Agilent
PNA Series
Microwave Network Analyzers

Configuration Guide

PNA-L N5230A	**300 kHz to 6, 13.5, or 20 GHz**
PNA-L N5230A	**10 MHz to 20, 40, or 50 GHz**
PNA E8362B	**10 MHz to 20 GHz**
PNA E8363B	**10 MHz to 40 GHz**
PNA E8364B	**10 MHz to 50 GHz**
PNA E8361A	**10 MHz to 67 GHz**
PNA N5250A	**10 MHz to 110 GHz**

System configuration summary

This summary lists the main components required to form a basic measurement system. Options or peripherals may be added to provide enhanced measurement and data storage capability.

Full S-parameter measurements

· **Agilent PNA Series microwave network analyzers**
· **Test port cables, 50 ohms**
· **Calibration kit for applicable connector type**
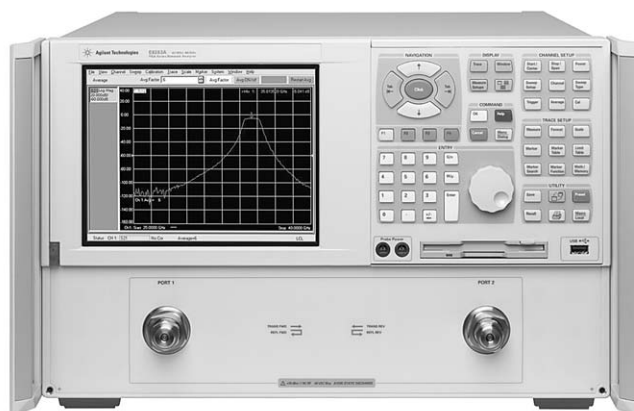
This configuration guide describes standard configurations, options, accessories, upgrade kits and compatible peripherals for the PNA Series microwave network analyzers. This guide should be used with the *Agilent PNA Series Microwave Network Analyzers, Data Sheet* for a complete description of these analyzers.

⁂ Agilent Technologies

PNA-L (N5230A)

Step 1: Select N5230A model number

Step 2: Choose your frequency range and test set
(Mandatory, choose only one)

Description		Ordering number
300 kHz to 6 GHz	2-port standard test set	N52300-020
300 kHz to 6 GHz	2-port configurable test set and extended power range	N52300-025
300 kHz to 13.5 GHz	2-port standard test set	N52300-120
300 kHz to 13.5 GHz	2-port configurable test set and extended power range	N52300-125
300 kHz to 13.5 GHz	4-port standard test set	N52300-140
300 kHz to 13.5 GHz	4-port configurable test set and extended power range	N52300-145
300 kHz to 13.5 GHz	4-port configurable test set, extended power range and internal second source	N52300-146
10 MHz to 20 GHz	2-port standard test set	N52300-220
10 MHz to 20 GHz	2-port configurable test set and extended power range	N52300-225
300 kHz to 20 GHz	4-port standard test set	N52300-240
300 kHz to 20 GHz	4-port configurable test set and extended power range	N52300-245
300 kHz to 20 GHz	4-port configurable test set, extended power range and internal second source	N52300-246
10 MHz to 40 GHz	2-port standard test set	N52300-420
10 MHz to 40 GHz	2-port configurable test set and extended power range	N52300-425
10 MHz to 50 GHz	2-port standard test set	N52300-520
10 MHz to 50 GHz	2-port configurable test set and extended power range	N52300-525

Step 3: Choose additional software options (Optional)

Description	Ordering number
Time domain for 6 GHz model	N52310-010
Time domain for 13.5, 20, 40 or 50 GHz model	N52300-010
Frequency-offset measurements	N52300-080
Scalar-calibrated converter measurements (Option 080 required)	N52300-082
4-port measurement application	N52300-550
N-port capabilities for 6, 13.5 or 20 GHz model	N52310-551
N-port capabilities for 40 or 50 GHz model	N52300-551

Step 4: Choose an electronic or mechanical calibration kit (Optional)

Description	Ordering number
300 kHz to 9 GHz, 2-port, 3.5 mm	85093C
300 kHz to 13.5 GHz, 4-port, Type-N or 3.5 mm	N4431B
300 kHz to 18 GHz, 4-port, Type-N	N4432A
300 kHz to 20 GHz, 4-port, 3.5 mm	N4433A
300 kHz to 26.5 GHz, 2-port, 3.5 mm	N4691B
10 MHz to 50 GHz, 2-port, 2.4 mm	N4693A

Note: For additional calibration kits refer to page 16

Step 5: Accessories (Optional)

Description	Ordering number
Rack mount kit without handles	N5230A-1CM
Rack mount kit with handles	N5230A-1CP
USB CD R/W drive	N4688A
USB Hub	N4689A

Note: For additional accessories refer to page 16

Step 6: Calibration documentation (Optional)

Description	Ordering number
ISO 17025 compliant calibration	N5230A-1A7
Commercial calibration certificate with test data	N5230A-UK6
ANSI Z540 compliant calibration	N5230A-A6J

Step 7: Choose your warranty and service (Optional)
Description
1 year return-to Agilent warranty and service
3 year return-to Agilent warranty and service

Documentation
The PNA Series instruments are equipped with an Online Help system available within the instrument in the following languages: English, Japanese, Chinese, German, Spanish, and French. The PNA Service Guide and Online Help system are available on the Web: **www.na.tm.agilent.com/pna**

Connector type
Option 020, 025, 120, 125, 140, 145, 146, 220, 225, 240, 245, 246:
3.5 mm ruggedized male, 50 ohm
Option 420, 425, 520, 525:
2.4 mm ruggedized male, 50 ohm

Additional product information
For additional PNA-L (N5230A) product information, refer to the PNA-L brochure available on our Web site: **www.agilent.com/find/pnal**
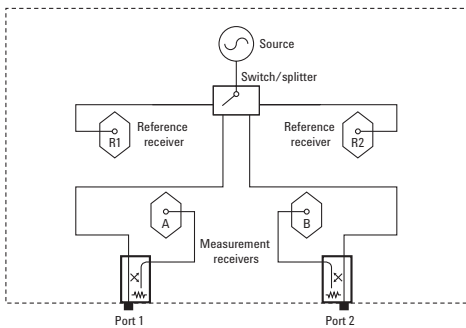
PNA-L (N5230A)

This guide is intended to assist you in the ordering process. Additional information and products (such as calibration kits and cables) are described throughout this document.
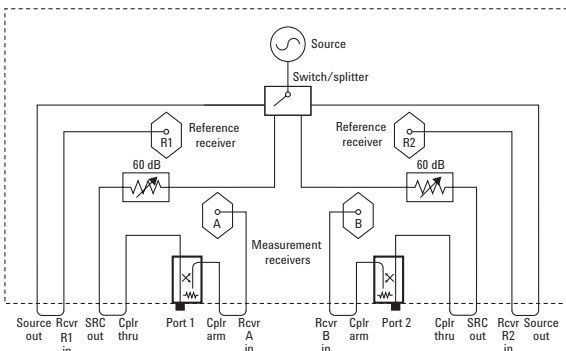
Test set options

- **Standard test set and power range (Option xx0)**
  The 13.5 and 20 GHz versions are available in 2- or 4-ports.

- **Configurable test set and extended power range (Option xx5)**
  Adds front panel access loops and one or two 60 dB step attenuators as shown in the figures below. This provides the capability to improve instrument sensitivity for measuring low-level signals, to reverse the directional couplers to achieve even more dynamic range or to add components and other peripheral instruments for a variety of measurement applications. The 13.5 and 20 GHz versions are available in 2- or 4-ports.

- **Configurable test set, extended power range and internal second source (Option x46)**
  Available with 4-port models only, this option adds an internal second source, nine front panel access loops and two 60 dB step attenuators as shown in the figure below. This provides an additional signal (fixed or swept) for two-tone third-order-intercept (TOI) and intermodulation testing of amplifiers; or it can be used as a fast swept-LO signal for fixed-IF testing of mixers and converters. In either case, sweep speed is more than twenty times faster than using an external source.
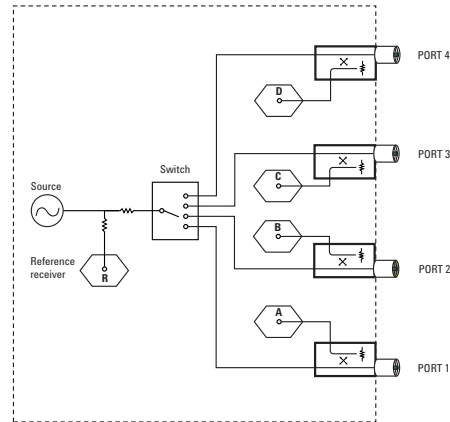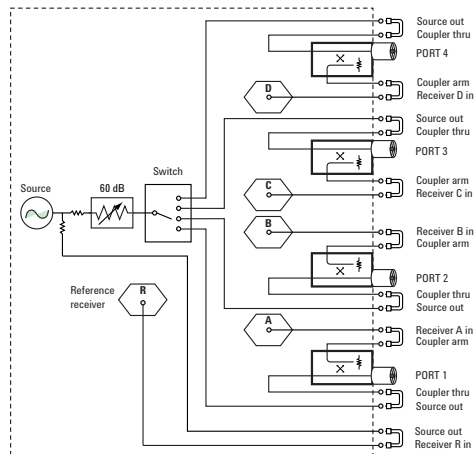
2-port standard test set

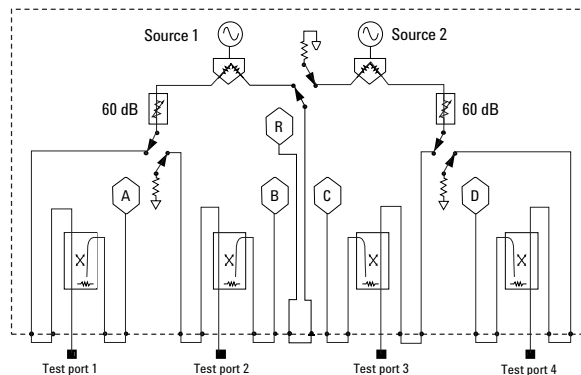### 2-port configurable test set and extended power range

4-port standard test set

4-port configurable test set and extended power range

4-port configurable test set, extended power range and internal second source

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PNA-L (N5230A)

Additional options

❑ **Time domain (Option 010)**

This option enables the PNA Series to view reflection and transmission responses in both time or distance domain. Use time domain to tune filters, gate out the response of fixtures and cables, characterize the impedance of transmission line, and more.

❑ **Frequency offset (Option 080)**

This option enables the PNA Series to set the source frequency independently from where the receivers are tuned. This ability is important for two general classes of devices: mixers (and converters) and amplifiers.

❑ **Scalar-calibrated converter measurements (Option 082)**

With a simple setup and calibration, this application provides the highest accuracy for conversion-loss (or gain) measurements by combining one-port and power-meter calibrations to remove mismatch errors. Includes GPIB to USB interface (82357A). Option 080 required.

❑ **4-port measurement application (Option 550)**

Enables full 4-port error correction and differential measurements on a 2-port network analyzer with configurable test set (Option x25). External test set required. User installable.

❑ **N-port capabilities (Option 551)**

Adds full N-port error correction and measurement capabilities to any PNA-L network analyzer with configurable test set (Option xx5 or x46). External test set required. User installable.

Certification options

❑ **Commercial calibration certification with test data (Option UK6)**

Complete set of measurements which tests unit to manufacturer's published specifications. Includes calibration label, calibration certificate, and data report. Conforms to ISO 9001.

❑ **ISO 17025 compliant calibration (Option 1A7)**

Complete set of measurements which tests unit to manufacturer's published specifications. Includes calibration label, ISO 17025 calibration certificate, and data report, measurement uncertainties and guardbands on all customer specifications. Conforms to ISO 17025 and ISO 9001.

❑ **ANSI Z540 compliant calibration (Option A6J)**

Complete set of measurements which tests unit to manufacturer's published specifications. Includes pre- and post-adjustment data with measurement uncertainty information compliant to the ANSI/NCSL Z540 standard.

PNA Network Analyzers[1] E8361A/62B/63B/64B, N5250A

PNA **(highest performance series)**
E8362B   10 MHz to 20 GHz
E8363B   10 MHz to 40 GHz
E8364B   10 MHz to 50 GHz
E8361A   10 MHz to 67 GHz
N5250A[2]   10 MHz to 110 GHz

Options

To add options to a product, order the corresponding item number.

	Description	For E8362B	For E8363B	For E8364B	For E8361A	For N5250A system[3]	Additional information
Test set							
Option 014	• Configurable test set	E8362B-014	E8363B-014	E8364B-014	E8361A-014	Included	
Power configuration							
Option UNL	• Extended power range and bias-tees	E8362B-UNL	E8364B-UNL	E8364B-UNL	E8361A-UNL	Included	Only E8361A requires 014
Option 016	• Add receiver attenuators	E8362A-016	E8364A-016	E8364A-016	E8361A-016	E8361A-016	Requires UNL (only E8361A also requires 014)
Option H85	• High-power configuration	E8362B-H85	E8363B-H85	E8364B-H85	Contact Agilent	Contact Agilent	Includes 014, 016, UNL*[4], 080, 081
Non-linear measurements							
Option 080	• Frequency offset	E8362A-080	E8364A-080	E8364A-080	E8361A-080	Included	Requires 014 (E8361A only, 081 required if UNL is also purchased)
Option 081	• Reference receiver switch	E8362A-081	E8364A-081	E8364A-081	E8361A-081	Included	Requires 014, 080 (only E8361A also requires UNL)
Option 082	• Scalar-calibrated converter measurements	E8362B-082	E8363B-082	E8364B-082	E8361A-082	E8361A-082[5]	Requires 014, 080 includes GPIB to USB interface (82357A)
Option 083	• Frequency converter measurement application	E8362A-083	E8364A-083	E8364A-083	E8361A-083	E8361A-083[5]	Requires 014, 080, 081(only E8361A also requires UNL) includes GPIB to USB interface (82357A)
Pulse, antenna, mm-wave							
Option H08	• Pulsed-RF measurement capability	E8362B-H08	E8363B-H08	E8364B-H08	E8361A-H08	E8361A-H08[5]	
Option H11	• IF access (for antenna, pulsed-RF and mm-wave measurements)	E8362B-H11	E8363B-H11	E8364B-H11	E8361A-H11	Included	Requires 014, UNL, 080, and 081
Measurement features							
Option 010	• Time-domain capability	E8362A-010	E8363A-010	E8364A-010	E8361A-010	E8361A-010	Options 550 and 551
Option 550	• 4-port measurement application	E8362B-550	E8363B-550	E8364B-550	E8361A-550		require 014, and are
Option 551	• N-port capabilities	E8362B-551	E8363B-551	E8364B-551	E8361A-551		not compatible with N5250A systems
Accessories							
Option 1CM	• Rack mount kit for use without handles	E8362A-1CM	E8363A-1CM	E8364A-1CM	E8361A-1CM	E8361A-1CM	
Option 1CP	• Rack mount kit for use with handles	E8362A-1CP	E8363A-1CP	E8364A-1CP	E8361A-1CP	E8361A-1CP	
N4688A	• USB CD R/W drive	N4688A	N4688A	N4688A	N4688A	N4688A	
N4689A	• USB Hub	N4689A	N4689A	N4689A	N4689A	N4689A	
Calibration documentation							
Option 1A7	• ISO 17025 compliant calibration	E8362B-1A7	E8363B-1A7	E8364B-1A7	E8361A-1A7	E8361A-1A7	
Option UK6	• Commercial calibration certificate with test data	E8362A-UK6	E8363A-UK6	E8364A-UK6	E8361A-UK6	E8361A-UK6	
Option A6J	• ANSI Z540 compliant calibration	E8362B-A6J	E8363B-A6J	E8364B-A6J	E8361A-A6J	E8361A-A6J	

Note: Item numbers may not correspond to product model number. For example, to order the time-domain option on the E8362B, the correct item number to order is E8362A-010.

Warranty and service

One, and three year warranty service plans are available at time of instrument purchase. The N5250A 110 GHz system carries a full one-year on-site warranty (where available).

Calibration

Three year calibration plans are available at time of instrument purchase.

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1. All models are not available in all countries.
2. For more detailed information regarding the 110 GHz network analyzer system, refer to the Agilent Web site: **www.agilent.com/find/pna** and download the N5250A Technical Overview, literature number 5988-9620EN.
3. The N5250A 110 GHz system also includes an N5260A millimeter-wave test set controller, 1.0 mm combiner assembly, interconnecting cables, and installation and productivity assistance. See page 14 for more details.
4. UNL* does not include bias-tees. Only includes source attenuators.
5. Up to 67 GHz.

Agilent PNA Network Analyzers

The microwave PNA Series instruments are integrated vector network analyzers equipped with a built-in S-parameter test set, synthesized source, hard and floppy disk drives, and LCD display. The E8362B analyzer has two 50 ohm, 3.5 mm (m) test ports. The E8363B and E8364B analyzers have two 50 ohm, 2.4 mm (m) test ports. The E8361A analyzer has two 50 ohm, 1.85 mm (m) test ports. Included with each instrument is a mouse, keyboard (U.S.), CD-ROM containing a copy of on-line Help and programming documentation, and a 1-year return-to-Agilent service warranty.

- **E8362B** network analyzer, 10 MHz to 20 GHz
- **E8363B** network analyzer, 10 MHz to 40 GHz
- **E8364B** network analyzer, 10 MHz to 50 GHz
- **E8361A** network analyzer, 10 MHz to 67 GHz[1]
- **N5250A** network analyzer system, 10 MHz to 110 GHz

Options

Time-domain capability (Option 010)
For viewing reflection and transmission responses in time or distance domain.

Configurable test set (Option 014)[2]
Provides six front panel access loops. Three access loops are for port one and three for port two. The loops provide access to the signal path between (a) the source output and the reference receiver, (b) the source output and directional coupler thru arm and (c) the coupled arm of the directional coupler and the port receiver. This option provides the capability to improve instrument sensitivity for measuring low-level signals, to reverse the directional coupler to achieve even more dynamic range or to add components and other peripheral instruments for a variety of measurement applications.
(see PNA Series Microwave Data Sheet literature number 5988-7988EN for a basic block diagram)

4-port measurement application (Option 550)[2]
Enables full 4-port error correction and differential measurements on a 2-port network analyzer with configurable test set. Option 014 required. External test set required.

N-port capabilities (Option 551)[2]
Adds full N-port error correction and measurement capabilities to any PNA network analyzer with configurable test set. Option 014 required. External test set required.

Extended power range and bias-tees (Option UNL)[2]
Adds two 60 dB step attenuators and two bias-tees to the E8362/3/4B. Adds two 50 dB step attenuators and two bias-tees to the E8361A. A step attenuator and bias-tee set is inserted between the source and test port one and another set between the source and test port two. (see PNA Series Microwave Data Sheet literature number 5988-7988EN for a basic block diagram)

Frequency offset (Option 080)[2] This option enables the PNA Series microwave network analyzers to set the source frequency independently from where the receivers are tuned. This ability is important for two general classes of devices: mixers (and converters) and amplifiers. Option 080 provides a very basic user interface.

Reference receiver switch (Option 081)[2] Option 081 adds a solid-state internal RF transfer switch in the R1 reference-receiver path (see PNA Series Microwave Data Sheet literature number 5988-7988EN for a basic basic block diagram). The switch allows the instrument to easily switch between standard S-parameter (non-frequency-offset) measurements and frequency offset measurements such as relative phase or absolute group delay that require an external reference mixer. The user can set the switch manually or remotely, but it is best used with the frequency-converter application (Option 083), where it is controlled automatically during the vector-mixer calibration procedure and subsequent measurements.

Scalar-calibrated converter measurements (Option 082)[2]
With a simple setup and calibration, this application provides the highest accuracy for conversion-loss (or gain) measurements by combining one-port and power-meter calibrations to remove mismatch errors. Includes GPIB to USB interface (82357A). Option 080 required.

Frequency-converter measurement application (Option 083)[2]
The frequency-converter application adds an intuitive and easy-to-use user interface, advanced calibration choices that provide exceptional amplitude and phase accuracy, and control of external signal sources for use as local oscillators. Mixer calibration techniques include scalar-mixer calibration and vector-mixer calibration (requires Option 081). Finally, the frequency-converter application supports all of Agilent's major signal source families. Option 083 includes a GPIB to USB interface (82357A) for control of external sources and power meters.

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1. The E8361A can be extended to 110 GHz with IF access (Option H11).
2. Up to 67 GHz.

❏ **Add receiver attenuators (Option 016)** An attenuator is added between each test port and its corresponding receiver. Two 35 dB step attenuators are added to the E8362/3/4B. Two 50 dB step attenuators are added to the E8361A (see PNA Series Microwave Data Sheet literature number 5988-7988EN for a basic block diagram).

❏ **Pulsed-RF measurement capability (Option H08)**[2] Provides software to set up and control pulsed-RF measurements with point-in-pulse capability. The software sets the coefficient of the PNA's digital-IF filter to null out unwanted spectral components, enables the IF gates provided with IF access (Option H11), and controls selected Agilent pulse generators. It can be run on the PNA or an external computer. A ".dll" file containing the IF-filter algorithms is included for automated pulsed-RF testing. The pulsed application is configured to work with the Agilent 81110A series pulse generator.

For more detailed information regarding pulsed measurement capabilities with the microwave PNA refer to the Agilent Web site **www.agilent.com/find/pna** and download the *PNA Series MW Network Analyzers Configuration Guide for Pulsed Measurements*, literature number 5988-9833EN.

❏ **IF access (Option H11)** Provides hardware to enable antenna, point-in pulse, and broadband millimeter-wave measurements to 110 GHz. For each of the MW PNA's measurement receivers, IF gates (enabled with pulsed measurement capability, Option H08) and external IF inputs are added. In addition, access to the PNA's internal RF and LO source is provided for remote mixing applications. For basic antenna measurements, only Option H11 is necessary. Pulsed antenna applications also require the pulsed measurement capability (Option H08). Broadband measurements to 110 GHz, also requires an N5260A millimeter-wave test set controller.

Note: Use external IF access for up to 20 dB more sensitivity when making antenna measurements with a remote mixing configuration. Add Option H08 (Pulsed-RF Measurement Capability) to enable advanced pulsed measurements. Or upgrade to a broadband (10 MHz to 110 GHz) VNA system simply by purchasing an N5260A controller test set with test heads (Option 110, 120, or 130).

❏ **High-power test set (Option H85)** This configuration combines options that are often necessary for high power measurements (UNL*[1], 014, 016, 080, 081). The only difference between ordering Option H85 versus a combination of the options listed above is the source attenuator option UNL. Standard UNL includes two source attenuators and two bias-tees. Option H85 includes the two source attenuators, but not the bias-tees, as the bias-tees are the power-limiting factor in the network analyzer test set. The maximum power at the test port is +43 dBm (<20 GHz), and +40 dBm (>20 GHz).

Option 080, frequency-offset mode, is included in option H85 because it manages the phase-locking internally (instead of depending on the R1 receiver). So if you need to use external components in the path of the R1 receiver, it makes the measurements simpler and more robust.

❏ **Rack mount kit without handles (Option 1CM)** Adds a rack mount (5063-9217) and rail kit (E3663AC) for use without handles.

❏ **Rack mount kit with handles (Option 1CP)** Adds a rack mount (5063-9237)[3] and rail kit (E3663AC) for use with standard supplied handles.

Documentation
PNA Online Help system is available within PNA instruments in the following languages: English, German, Spanish, French, Japanese, and Chinese.

The PNA Service Guide and Online Help are available on the Web: **http://na.tm.agilent.com/pna**

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1. UNL* does not include bias-tees. Only includes source attenuators.
2. Up to 67 GHz.
3. The 5063-9237 kit assumes you have the standard handles shipped with the instrument. If you do not have handles, order a 5063-9224 kit.

Certification options

❏ **Commercial calibration certificate with test data (Option UK6)**
Complete set of measurements which tests unit to manufacturer's published specifications. Includes calibration label, calibration certificate, and data report. Conforms to ISO 9001.

❏ **ISO 17025 compliant calibration (Option 1A7)**
Complete set of measurements which tests unit to manufacturer's published specifications. Includes calibration label, ISO 17025 calibration certificate, and data report, measurement uncertainties and guardbands on all customer specifications. Conforms to ISO 17025 and ISO 9001.

❏ **ANSI Z540 compliant calibration (Option A6J)**
Complete set of measurements which tests unit to manufacturer's published specifications. Includes pre- and post-adjustment data with measurement uncertainty information compliant to the ANSI/NCSL Z540 standard.

Warranty and service
1 and 3 year warranty and service plans are available at time of instrument purchase. Standard warranty is 1 year.

Calibration
3 year calibration plans are available at time of instrument purchase. Contact your local Agilent sales office for details.

Product services
Agilent product services provide tailored assistance related to a specific need or application. Product services enable you to quickly learn how Agilent instruments operate, their capabilities, and how to apply that knowledge to achieve your specific measurement goals. PNA series services available include:
- Remote scheduled productivity assistance
- 1 Day of start-up assistance
- Daily productivity assistance
- PNA operator training for 8 students at your business site
- PNA operator web classes for 1 student
- Custom services to be qualified by an Agilent technical consultant

E8361A/62B/63B/64B Configuration Details

## Selecting the correct mixer-test configuration:

Most mixer or converter test applications require Options 014, 080, and 082 for conversion loss/gain, or Options 014, 080, 081 and 083 for conversion loss/gain and phase/delay measurements. If you want to create and automate your own custom frequency-offset measurements (for example, intermodulation distortion), you may only need Options 014 and 080. For converters that require input power below -27 dBm, or for devices that have a large amount of LO feedthrough (like an unfiltered mixer), Option UNL, which adds source attenuators, is highly recommended. Besides allowing lower input power levels, these attenuators improve the isolation between the PNA's internal source and LO leakage signals, helping to prevent source-unleveled errors. For devices that put out signals near or above the receiver's compression levels (which varies between –3 and +5 dBm, depending on the model and frequency), Option 016 is recommended, which adds receiver attenuators. Finally, Option 010, which adds time-domain analysis, is very useful for gating out unwanted, time-delayed responses which often occur when measuring mixers.
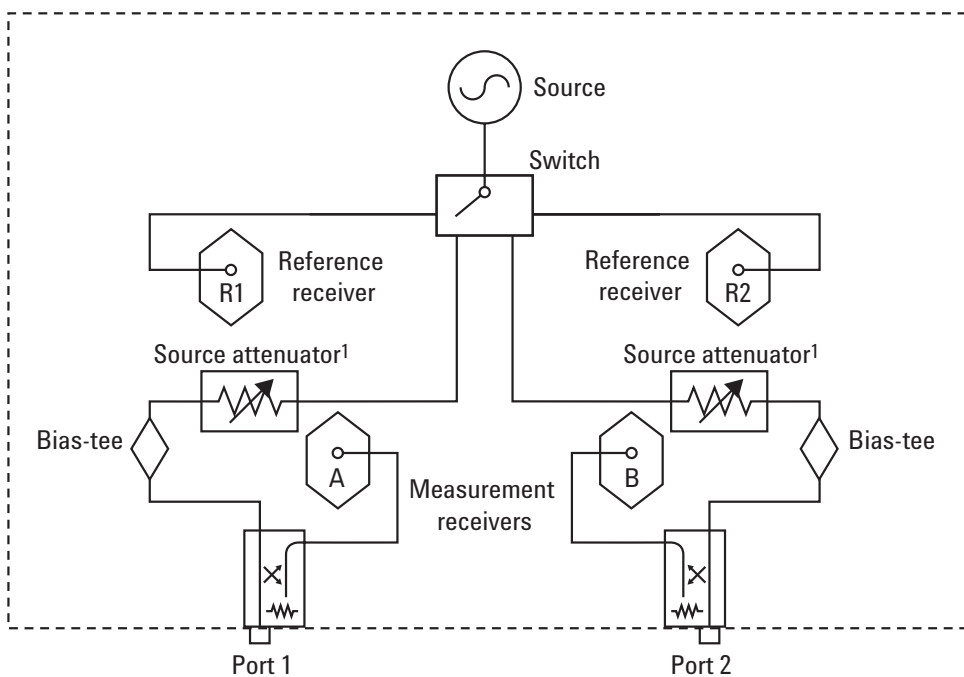
Microwave PNA Network Analyzer

Simplified test set block diagrams

Standard power range
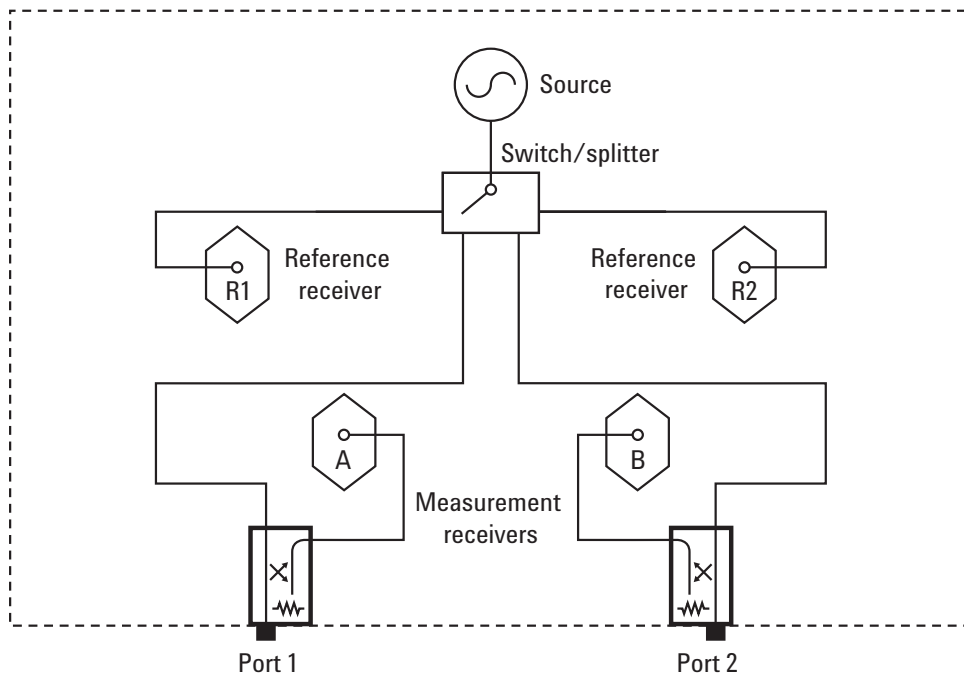
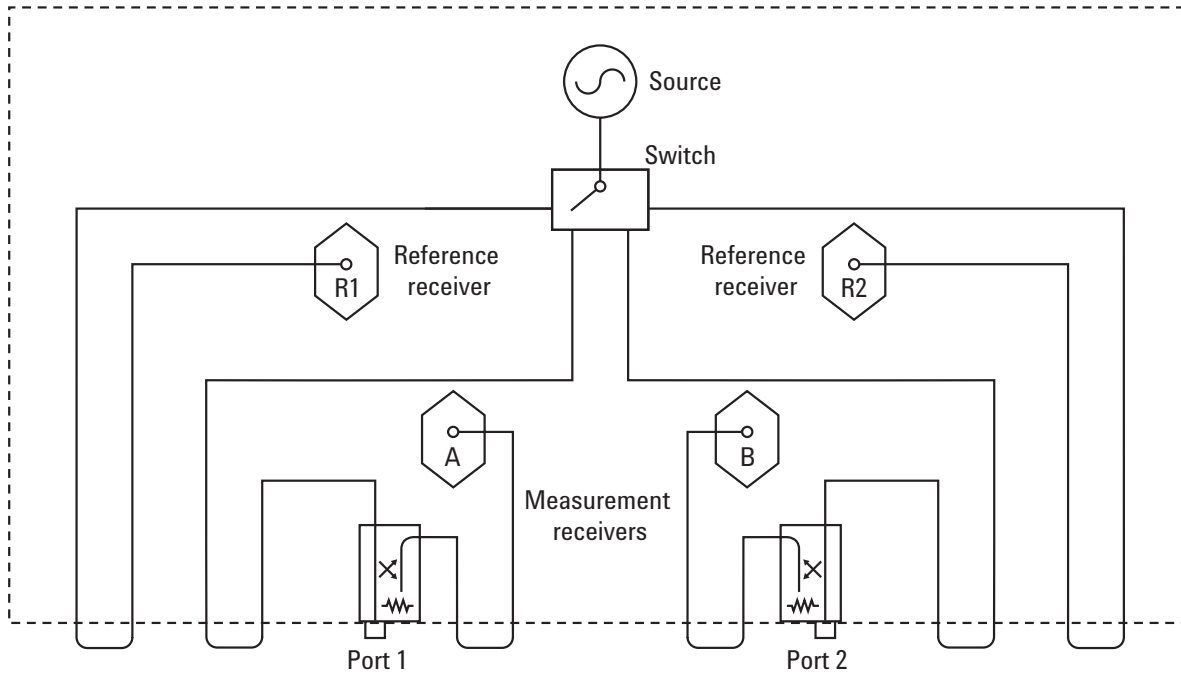**Extended power range and bias-tees (Option UNL)**

1. Source attenuator for E8362/3/4B is 60 dB in 10 dB steps.
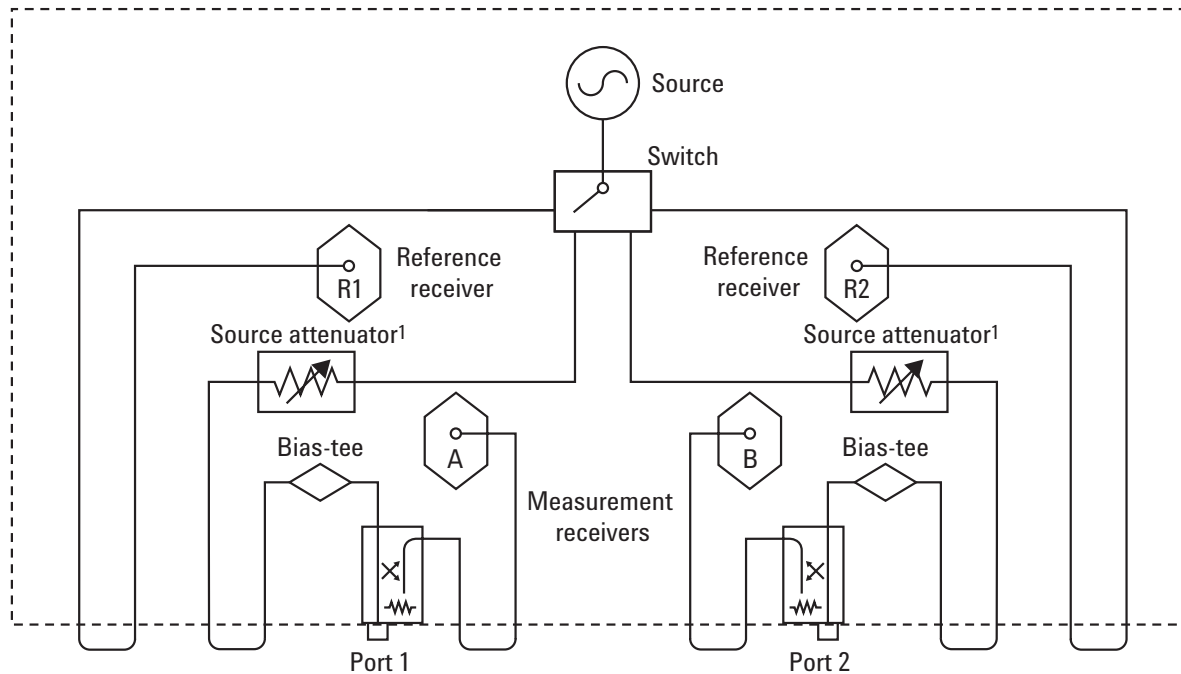   Source attenuator for E8361A is 50 dB in 10 dB steps.

Microwave PNA Network Analyzer

Simplified test set block diagrams – continued

Configurable test set (Option 014)

Configurable test set with extended power range and bias-tees (Option UNL and 014)
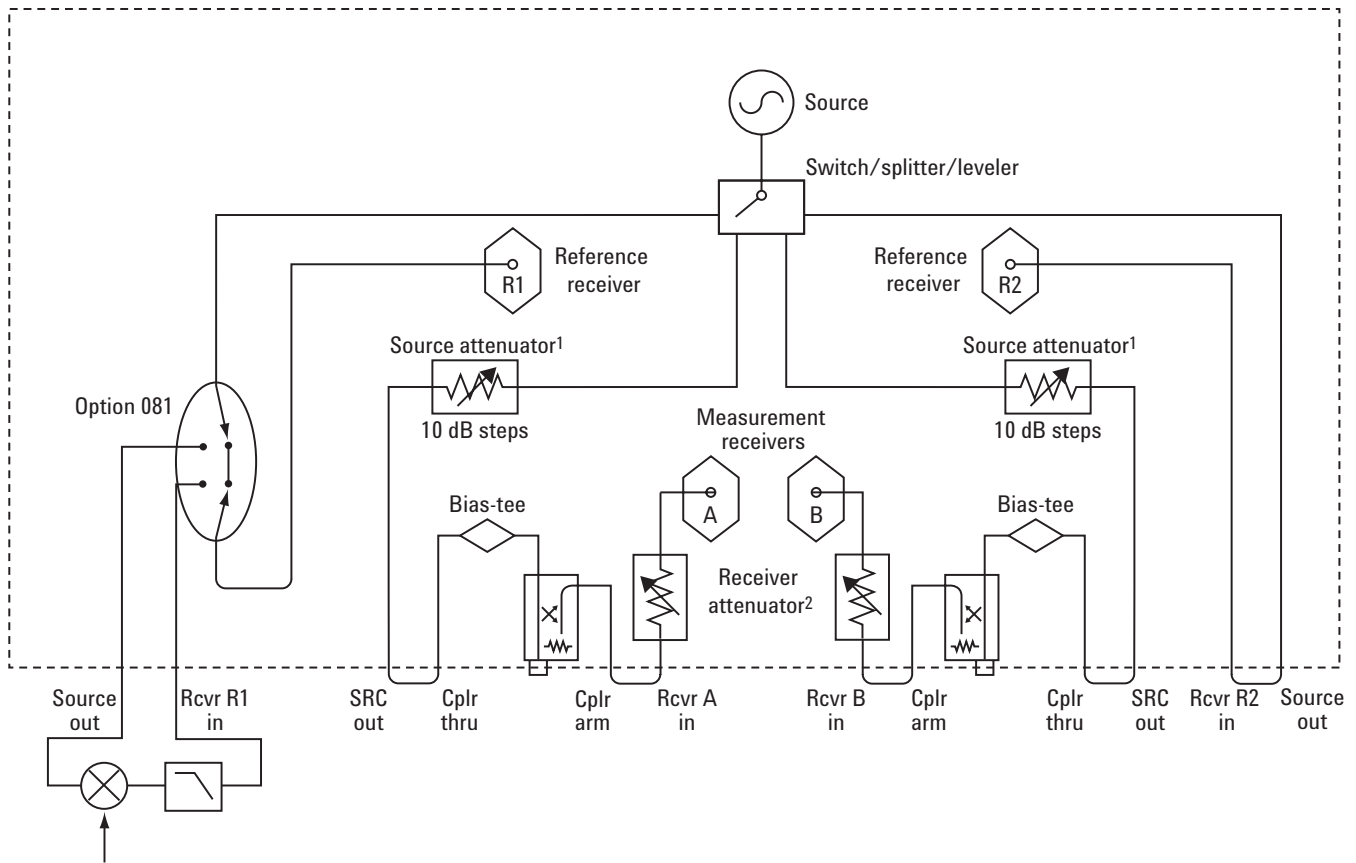

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1. Source attenuator for E8362/3/4B is 60 dB in 10 dB steps.
   Source attenuator for E8361A is 50 dB in 10 dB steps.

Microwave PNA Network Analyzer

Simplified test set block diagrams – continued

Fully optioned, active device or mixer/converter test configuration (Options 014, UNL, 016, 080, 081)

1. Source attenuator for E8362/3/4B is 60 dB in 10 dB steps. Source attenuator for E8361A is 50 dB in 10 dB steps.
2. Receiver attenuator for E8362/3/4B is 35 dB in 5 dB steps. Receiver attenuator for E8361A is 50 dB in 10 dB steps.

Microwave PNA Network Analyzer

Simplified test set block diagrams – continued

High-power configuration (Option H85)

Power levels shown on the diagram are damage levels. At a minimum, keep power levels 6 dB below damage level. For optimal performance, keep the power level incident upon the receivers -20 dBm or less. This will keep the receivers out of compression.
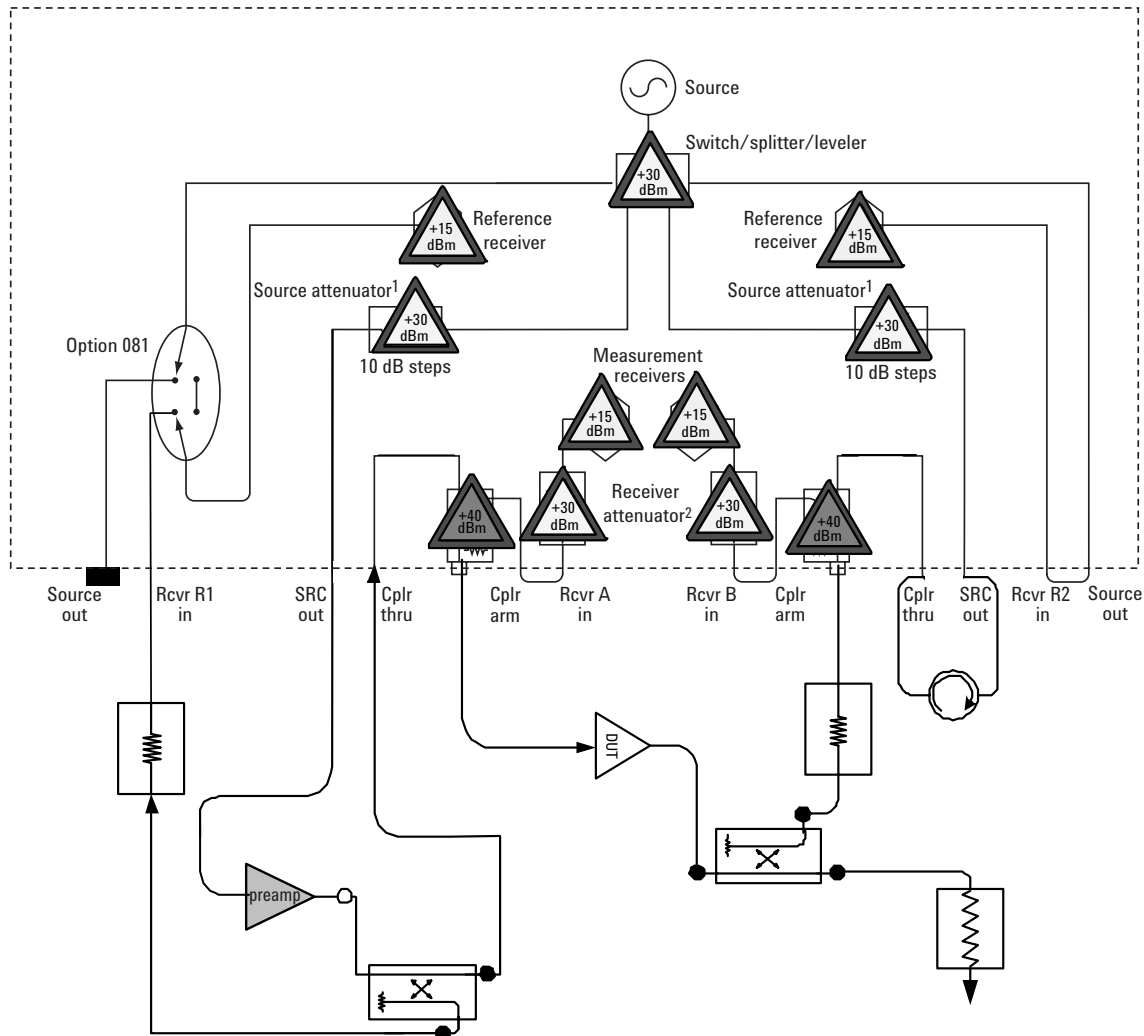
1. Source attenuator for E8362/3/4B is 60 dB in 10 dB steps. Source attenuator for E8361A is 50 dB in 10 dB steps.
2. Receiver attenuator for E8362/3/4B is 35 dB in 5 dB steps. Receiver attenuator for E8361A is 50 dB in 10 dB steps.

Microwave PNA Network Analyzer

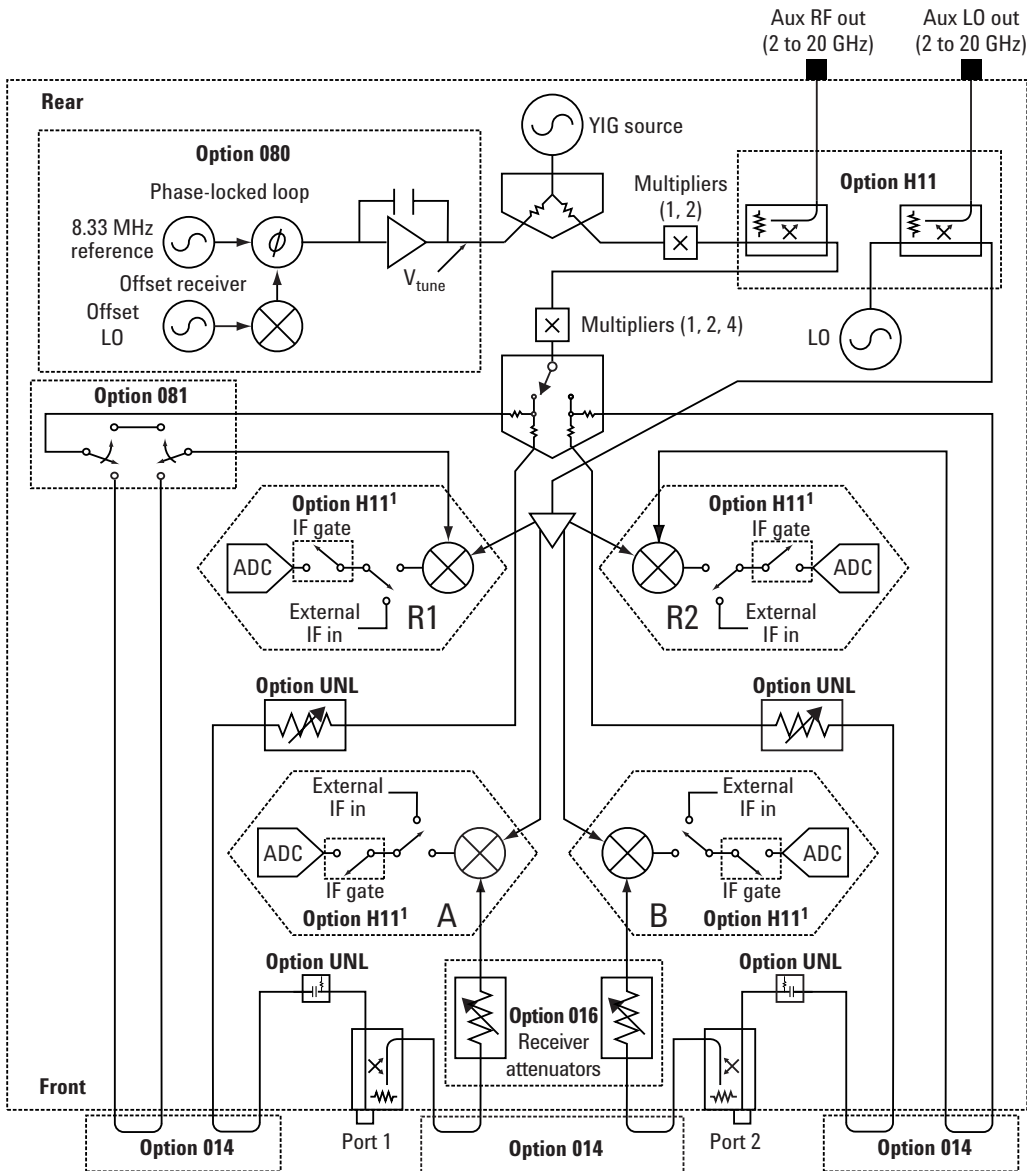## Simplified test set block diagrams – continued

**Fully optioned, pulse-RF, antenna, or mm-wave configuration
(Options 014, UNL, 016, 080, 081, H11)**

1. Option H11: IF-gate controls and external-IF inputs are accessed on rear panel.
   IF gates are enabled with Option H08. External-IF input frequency is 8.33 MHz.

N5250A Configuration Details

❑ **N5250A MW PNA system[1], 10 MHz to 110 GHz, includes:**
  E8361A MW PNA with IF access (Option H11)
  - Configurable test set – Option 014 (required)
  - Extended power range and bias-tees – Option UNL (required)
  - Frequency-offset mode – Option 080 (required)
  - Reference channel switch – Option 081 (required)

  N5260A millimeter-wave test set controller with test heads
  - 67 to 110 GHz test heads
  - 1.0 mm combiner assembly
  - Interconnecting cables
  - Installation and productivity assistance

  Additional options available:
  - Millimeter-wave modules with bias-tees - Option 017
  - Millimeter-wave modules with bias-tees and port 2 attenuator - Option 018
  - Receiver attenuator – Option 016
  - Time-domain capability – Option 010
  - Pulsed-RF measurement capability – Option H08[2]
  - Scalar-calibrated converter measurements – Option 082[2]
  - Frequency converter application – Option 083[2]

Factory integration of the N5250A system integrates the E8361A with Option H11 and the N5260A millimeter-wave controller with test heads. On-site installation is included, and the entire system carries a full one-year, on-site warranty (where available).

Option Descriptions

❑ **Millimeter-wave modules with bias-tees (Option 017)**
Adds 67 GHz bias-tees to the combiner assembly between the input to the combiner and the 67 GHz coupler. The bias-tees have tri-axial connectors for force, sense, and ground. Positioning the bias-tees close to the DUT greatly improves stability for on-wafer and in-fixture devices. The bias-tees added for this option have a voltage rating of 40 volts and a maximum of 0.5 amps.

❑ **Millimeter-wave modules with bias-tees and port 2 attenuator (Option 018)**
Adds 67 GHz bias-tees to the combiner assembly between the input to the combiner and the 67 GHz coupler. The bias-tees have tri-axial connectors for force, sense, and ground. Positioning the bias-tees close to the DUT greatly improves stability for on-wafer and in-fixture devices. The bias-tees added for this option have a voltage rating of 40 volts and a maximum of 0.5 amps. Additionally, Option 018 adds a 25 dB micrometer attenuator to the port 2 test head.

Banded waveguide solution

In order to assemble a banded waveguide solution, the following components are needed:
- Microwave PNA network analyzer (E8361A or E8362/3/4B) with the following options:
  - IF access - Option H11
  - Configurable test set - Option 014
  - Extended power range and bias-tees - Option UNL
  - Frequency-offset mode - Option 080
  - Reference channel switch - Option 081
  - Millimeter-wave test set controller (N5260A) with no options
- A set of waveguide modules:
  - N5260AW15, 50 to 75 GHz
  - N5260AW12, 60 to 90 GHz
  - N5260AW10, 75 to 110 GHz
  - N5260AW08, 90 to 140 GHz
  - N5260AW06, 110 to 170 GHz
  - N5260AW05, 140 to 220 GHz
  - N5260AW03, 220 to 325 GHz

NOTE: To significantly improve system dynamic range above 220 GHz, Agilent strongly recommends adding two external synthesizers such as Agilent's PSG Series signal generators; one for the RF signal, and one for the LO signal.

For more detailed information, see *PNA Millimeter-wave Technical Overview*, literature number 5988-9620EN.

On-wafer applications

For on-wafer applications, Cascade Microtech[3] provides complete probing systems using the N5250A. These include both new probing systems and upgrades to existing Cascade Microtech products. Cascade can also provide on-wafer verification and probing system training. Once the N5250A system is verified in coax, Cascade Microtech will verify the system through its wafer probes.

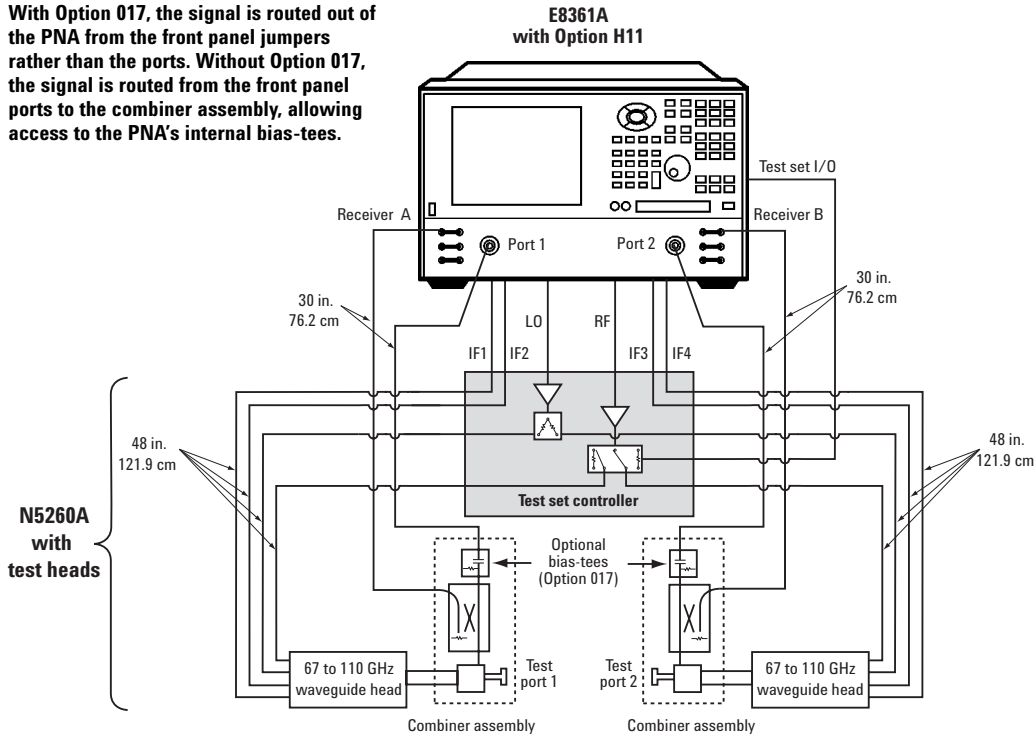
1. For more detailed information regarding the 110 GHz network analyzer system, refer to the Agilent Web site: **www.agilent.com/find/pna** and download the N5250A Technical Overview, literature number 5988-9620EN.
2. Up to 67 GHz.
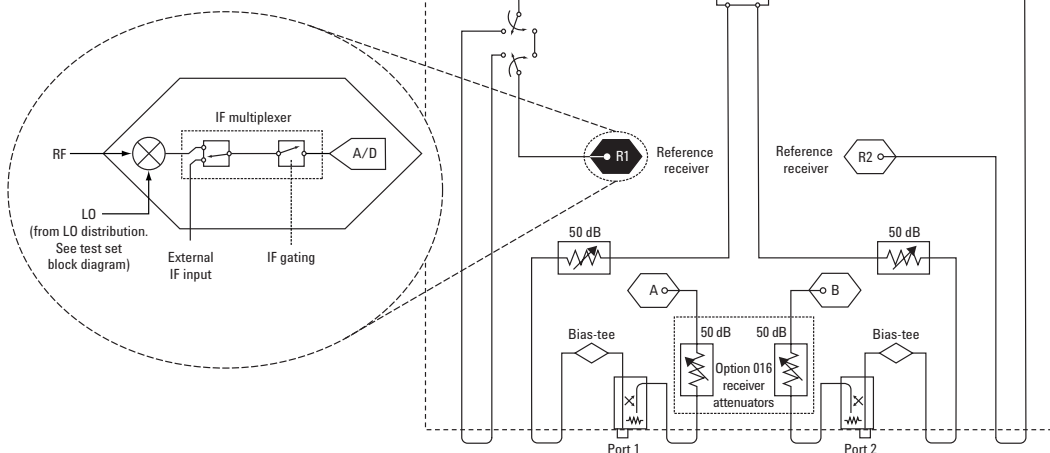3. Cascade Microtech is an Agilent Channel Partner.

N5250A Millimeter-Wave PNA Block Diagram

With Option 017, the signal is routed out of the PNA from the front panel jumpers rather than the ports. Without Option 017, the signal is routed from the front panel ports to the combiner assembly, allowing access to the PNA's internal bias-tees.

**E8361A
with Option H11**

Test set I/O

Receiver A

Port 1

Port 2

Receiver B

30 in.
76.2 cm

30 in.
76.2 cm

LO

RF

IF1   IF2   IF3   IF4

48 in.
121.9 cm

48 in.
121.9 cm

**N5260A
with
test heads**

Test set controller

Optional
bias-tees
(Option 017)

67 to 110 GHz
waveguide head

Test
port 1

Test
port 2

67 to 110 GHz
waveguide head

Combiner assembly

Combiner assembly

SMA
connectors

BNC
connectors

SMA
connectors

BNC
connectors

LO: 2 to 20 GHz

R1   R2   A   B
IF   IF   IF   IF

RF: 2 to 20 GHz

R1   R2   A   B
gate gate gate gate

PNA test set block diagram

To IF multiplexer
(see Figure 5)

To IF multiplexer
(see Figure 5)

LO distribution to
each receiver

Simplified receiver block diagram

IF multiplexer

RF

A/D

LO
(from LO distribution.
See test set
block diagram)

External
IF input

IF gating

R1   Reference
receiver

Reference
receiver   R2

50 dB

50 dB

A

B

Bias-tee

50 dB   50 dB

Option 016
receiver
attenuators

Bias-tee

Port 1

Port 2

Measurement Accessories

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

Accessories are available in these connector types: 50 ohm 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.

Cables and adapter sets

Agilent 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.
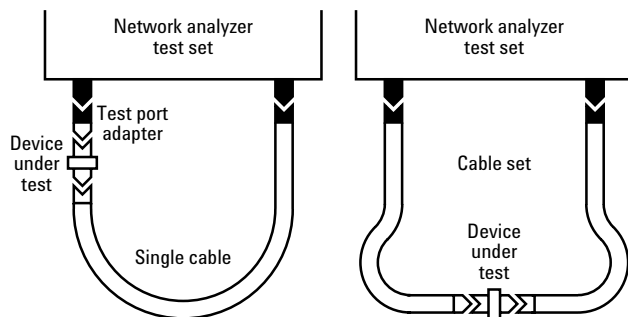
Calibration kits

Coaxial measurements

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

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.

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 ohm airline(s) for TRL calibration
- TRL adapters

Waveguide measurements

For waveguide measurements, Agilent 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 1.0 mm connectors

Mechanical calibration/verification kit
☐ **85059A** DC to 110 GHz precision calibration/verification
   kit. Includes:
   85059-60003   1.00 mm (m) short 2.450 mm
   85059-60007   1.00 mm (f) short 2.450 mm
   85059-60004   1.00 mm (m) short 3.000 mm
   85059-60008   1.00 mm (f) short 3.000 mm
   85059-60002   1.00 mm (m) short 1.825 mm
   85059-60006   1.00 mm (f) short 1.825 mm
   85059-60001   1.00 mm (m) short 1.300 mm
   85059-60005   1.00 mm (f) short 1.300 mm
   85059-60009   1.00 mm male open
   85059-60010   1.00 mm female open
   85059-60019   1.00 mm male load
   85059-60020   1.00 mm female load
   85059-60021   1.00 mm lossy delay line
   11920-60001   1.00 mm (m) to 1.00 mm (m) adapter
   11920-60002   1.00 mm (f) to 1.00 mm (f) adapter
   11920-60003   1.00 mm (m) to 1.00 mm (f) adapter
   11500-60001   1.00 mm (f) to 1.00 mm (f) 8.8 cm cable
   85059-60016   1.00 mm mismatch thru adapter
                 for verification
   85059-60017   1.00 mm matched thru adapter
                 for verification
   8710-2079   6 mm, 4 in-lb torque wrench
   8710-2156   6 mm open end wrench

Cables
☐ **11500I** 1.0 mm (f-f) test port cable (8.8 cm)
☐ **11500J** 1.0 mm (m-f) test port cable (16.0 cm)[1]
☐ **11500K** 1.0 mm (m-f) test port cable (20.0 cm)[1]
☐ **11500L** 1.0 mm (m-f) test port cable (24.0 cm)[1]

Adapter set
☐ **V281C** 1.0 mm(f) to V-band waveguide adapter
☐ **V281D** 1.0 mm (m) to V-band waveguide adapter
☐ **W281C** 1.0 mm (f) to W-band waveguide adapter
☐ **W281D** 1.0 mm (m) to W-band waveguide adapter
☐ **11920A** 1.0 mm (m) to 1.0 mm (m) adapter
☐ **11920B** 1.0 mm (f) to 1.0 mm (f) adapter
☐ **11920C** 1.0 mm (m) to 1.0 mm (f) adapter
☐ **11921A** 1.0 mm (m) to 1.85 mm (m) adapter
☐ **11921B** 1.0 mm (f) to 1.85 mm (f) adapter
☐ **11921C** 1.0 mm (m) to 1.85 mm (f) adapter
☐ **11921D** 1.0 mm (f) to 1.85 mm (m) adapter
☐ **11922A** 1.0 mm (m) to 2.4 mm (m) adapter
☐ **11922B** 1.0 mm (f) to 2.4 mm (f) adapter
☐ **11922C** 1.0 mm (m) to 2.4 mm (f) adapter
☐ **11922D** 1.0 mm (f) to 2.4 mm (m) adapter
☐ **11923A** 1.0 mm (f) connector launch assembly

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1. For on-wafer applications, two 11500J/K/L cables are required;
   one cable for each test port.
2. Special rugged female connector specifically for connecting to the
   network analyzer test port, but does not mate with a standard
   male connector.

For devices with 1.85 mm connectors

Mechanical calibration kits
☐ **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
   85058-60123   1.85 mm male load
   85058-60124   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
☐ **N4694A** Microwave ECal: 10 MHz to 67 GHz, 2 ports.
   Includes:
   Option M0F module with:
      N4694-60001 1.85 mm (f) to 1.85 mm (m) ECal module
   Option 00M module with:
      N4694-60002 1.85 mm (m) to 1.85 mm (m) ECal module
   Option 00F module with:
      N4694-60003 1.85 mm (f) to 1.85 mm (f) ECal module
   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

Cables
☐ **N4697E**[2] Single, flexible: 1.85 mm (f) to 1.85 mm (f),
   96.5 cm, 38 inches
☐ **N4697F**[2] Set, flexible:
   One 1.85 mm (f) to 1.85 mm (f) cable, 62.2 cm,
   24.5 inches, p/n N4697-60100
   One 1.85 mm (f) to 1.85 mm (m) cable, 62.2 cm,
   24.5 inches, p/n N4697-60200
☐ **N4697-60200**[2] Single, flexible: 1.85 mm (f) to
   1.85 mm (m), 62.2 cm, 24.5 inches
☐ **N4421B-B67** Set of 4, flexible: 1.85 mm (f) to
   1.85 mm (m), 91.4 cm, 36 inches

Adapter set
☐ **85130H** 1.85 mm[2] to 1.85 mm

For devices with 2.4 mm connectors

Mechanical calibration kits
❏ **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
❏ **N4693A** Microwave ECal: 10 MHz to 50 GHz, 2 ports.
   Includes:
   Option M0F module with:
      N4693-60001 2.4 mm (f) to 2.4 mm (m) ECal module
   Option 00M module with:
      N4693-60002 2.4 mm (m) to 2.4 mm (m) ECal module
   Option 00F module with:
      N4693-60003 2.4 mm (f) to 2.4 mm (f) ECal module
   Option 00A adds:
      85056-60005 2.4 mm (m) to 2.4 mm (m) adapter
      85056-60007 2.4 mm (f) to 2.4 mm (f) adapter

Cables
❏ **85133C**[1] single, semi-rigid: 2.4 mm (f) to PSC-2.4 mm (f), 81 cm, 32 inches
❏ **85133D**[1] set, semi-rigid:
   One 2.4 mm (f) to 2.4 mm (m), 53 cm, 21 inches,
   p/n 85133-60001
   One 2.4 mm (f) to 2.4 mm (f), 53 cm, 21 inches,
   p/n 85133-60002
❏ **85133E**[1] single, flexible: 2.4 mm (f) to PSC-2.4 mm (f), 97 cm, 38 inches
❏ **85133F**[1] set, flexible:
   One 2.4 mm (f) to 2.4 mm (f), 63 cm, 25 inches,
   p/n 85133-60016
   One 2.4 mm (f) to 2.4 mm (m), 63 cm, 25 inches,
   p/n 85133-60017
❏ **85133-60017**[1] Single, flexible: 2.4 mm (f) to 2.4 mm (m), 63 cm, 25 inches
❏ **N4421A-B20** Set of 4, flexible: 2.4 mm (f) to 2.4 mm (m), 91.4 cm, 36 inches

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

Adapter set
❏ **85130G** 2.4 mm[1] to 2.4 mm

For devices with K connectors (2.92 mm)

Mechanical calibration kits
❏ **85056K** 2.92/2.4 economy: DC to 40/50 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 (Option 001)
   00915-60004 2.4 mm (f) sliding load (Option 001)
   11904-60001 2.4 mm (m) to 2.92 mm (m) adapter
   11904-60002 2.4 mm (f) to 2.92 mm (f) adapter
   11904-60003 2.4 mm (m) to 2.92 mm (f) adapter
   11904-60004 2.4 mm (f) to 2.92 mm (m) adapter
   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
❏ **N4692A** Microwave ECal: 10 MHz to 40 GHz, 2 ports.
   Includes:
   Option M0F module with:
      N4692-60001 2.92 mm (f) to 2.92 mm (m) ECal module
   Option 00M module with:
      N4692-60002 2.92 mm (m) to 2.92 mm (m) ECal module
   Option 00F module with:
      N4692-60003 2.92 mm (f) to 2.92 mm (f) ECal module
   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

Cables
❏ **85133C**[1] single, semi-rigid: 2.4 mm (f) to PSC-2.4 mm (f), 81 cm, 32 inches
❏ **85133D**[1] set, semi-rigid:
   One 2.4 mm (f) to 2.4 mm (m), 53 cm, 21 inches,
   p/n 85133-60001
   One 2.4 mm (f) to 2.4 mm (f), 53 cm, 21 inches,
   p/n 85133-60002
❏ **85133E**[1] single, flexible: 2.4 mm (f) to PSC-2.4 mm (f), 97 cm, 38 inches
❏ **85133F**[1] set, flexible:
   One 2.4 mm (f) to 2.4 mm (f), 63 cm, 25 inches,
   p/n 85133-60016
   One 2.4 mm (f) to 2.4 mm (m), 63 cm, 25 inches,
   p/n 85133-60017
❏ **85133-60017**[1] Single, flexible: 2.4 mm (f) to 2.4 mm (m), 63 cm, 25 inches
❏ **N4421A-B20** Set of 4, flexible: 2.4 mm (f) to 2.4 mm (m), 91.4 cm, 36 inches

Adapters
❏ **11904A** 2.4 mm (m) to K (m)
❏ **11904B** 2.4 mm (f) to K (f)
❏ **11904C** 2.4 mm (m) to K (f)
❏ **11904D** 2.4 mm (f) to K (m)
❏ **11904S** 2.4 mm to K adapter set

For devices with 3.5 mm or SMA connectors

Mechanical calibration kits

❏ **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 kits

❏ **85093C** RF ECal: 300 kHz to 9 GHz, 2 ports
  Standard module includes
  Option M0F with:
    85093-60008 3.5 mm (f) to 3.5 mm (m) ECal module
  Option 00F module with:
    85093-60010 3.5 mm (f) to 3.5 mm (f) ECal module
  Option 00M module with:
    85093-60009 3.5 mm (m) to 3.5 mm (m) ECal module
  Option 00A adds:
    85052-60012 3.5 mm (m) to 3.5 mm (m) adapter
    85052-60014 3.5 mm (f) to 3.5 mm (f) adapter

85093C-xxx mixed-connector options:

Port A option			Port B option					
Type	(f)	(m)	Type	(f)	(m)	Type	(f)	(m)
3.5 mm	101	102	Type-N 50 ohm	203	204	7-16	205	206

❏ **N4431B** Microwave ECal: 300 kHz to 13.5 GHz, 4 ports.
  Includes:
  Option 010 module with:
    N4431-60006 4 x 3.5 mm (f) ECal module

N4431B-xxx mixed-connector options:

Connector type	Port A option	Port B option	Port C option	Port D option
3.5 mm (f)	101	201	301	401
3.5 mm (m)	102	202	302	402
Type-N 50 ohm (f)	103	203	303	403
Type-N 50 ohm (m)	104	204	304	404
7-16 (f)	105	205	305	405
7-16 (m)	106	206	306	406

❏ **N4433A** Microwave ECal: 300 kHz to 20 GHz, 4 ports.
  Includes:
  Option 010 module with:
    N4433-60003 4 x 3.5 mm (f) ECal module

N4433A-xxx mixed-connector options:

Connector type	Port A option	Port B option	Port C option	Port D option
3.5 mm (f)	101	201	301	401
3.5 mm (m)	102	202	302	402

❏ **N4691B** Microwave ECal: 300 kHz to 26.5 GHz, 2 ports.
  Includes:
  Option M0F module with:
    N4691-60001 3.5 mm (f) to 3.5 mm (m) ECal module
  Option 00M module with:
    N4691-60002 3.5 mm (m) to 3.5 mm (m) ECal module
  Option 00F module with:
    N4691-60003 3.5 mm (f) to 3.5 mm (f) ECal module
  Option 00A adds:
    85052-60012 3.5 mm (m) to 3.5 mm (m) adapter
    85052-60014 3.5 mm (f) to 3.5 mm (f) adapter

Cables

- **85131C**[1] single, semi-rigid: 3.5 mm (f) to PSC-3.5 mm (f), 81 cm, 32 inches[2]
- **85131D**[1] set, semi-ridgid:
  One 3.5 mm (f) to 3.5 mm (m), 53 cm, 21 inches, p/n 85131-60009
  One 3.5 mm (f) to PSC-3.5 mm (f), 53 cm, 21 inches, p/n 85131-60010
- **85131E**[1] single, flexible: 3.5 mm (f) to PSC-3.5 mm (f), 96.5 cm, 38 inches[2]
- **85131F**[1] set, flexible:
  One 3.5 mm (f) to 3.5 mm (m), 62.2 cm, 24.5 inches, p/n 85131-60012
  One 3.5 mm (f) to PSC-3.5 mm (f), 62.2 cm, 24.5 inches, p/n 85131-60013
- **85134C**[1] single, semi-rigid: PSC-3.5 mm (f) to 2.4 mm (f), 81 cm, 32 inches
- **85134D**[1] set, semi-rigid:
  One 2.4 mm (f) to PSC-3.5 mm (f), 53 cm, 21 inches, p/n 85134-60002
  One 2.4 mm (f) to PSC-3.5 mm (m), 53 cm, 21 inches, p/n 85134-60001
- **85134E**[1] single, flexible: PSC-3.5 mm (f) to 2.4 mm (f), 96 cm, 38 inches
- **85134F**[1] set, flexible:
  One 2.4 mm (f) to PSC-3.5 mm (f), 53 cm, 21 inches, p/n 85134-60004
  One 2.4 mm (f) to PSC-3.5 mm (m), 53 cm, 21 inches, p/n 85134-60003
- **85131-60009**[1] Single, flexible: 3.5 mm (f) to 3.5 mm (m), 53 cm, 21 inches
- **N4419A-B20** set of 4, flexible: 3.5 mm (m) to 3.5 mm (f), 91.4 cm, 36 inches
- **Z5623A-B20** set of 4, flexible: 3.5 mm (m) to 3.5 mm (m), 91.4 cm, 36 inches

Adapter sets

- **85130C** 3.5 mm[1] to Type-N
- **85130D** 3.5 mm[1] to 3.5 mm
- **85130F** 2.4 mm[1] to 3.5 mm

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1. Special rugged female connector specifically for connecting to the network analyzer test port, but does not mate with a standard male connector.
2. For use with E8362A or B.

For devices with Type-N connectors

Mechanical calibration kits
❏ **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 kits

❏ **N4431B** Microwave ECal: 300 kHz to 13.5 GHz, 4 ports. Includes:
   Option 020 module with:
      N4431-60007 4 x Type-N (f) ECal module

N4431B-xxx mixed-connector options:

Connector type	Port A option	Port B option	Port C option	Port D option
3.5 mm (f)	101	201	301	401
3.5 mm (m)	102	202	302	402
Type-N 50 ohm (f)	103	203	303	403
Type-N 50 ohm (m)	104	204	304	404
7-16 (f)[1]	105	205	305	405
7-16 (m)[1]	106	206	306	406

❏ **N4432A** Microwave ECal: 300 kHz to 18 GHz, 4 ports. Includes:
   Option 020 module with:
      N4432-60003 4 x Type-N (f) ECal module

N4432A-xxx mixed-connector options:

Connector type	Port A option	Port B option	Port C option	Port D option
3.5 mm (f)	101	201	301	401
3.5 mm (m)	102	202	302	402
Type-N 50 ohm (f)	103	203	303	403
Type-N 50 ohm (m)	104	204	304	404

❏ **N4690B** Microwave ECal: 300 kHz to 18 GHz, 2 ports. Includes:
   Option M0F module with:
      N4690-60001 Type-N (f) to Type-N (m) ECal module
   Option 00M module with:
      N4690-60002 Type-N (m) to Type-N (m) ECal module
   Option 00F module with:
      N4690-60003 Type-N (f) to Type-N (f) ECal module
   Option 00A adds:
      85054-60037 Type-N (f) to Type-N (f) adapter
      85054-60038 Type-N (m) to Type-N (m) adapter

Cables [2]
Use the test port cables recommended for devices with 7 mm connectors, and 7 mm to Type-N adapters that are from the 85054B/D Type-N calibration kit (see 7 mm connector section).

1. Limits ECal module high frequency to 7.5 GHz.

2. Special rugged female connector specifically for connecting to the network analyzer test port, but does not mate with a standard male connector.

For devices with 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 collet
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 kits
❑ **N4696B** Microwave ECal: 300 kHz to 18 GHz, 2 ports, 7mm to 7mm Microwave module

Cables[1]
❑ **85132C** single, semi-rigid: 7 mm to 3.5 mm (f), 81 cm, 32 inches[2]
❑ **85132D** set, semi-rigid: two 3.5 mm (f) to 7 mm cables, 53 cm each, 21 inches each[2], p/n 85132-60003
❑ **85132E** single, flexible: 7 mm to 3.5 mm (f), 97.2 cm, 38.25 inches[2]
❑ **85132F** set, flexible: two 3.5 mm (f) to 7 mm cables, 62.9 cm each, 24.75 inches each[2], p/n 85132-60004
❑ **85135C** single, semi-rigid: 7 mm to 2.4 mm (f), 81 cm, 32 inches
❑ **85135D** set, semi-rigid: two 2.4 mm (f) to 7 mm cables, 53 cm each, 21 inches each, p/n 85135-60001
❑ **85135E** single, flexible: 7 mm to 2.4 mm (f), 96 cm, 38 inches
❑ **85135F** set, flexible: two 2.4 mm (f) to 7 mm cables, 53 cm each, 21 inches each, p/n 85135-60002

Adapter sets
❑ **85130E** 2.4 mm[1] to 7 mm

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
❑ **85132F** cable set (set, flexible 7 mm to 3.5 mm, 62.9 cm each, 24.75 inches each[2])
❑ **85135F** cable set (set, flexible, 7 mm to 2.4 mm, 53 cm each, 21 inches each)
❑ **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
❑ **85132F** cable set (set, flexible, 7 mm to 3.5 mm, 62.9 cm each, 24.75 inches each[2])
❑ **85135F** cable set (set, flexible, 7 mm to 2.4 mm, 53 cm each, 21 inches each)
❑ **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
❑ **85134F** cable set (set, flexible, 3.5 mm to 2.4 mm, 53 cm each, 21 inches each)
❑ **K281C** adapter (included in calibration kit): WR-42 to 3.5 mm (f)
Option 012 WR-42 to 3.5 mm (m)

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1. Special rugged female connector specifically for connecting to the network analyzer test port, but does not mate with a standard male connector.
2. For use with E8362A or B.

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
- **85133F** cable set (set, flexible, 2.4 mm, 53 cm
  each, 21 inches each)
- **R281A** adapter (2.4 mm (f) to WR-28 waveguide
  adapter)
- **R281B** adapter (2.4 mm (m) to WR-28 waveguide
  adapter)

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
- **85133F** cable set (set, flexible, 2.4 mm, 53 cm
  each, 21 inches each)
- **Q281A** adapter (2.4 mm (f) to WR-22 waveguide
  adapter)
- **Q281B** adapter (2.4 mm (m) to WR-22 waveguide
  adapter)

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

V Band
- **V11644A** standard, WR-15: 50 to 75 GHz.
  Includes:
  11644-60025 V-band termination
  11644-20015 V-band short
  11644-20013 V-band shim
  11644-60012 V-band standard section

Verification kits

All Agilent verification kits include:
- precision Zo airline or match thru
- mismatched airline or mismatch thru
- fixed attenuators
- traceable measured data and uncertainties

- **85053B** 300 kHz to 26.5 GHz 3.5 mm kit
  Includes attenuators, airline and mismatch airline
  with data on a 3.5-inch disk for use in confirming
  accuracy enhanced system measurement 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 3.5-inch disk for use in confirming
  accuracy enhanced system measurement 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 3.5-inch disk for use in confirming
  accuracy enhanced system measurement 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 3.5-inch disk for use in confirming
  accuracy enhanced system measurement performance,
  traceable to national standards. Test procedure is
  provided in the service manual.

General Accessories

USB

❏ **N4688A** CD-ROM drive
Provides an external read/write CD-ROM drive with a USB cable.

❏ **N4689A** USB hub
Provides a USB hub for connecting additional USB peripherals.

Hard drive

❏ **N8980A** Spare hard drive
Recommended for a secure environment.

Probe

❏ **85024A** high-frequency probe
Provides high-impedance in-circuit test capability from 300 kHz to 3 GHz.

Power meters and sensors[1]

Recommended for self support, adjustments and performance tests to verify proper instrument operation.
❏ **E4418B** single-channel power meter
❏ **E4419B** dual-channel power meter
❏ **8481B** power sensor, 10 MHz to 18 GHz, Type-N (m), 25 W
❏ **8481A** power sensor, 10 MHz to 18 GHz, Type-N (m), 100 mW
❏ **8485A** power sensor, 50 MHz to 26.5 GHz, APC-3.5 mm (m), 100 mW
❏ **8487A** power sensor, 50 MHz to 50 GHz, 2.4 mm, 300 mW
❏ **8487D** power sensor, 50 MHz to 50 GHz, 2.4 mm, 100 mW
❏ **R8486A** power sensor, 26 GHz to 40 GHz, waveguide flange UG-599/U, 100 mW
❏ **Q8486A** power sensor, 33 GHz to 50 GHz, waveguide flange UG-383/U, 100 mW
❏ **U8486A** power sensor, 50 GHz to 75 GHz, waveguide flange UG-385/U, 200 mW avg
❏ **E4412A** CW power sensor, 10 MHz to 18 GHz, Type-N (m), 200 mW
❏ **E4413A** CW power sensor, 50 MHz to 26.5 GHz, 3.5 mm, 200 mW

Amplifiers

❏ **83006A** power amplifier, 10 MHz to 26.5 GHz, 20 dB gain, power out: +18 dBm to 10 GHz or +16 dBm to 20 GHz or +14 dBm to 26.5 GHz
❏ **83017A** power amplifier, 50 MHz to 26.5 GHz, 25 dB gain, power out: +20 dBm to 20 GHz, or +15 dBm to 26.5 GHz
❏ **83018A** power amplifier, 2 to 26.5 GHz, 27 dB gain to 20 GHz or 23 dB to 26.5 GHz, power out: +24 dBm to 20 GHz or +21 dBm to 26.5 GHz
❏ **83020A** power amplifier, 2 to 26.5 GHz, 30 dB gain to 20 GHz or 27 dB to 26.5 GHz, power out: +30 dBm to 20 GHz or +26 dBm to 26.5 GHz
❏ **83050A** power amplifier, 2 to 50 GHz, 23 dB gain, power out: +20 dBm to 40 GHz or +17 dBm to 50 GHz
❏ **83051A** power amplifier, 45 MHz to 50 GHz, 23 dB gain power out: +12 dBm to 45 GHz or +10 dBm to 50 GHz

Couplers

❏ **87300B** coaxial coupler, 1 to 20 GHz, SMA (f), 10 dB coupling
❏ **87300C** coaxial coupler, 1 to 26.5 GHz, 3.5 mm (f), 10 dB coupling
❏ **87301B** coaxial coupler, 10 to 46 GHz, 2.92 mm (f), 10 dB coupling
❏ **87301D** coaxial coupler, 1 to 40 GHz, 2.4 mm (f) or optional 2.92 mm (f), 13 dB coupling
❏ **87301E** coaxial coupler, 2 to 50 GHz, 2.4 mm (f), 10 dB coupling
❏ **87310B** 90º coaxial coupler, 1 to 18 GHz, SMA (f), 3 dB coupling

Equipment rack accessories

❏ **E3663AC** Rail kit
❏ **5063-9205** Front handle kit
❏ **5063-9217** Rack mount kit, for use without handles (included with Option 1CM)
❏ **5063-9224** Rack mount kit with handles
❏ **5063-9237** Rack mount kit, for use with standard supplied handles (included with Option 1CP)

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1. For the latest guide to power meters and power sensors, refer to the Agilent web site: **www.agilent.com/find/powermeters**

Applications

Material measurements

❑ **85070E** High-Temperature Dielectric Probe Kit
The 85070E enables measurements of the dielectric properties of materials quickly and conveniently. Measurements made with this probe are nondestructive and require no sample preparation. The dielectric probe is well suited for measurements of liquid, semisolid and flat solid materials. Measurement results can be viewed in a variety of formats (ε'_r, ε''_r, tan δ or Cole-Cole). The supplied software can be run in the PNA analyzer or on a PC.

❑ **85071E** Materials Measurement Software
The 85071E materials measurement software calculates the permittivity and permeability of material samples placed in a coaxial airline or a rectangular waveguide. The measurement technique works well for solid materials that can be machined to fit precisely inside a transmission line. Measurement results can be viewed in a variety of formats (ε'_r, ε''_r, μ'_r, μ''_r, tan δ, or Cole-Cole μ). The software can be run in the PNA analyzer or on a PC.

Pulsed measurements[1]

The pulsed RF measurement capability (Option H08) and IF access (Option H11), are recommended for pulsed measurements with the PNA Series.

Pulse/pattern generators
Recommended to provide pulse signals and timing to the pulsed S-parameter text set and MW PNA
❑ **81104A** Pulse/pattern generator, 80 MHz, single-/dual-channel with one or two Agilent 81105A output modules.
❑ **81110A** Pulse/pattern generator, 165 MHz, single-/dual-channel with one or two Agilent 81111A output modules.

Note: Each pulse/pattern generator must be ordered with its associated output modules depending on the measurement configuration.

Pulsed S-Parameter test sets
❑ **Z5623AH81** Pulsed S-parameter test set, 2 to 20 GHz
Includes a pin-diode switch to modulate the analyzer's internal source, an amplifier, and directional coupler to provide a pulsed reference to the analyzer.
❑ **Z5623AH83** Pulsed S-parameter test set, 2 to 20 GHz
Includes two pin switches for bi-directional (forward and reverse) pulsed-RF stimulus, and two directional couplers for the reference channels. It does not include internal amplifiers, but has front panel access loops for switching in external amplifiers to boost port power in both directions.

1. For more details regarding pulsed measurement configurations with the PNA Series, refer to Agilent's Web site (**www.agilent.com/find/pna**) to download a copy of the *Microwave PNA Series Network Analyzer Configuration Guide for Pulsed Measurements*, literature number 5988-9833EN.

❑ **Z5623AH84** Pulsed S-parameter test set, 2 to 40 GHz
Includes two pin switches for bi-directional (forward and reverse) pulsed-RF stimulus, and two directional couplers for the reference channels. It does not include internal amplifiers, but has front panel access loops for switching in external amplifiers to boost port power in both directions.
❑ **Z5623AH86** Pulsed S-parameter test set, 2 to 40 GHz
Includes one pin switch to modulate the analyzer's internal source in the forward direction, and one directional coupler for the reference channel. It does not include internal amplifiers, but has front panel access loops for switching in an external amplifier to boost port power.
❑ **Z5623AH87** Pulsed S-parameter test set, 1 to 50 GHz
Includes two pin switches for bi-directional (forward and reverse) pulsed-RF stimulus. It does not include internal amplifiers, but has front panel access loops for switching in external amplifiers to boost port power in both directions.
❑ **Z5663AH89** Pulsed S-parameter test set, 10 MHz to 5 GHz
Includes one pin switch to modulate the analyzer's internal source in the forward direction. This test set has no internal amplifier, no reference channel variable attenuator, and no GPIB control (manual control only).
❑ **Z5623AH90** Pulsed S-parameter test set, 1 to 50 GHz
Same as Z5623AH87, but adds 50 GHz couplers to the front panel to allow DUT connection on the test set instead of using the PNA test ports.

Note: Pulse biasing can be achieved with or without the use of a pulsed S-parameter test set. A proper pulse-bias driver must be used. Contact your local Agilent Sales Representative for additional pulsed S-parameter test set configurations and details.

Peripherals

The following peripherals may be used with the Microwave PNA Series. Other peripherals not listed here may also be compatible with these instruments.

Monitors

VGA-compatible monitor

Printers

USB, LAN, parallel or serial printers with Microsoft® Windows® printer driver

Interface cables

Choose the appropriate cables to connect each peripheral to the network analyzer.
❑ **10833A** GPIB cable, 1.0 m (3.3 ft)
❑ **10833B** GPIB cable, 2.0 m (6.6 ft)
❑ **10833D** GPIB cable, 0.5 m (1.6 ft)
❑ **82357A** GPIB to USB interface

Upgrade Kits

Upgrade kits for the PNA Series
E8362A, E8363A, E8364A, E8362B, E8363B, E8364B, E8361A, N5250A

Upgrade kits are available to add options after initial purchase. To order an upgrade kit for the PNA series, order the analyzer's model number followed by a "U", then indicate the option to be added (for example, E8362BU-010). The serial number of the instrument to be retrofitted is required as part of the order.

❑ **Time-domain** (Option 010)
   User installable.
❑ **Configurable test set** (Option 014)
   Provides six front-panel RF access loops.
   Includes installation at an Agilent service center.
❑ **Receiver attenuators** (Option 016)
   (Not available for the E8362A/63A/64A)
   Includes installation at an Agilent service center.
❑ **Extended memory** (Option 022)
   (Not available for the E8362A/63A/64A)
   Includes installation at an Agilent service center.
❑ **Frequency range upgrade to an E8363A/B (40 GHz) PNA** (Option 040)
   Available only for the E8362A/B. Includes installation at an Agilent service center.
❑ **Frequency range upgrade to an E8364A/B (50 GHz) PNA** (Option 050)
   Available only for the E8362A/B and E8363A/B.
   Includes installation at an Agilent service center.
❑ **Frequency range upgrade to an E8361A (67 GHz) PNA** (Option 067)
   Available only for the E8363A/B and E8364A/B.
   Includes installation at an Agilent service center.
❑ **Frequency-offset** (Option 080)
   (Not available for the E8362A/63A/64A)
   Includes installation at an Agilent service center.
❑ **External reference switch** (Option 081)
   (Not available for the E8362A/63A/64A)
   Includes installation at an Agilent service center.
❑ **Scalar-calibrated converter measurements** (Option 082)
   (Not available for the E8362A/63A/64A)
   User installable. Option 080 required.
❑ **Frequency converter measurement application** (Option 083)
   (Not available for the E8362A/63A/64A)
   User installable. Option 080 and 081 required.

❑ **Extended hardware capability** (Option 097)
   (Available for the E8362A/63A/64A only)
   This option will upgrade your E836xA model to an E836xB model; adding a 10 MHz start frequency and the ability to add the options needed to test mixers (080, 081, and 083).
❑ **4-Port measurement application** (Option 550)
   (Available for E8361A, E8362B/3B/4B)
   Enables full 4-port error correction and differential measurements. Option 014 and external test set required. User installable.
❑ **N-port capabilities** (Option 551)
   (Available for E8361A, E8362B/3B/4B)
   Adds full N-port error correction and measurement capabilities. Option 014 and external test set required. User installable.
❑ **Extended power range** (Option UNL)
   Adds a step attenuator and a bias-tee between source and each test port. Includes installation at an Agilent service center.
❑ **Pulsed-RF measurement capability** (Option H08)
   (Not available for E8362A/63A/64A)
   Provides software to set up and control pulsed-RF measurements using narrowband detection, with point-in-pulse and pulse-profile capability. User installable.
❑ **IF access** (Option H11)
   (Not available for E8362A/63A/64A)
   Provides hardware for antenna, point-in-pulse, and millimeter-wave measurements. Adds rear-panel RF and LO outputs, external IF inputs, and IF gates (gates enabled with Option H08). Includes installation at an Agilent service center.

Upgrade kits for the PNA-L Series N5230A

Upgrade kits are available to add options after initial purchase. To order an upgrade kit for the PNA-L series, order the analyzer's model number followed by a "U", then indicate the option to be added (example: N5230AU-010). The serial number of the instrument to be retrofitted is required as part of the order.

❏ **Time-domain upgrade kit** (Option 010)
The serial number of the instrument to be retrofitted must be specified when ordering this kit. User installable.

❏ **4-port measurement application** (Option 550)
Enables full 4-port error correction and differential measurements on a 2-port network analyzer with configurable test set (Option x25). External test set required. User installable.

❏ **N-port capabilities** (Option 551)
Adds full N-port error correction and measurement capabilities to PNA-L with configurable test set (Option xx5 or x46). External test set required. User installable.

❏ **6 or 13.5 GHz configurable test set & extended power range upgrade kit** (Option 901)
Applicable to 6 or 13.5 GHz PNA-L (N52300-020, N52300-120). Upgrade to configurable test set and extended power range. Includes installation at an Agilent service center.

❏ **20 GHz 2-port configurable test set & extended power range upgrade kit** (Option 921)
Applicable to 20 GHz PNA-L (N52300-220). Upgrade to configurable test set and extended power range. Includes installation at an Agilent service center.

❏ **13.5 or 20 GHz 4-port configurable test set & extended power range upgrade kit** (Option 926)
Applicable to 13.5 or 20 GHz 4-port PNA-L (N52300-140, N52300-240). Upgrade to configurable test set and extended power range. Includes installation at an Agilent service center.

❏ **13.5 or 20 GHz 4-port configurable test set, extended power range & internal second source upgrade kit** (Option 927)
Applicable to 13.5 or 20 GHz 4-port PNA-L (N52300-145, N52300-245). Upgrade to configurable test set, extended power range and internal second source. Includes installation at an Agilent service center.

❏ **40 or 50 GHz configurable test set & extended power range upgrade kit** (Option 941)
Applicable to 40 or 50 GHz PNA-L (N52300-420, N52300-520). Upgrade to configurable test set and extended power range. Includes installation at an Agilent service center.

❏ **Frequency-offset upgrade kit** (Option 080)
The serial number of the instrument to be retrofitted must be specified when ordering this kit. User installable.

❏ **Scalar-calibrated converter measurements** (Option 082)
User installable. Option 080 required.

❏ **Frequency range upgrade from 6 to 13.5 GHz** (Option 960)
Applicable to the 6 GHz PNA-L (N52300-020, N52300-025). Includes installation at an Agilent service center.

❏ **Frequency range upgrade from 13.5 to 20 GHz** (Option 966)
Applicable to the 13.5 GHz 4-port PNA-L (N52300-140, N52300-145, N52300-146). Includes installation at an Agilent service center.

❏ **Frequency range upgrade from 20 to 40 GHz** (Option 971)
Applicable to the 20 GHz PNA-L (N52300-220). Includes installation at an Agilent service center.

❏ **Frequency range upgrade from 20 to 40 GHz** (Option 973)
Applicable to the 20 GHz PNA-L (N52300-225). Includes installation at an Agilent service center.

❏ **Frequency range upgrade from 40 to 50 GHz** (Option 990)
Applicable to the 40 GHz PNA-L (N52300-420, N52300-425). Includes installation at an Agilent service center.

For additional upgrade paths, contact your Agilent field office.
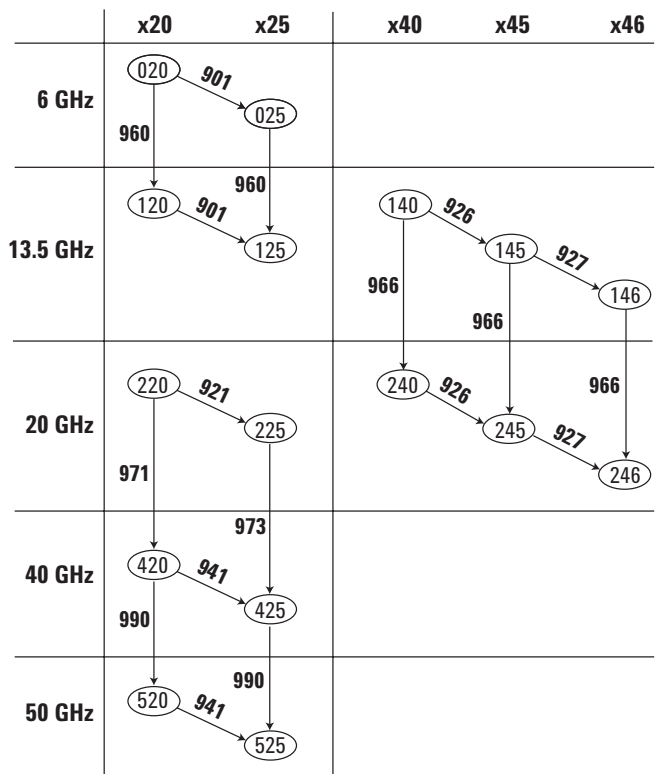
PNA-L upgrade path examples.

Key Web Resources

Visit our Web sites for additional product information and literature:
www.agilent.com/find/pna

Electronic calibration (ECal) visit:
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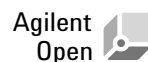
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Printed in USA, July 20, 2006
5988-7989EN

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