 mm (m) to 1.85 mm (m), 67 GHz, 1 m</td>
<td></td>
</tr>
</tbody>
</table>
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.

**Enhanced time domain analysis with TDR (S97011A)**

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

This application enables the analyzer to perform enhanced time domain analysis for high-speed data applications. All functionality of the S97010A are included (TDR/TDT mode). In addition, the S97011A enables more detailed measurements and evaluations, such as eye-diagram/mask modes, without adding PLTS software. Jitters and/or emphasis/equalization capabilities enables simulation of real-world signals and environment. The S97011A covers up to 53 GHz bandwidth with 8.42 psec rise time. Full calibration is available and automatic deskew ensures easy removal of fixture and probe effects. To get the best accuracy, mechanical calibration kits or ECal with DC option (i.e. N443xD or N469xD with Option 0DC) are recommended.
Basic Pulsed-RF measurements (S97025A)

<table>
<thead>
<tr>
<th>P037xA 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 μs, 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>P037xA 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 Keysight N469x Series ECal module as 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. S97029A controls N469x Series ECal modules configured as impedance tuners for use with the P50xxA Series USB VNA.

A scalar-calibrated method is also available that offers less accuracy but is faster and does not require an impedance tuner. This method requires an external switch to isolate the M980xA’s source signal during noise figure measurements. A 50-ohm load must be connected to the DUT’s input using the switch.

The instrument’s standard receivers are used for noise figure measurements with the S97029A. An external preamplifier and filter(s) and switches are required for devices with < 30 dB of excess noise (gain plus noise figure in dB).

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/sensor is required. A 346-series noise source (Keysight 346C or 346C-K01 recommended) can be used for noise calibration of the instrument’s receiver, when a preamplifier is located before the receiver. All calibration accessories and external hardware must be ordered separately.

Noise figure measurements with the P50xxA are verified between 50 MHz and 45 GHz. Noise figure measurements of frequency converting devices are not supported with the S97029A.

1. 8509x, N443x or N755xA Series ECal modules are not supported.
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.

Vector and scalar mixer/converter measurements (S97083A)

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

This application includes the scalar mixer/converter plus phase (SMC+Phase) measurement class that provides fully calibrated conversion gain/loss, relative phase, and absolute group delay measurements of mixers and converters without the need for reference or calibration mixers. Eliminating the calibration mixer requires a U9391C/F/G comb generator\(^1\) and an external DC power supply capable of sourcing +15 V and 300 mA for U9391C/F or 800 mA for U9391G. A macro-based series-reference-mixer version of VMC is also included for measuring the phase difference between multiple paths or devices, or for measuring phase shifts within the frequency-converting device. The macro also supports characterization of the calibration mixer that is supplied by the user.

SMC+Phase with the S97083A 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 the analyzer’s built-in source(s) as well as 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. S97083A is a superset of S97082A, so they should not be installed together. S97083A is compatible with S97084A, which enables measurements of converters with internal LOs.

\(^1\) When a comb generator is used as a phase reference for calibration and the start frequency of the measurement is less than 630 MHz, a user-supplied calibration mixer is required.

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 and S97083A measurement applications.
Gain compression measurements (S97086A)

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.

Gain compression measurements of frequency converting devices are not supported with the S97086A.

Spectrum analysis (S97090A)

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. Accurate and fast noise power ratio (NPR) measurement capability is also included in this software application. It provides the ability of setting up and controlling of external signal generator/arbitrary waveform generators and performing the calibration of the flatness of a wideband signal and distortion signals in notches, and achieving very fast NPR measurements. 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.

Multiple instrument measurements (S97551A)

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) cannot be combined to configure a multiport VNA due to hardware difference.

Figure 1: 4-port configuration using two P937xA VNAs (left), 6-port configuration using 2-port P500xA and 4-port P502xA (right).

Multiport calibration assistant (S97552A)

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

This S97552A provides a tool to flexibly create and manage cal sets for multiport measurements. For example, two cal sets with independent test ports can be combined as one cal set with a greater number of test ports. The software also offers a way to re-calibrate using a certain set of test ports to refresh the cal set.

At least one ECal module is required for the operation of S97552A.

Multiport calibrated measurements with switch instruments (S97553A)

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

This application provides a macro which enables full multiport error correction and measurement capabilities using external switch instruments such as the P9164A/B or P9165A/B USB Solid-state Switch Matrix. The software delivers an easy-to-use measurement wizard that simplifies measurement procedures and reduces the setup time of complicated multiport measurements. Measured multiport S-parameters are displayed in the VNA viewer.

Multiport configurations using up to two P50xxA USB VNAs and up to two switch matrices are supported.

Only the 4-port ECal modules (i.e. N4431/32/33D) are supported for multiport calibration with the S97553A.
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: $\varepsilon'$, $\varepsilon''$, tand, $\mu'$, $\mu''$, tand$\mu$, 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 1.85 mm connectors

Mechanical calibration kit
85058B standard: DC to 67 GHz. Includes:
- 85058-60101 1.85 mm (m) short 5.4 mm
- 85058-60102 1.85 mm (m) short 6.3 mm
- 85058-60103 1.85 mm (m) short 7.12 mm
- 85058-60104 1.85 mm (m) short 7.6 mm
- 85058-60105 1.85 mm (f) short 5.4 mm
- 85058-60106 1.85 mm (f) short 6.3 mm
- 85058-60107 1.85 mm (f) short 7.12 mm
- 85058-60108 1.85 mm (f) short 7.6 mm
- 85058-60109 1.85 mm male open
- 85058-60110 1.85 mm female open
- 85058-60111 1.85 mm male load
- 85058-60112 1.85 mm female load
- 85058-60113 1.85 mm (m) to 1.85 mm (m) adapter
- 85058-60114 1.85 mm (f) to 1.85 mm (f) adapter
- 85058-60115 1.85 mm (m) to 1.85 mm (f) adapter

85058E economy: DC to 67 GHz. Includes:
- 85058-60101 1.85 mm (m) short 5.4 mm
- 85058-60105 1.85 mm (f) short 5.4 mm
- 85058-60109 1.85 mm male open
- 85058-60110 1.85 mm female open
- 85058-60111 1.85 mm male load
- 85058-60112 1.85 mm female load
- 85058-60113 1.85 mm (m) to 1.85 mm (m) adapter
- 85058-60114 1.85 mm (f) to 1.85 mm (f) adapter
- 85058-60115 1.85 mm (m) to 1.85 mm (f) adapter

Electronic calibration kits
N4694D Microwave ECal: DC or 10 MHz to 67 GHz, 2-ports. Includes:
- Option F0F: Both connectors are 1.85 mm female on module
- Option M0F: 1 female and 1 male 1.85 mm connector on module
- Option M0M: Both connectors are 1.85 mm male on module
- Option 0DC: DC to 67 GHz
- Option 100: 10 MHz to 67 GHz
- Option 00A adds:
  - 85058-60113 1.85 mm (m) to 1.85 mm (m) adapter
  - 85058-60114 1.85 mm (f) to 1.85 mm (f) adapter
For devices with 2.4 mm connectors

Mechanical calibration kit
85056A standard: DC to 50 GHz. Includes:
- 00901-60003 2.4 mm (m) fixed broadband load
- 00902-60004 2.4 mm (f) fixed broadband load
- 00915-60003 2.4 mm (m) sliding load
- 00915-60004 2.4 mm (f) sliding load
- 85056-60005 2.4 mm (m) to 2.4 mm (m) adapter
- 85056-60006 2.4 mm (f) to 2.4 mm (f) adapter
- 85056-60007 2.4 mm (m) to 2.4 mm (f) adapter
- 85056-60020 2.4 mm (m) short
- 85056-60021 2.4 mm (f) short
- 85056-60022 2.4 mm (m) open
- 85056-60023 2.4 mm (f) open

85056D economy: DC to 50 GHz. Includes:
- 00901-60003 2.4 mm (m) fixed broadband load
- 00902-60004 2.4 mm (f) fixed broadband load
- 85056-60005 2.4 mm (m) to 2.4 mm (m) adapter
- 85056-60006 2.4 mm (f) to 2.4 mm (f) adapter
- 85056-60007 2.4 mm (m) to 2.4 mm (f) adapter
- 85056-60020 2.4 mm (m) short
- 85056-60021 2.4 mm (f) short
- 85056-60022 2.4 mm (m) open
- 85056-60023 2.4 mm (f) open

Electronic calibration kits
N4693D Microwave ECal: DC or 10 MHz to 50 GHz, 2-ports. Includes:
- Option F0F: Both connectors are 2.4 mm female on module
- Option M0F: 1 female and 1 male 2.4 mm connector on module
- Option M0M: Both connectors are 2.4 mm male on module
- Option 0DC: DC to 50 GHz
- Option 100: 10 MHz to 50 GHz
- Option 00A adds:
  - 85056-60005 2.4 mm (m) to 2.4 mm (m) adapter
  - 85058-60006 2.4 mm (f) to 2.4 mm (f) adapter

Electronic calibration kits
N4692D Microwave ECal: DC or 10 MHz to 40 GHz, 2-ports. Includes:
- Option F0F: Both connectors are 2.92 mm female on module
- Option M0F: 1 female and 1 male 2.92 mm connector on module
- Option M0M: Both connectors are 2.92 mm male on module
- Option 0DC: DC to 40 GHz
Option 100: 10 MHz to 40 GHz
Option 00A adds: N4692-60021 2.92 mm (m) to 2.92 mm (m) adapter
N4692-60022 2.92 mm (f) to 2.92 mm (f) adapter

Adapters
11904A 2.4 mm (m) to 2.92 mm (m)
11904B 2.4 mm (f) to 2.92 mm (f)
11904C 2.4 mm (m) to 2.92 mm (f)
11904D 2.4 mm (f) to 2.92 mm (m)
11904S 2.4 mm to 2.92 mm: Adapter set, contains 4 matched adapters

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>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 mm</td>
<td>Female 101</td>
<td>Male 102</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Type-N 50 Ω</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7-16</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 (m)</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>
</tr>
<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
N4431D Microwave ECal: DC to 13.5 GHz, 4 ports.

Frequency option (mandatory)
- Option 0DC: DC to 13.5 GHz

Connector options
- Option 010: 3.5 mm female connector on four ports on module
- Option 020: Type-N female connector on four ports on module

<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 (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>

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>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

N4433D ECal: DC/300 kHz to 26.5 GHz, 4-ports.

Frequency options
- Option 0DC: DC to 26.5 GHz
- Option 003: 300 kHz to 26.5 GHz

Connector Options:
- Option 010: 3.5 mm female connector on four ports on module

<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 (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>
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

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

N4431D ECal: DC to 13.5 GHz, 4-ports.

Frequency option (mandatory)

- Option 0DC: DC to 13.5 GHz

Connector options

- Option 010: 3.5 mm female connector on four ports on module
- Option 020: Type-N female connector on four ports on module

<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></td>
<td></td>
<td>010</td>
<td></td>
</tr>
<tr>
<td>Four Type-N 50 Ω (f)</td>
<td></td>
<td></td>
<td>020</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>
<tr>
<td>7-16 (f)</td>
<td>105</td>
<td>205</td>
<td>305</td>
<td>405</td>
</tr>
<tr>
<td>7-16 (m)</td>
<td>106</td>
<td>206</td>
<td>306</td>
<td>406</td>
</tr>
<tr>
<td>4.3-10 (f)</td>
<td>107</td>
<td>207</td>
<td>307</td>
<td>407</td>
</tr>
<tr>
<td>4.3-10 (m)</td>
<td>108</td>
<td>208</td>
<td>308</td>
<td>408</td>
</tr>
</tbody>
</table>

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>
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<tbody>
<tr>
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<td></td>
<td></td>
<td>020</td>
<td></td>
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<td>102</td>
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<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
N4432D ECal: DC or 300 kHz to 18 GHz, 4-ports.

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

Connector options
- Option 020: Type-N female connector on four ports on module

<table>
<thead>
<tr>
<th>Connector Type</th>
<th>Port A Option</th>
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<tr>
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</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>

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
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

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.
Accessories

CalPod calibration refresh modules (8553xB/4xA)

<table>
<thead>
<tr>
<th>P937xA Series</th>
<th>P500xA &amp; P502xA Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>CalPod calibration refresh modules allow in-situ calibration refreshes to be performed at the push of a button without removing the DUT or re-connecting calibration standards. CalPods are designed for any measurement situation where it is desirable to ensure that a valid calibration is present before recording measurement data. For example, they are useful for removing environmental effects such as cable movement and thermal-based changes of cables, connectors, and adapters, as well as connector and switch-matrix repeatability errors. The modules are especially useful in temperature, or thermal-vacuum chamber testing. CalPod modules are equipped with 2.92 mm connectors.</td>
<td></td>
</tr>
</tbody>
</table>

- 85530B 20 GHz ambient-temperature CalPod
- 85531B 20 GHz temperature-compensated CalPod
- 85532B 20 GHz thermal-vacuum compatible CalPod
- 85540A 40 GHz ambient-temperature CalPod
- 85541A 40 GHz temperature-compensated CalPod
- 85542A 40 GHz thermal-vacuum compatible CalPod
- 85523B CalPod controller (provides control for up to 4 CalPods)
- 85556A CalPod drive-cable splitter (allows control for up to 12 CalPods)
- 85554A CalPod drive cable extension (10-meter cascadable extension cable)
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$^1$ or Windows 10 (64-bit)</td>
</tr>
<tr>
<td>Processor speed</td>
<td>Intel i5 6$^{th}$ 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>

1. For Windows 7 OS, SHA-2 code signing support must be installed.

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

www.keysight.com/find/na

www.keysight.com/find/vnasoftware

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