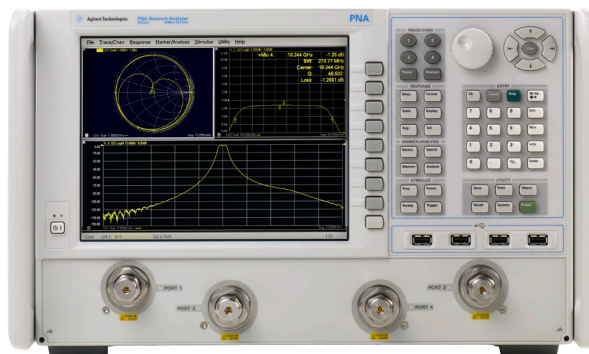
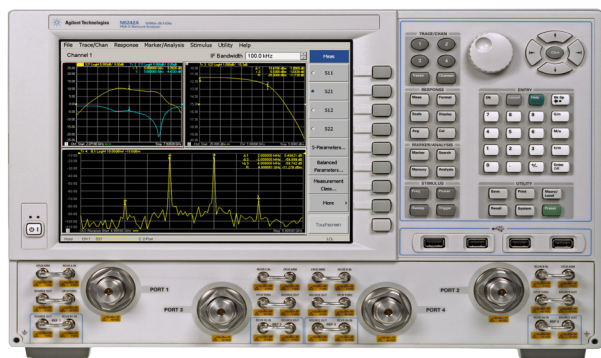


Agilent PNA Family Microwave Network Analyzers

Configuration Guide

PNA-X N5241A	10 MHz to 13.5 GHz
PNA-X N5242A	10 MHz to 26.5 GHz
PNA-X N5244A	10 MHz to 43.5 GHz
PNA-X N5245A	10 MHz to 50 GHz
PNA-X N5247A	10 MHz to 67 GHz
PNA N5221A	10 MHz to 13.5 GHz
PNA N5222A	10 MHz to 26.5 GHz
PNA N5224A	10 MHz to 43.5 GHz
PNA N5225A	10 MHz to 50 GHz
PNA N5227A	10 MHz to 67 GHz
PNA-L N5230C	300 kHz to 6, 13.5, or 20 GHz, 10 MHz to 20, 40, or 50 GHz



This configuration guide describes standard configurations, options, accessories, upgrade kits and compatible peripherals for the PNA Family microwave network analyzers. This guide should be used with the *Agilent PNA Family data sheets* for a complete description of these analyzers.



Table of Contents

PNA Family Network Analyzer Configurations	4
PNA-X/PNA option configurations	4
PNA-X Series test set and power configuration options	7
PNA Series test set and power configuration options	9
PNA-L Series Network Analyzer Configurations	11
PNA-L option configurations	11
PNA-L Series test set and power configuration options	12
PNA Family Application Options	13
Measurement applications.	13
Noise figure options	14
Pulse, antenna, millimeter-wave	17
Nonlinear vector network analyzer	17
Accessories	18
PNA Family Network Analyzer Upgrades	19
PNA-X/PNA upgrade kits	19
PNA-L upgrade kits	22
Applications	23
Material measurements.	23
Signal integrity measurements	23
Multiport measurements	23
Millimeter-wave measurements	24
Measurement Accessories.	25
Calibration kits, cables, adapters	25
For devices with 1.0 mm connectors	26
For devices with 1.85 mm connectors	26
For devices with 2.4 mm connectors	27
For devices with K (2.92 mm) connectors	27
For devices with 3.5 mm or SMA connectors	29
For devices with Type-N connectors	30
For devices with 7 mm connectors	31
For devices with waveguide	31
Verification kits	32
General Accessories	33
Hard drive	33
Probe	33
Power meters and sensors	33
Amplifiers	33
Couplers	33
Equipment rack accessories	33
Monitors.	33
Printers	33
Interface cables	33

Agilent offers the following options for all PNA Family network analyzers

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.

Warranty and service

1-, 3-, and 5-year warranty and service plans are available at the time of instrument purchase. Standard warranty is 1 year.

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. Service guides and the Online Help system are available on the web:

www.na.tm.agilent.com/pna

Calibration Software Licenses

Perpetual license for built-in performance test software for Agilent inclusive cal (Option 897)

Adds built-in performance testing and calibration software for self-maintainers. Requires additional equipment. See the analyzer's Service Guide for more information on equipment required.

Perpetual license for built-in performance test software for Standards compliant cal (Option 898)

Adds built-in performance testing and calibration software for self-maintainers. Requires additional equipment. See the analyzer's Service Guide for more information on equipment required.

PNA Family Network Analyzer Configurations

PNA-X Series

N5241A 10 MHz to 13.5 GHz N5242A 10 MHz to 26.5 GHz
 N5244A 10 MHz to 43.5 GHz N5245A 10 MHz to 50 GHz
 N5247A 10 MHz to 67 GHz

PNA Series

N5221A 10 MHz to 13.5 GHz N5222A 10 MHz to 26.5 GHz
 N5224A 10 MHz to 43.5 GHz N5225A 10 MHz to 50 GHz
 N5227A 10 MHz to 67 GHz

PNA-X/PNA option configurations

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

Description	For PNA-X Series	For PNA Series	Additional information
Test set and power configuration¹			
2-ports, single source	n/a	N522xA-200	Configurable test set not included
2-ports, single source, with configurable test set	N524xA-200	N522xA-201	
2-ports, single source, with extended power range	N524xAS-H85/285, and N524xA-200 ²	N522xA-217	Not available on 67 GHz model
2-ports, single source, with extended power range and bias-tees	N524xA-200/219	N522xA-219	
2-ports, with extended power range, internal second source, combiner and mechanical switches	N524xAS-H85/285, and N524xA-200/224 ²	n/a	Requires Option 080 Not available on 67 GHz model
2-ports, with extended power range, bias-tees, internal second source, combiner and mechanical switches	N524xA-200/219/224	n/a	Requires Option 080
4-ports, dual source	n/a	N522xA-400	Option 080 recommended, configurable test set not included
4-ports, dual source, with configurable test set	N524xA-400	N522xA-401	Option 080 recommended
4-ports, dual source, with extended power range	N524xAS-H85/485, and N524xA-400 ²	N522xA-417	Option 080 recommended Not available on 67 GHz model
4-ports, dual source, with extended power range and bias-tees	N524xA-400/419	N522xA-419	Option 080 recommended
4-ports, with extended power range, combiner and mechanical switches	N524xAS-H85/485, and N524xA-400/423 ²	n/a	Requires Option 080 Not available on 67 GHz model
4-ports, with extended power range, bias-tees, combiner and mechanical switches	N524xA-400/419/423	n/a	Requires Option 080
Measurement application			
Time-domain measurements	N524xA-010	N522xA-010	
Noise figure measurements using standard receivers ³	N524xA-028	N522xA-028	For measuring frequency converters, requires Option 082 or 083
Fully-corrected noise figure measurements ³	N524xA-029	n/a	Requires one of Options 219, 224, 419, 423, or H85 and for measuring frequency converters, requires Option 082 or 083 Not available on 43.5, 50 and 67 GHz models
Add 26.5 GHz noise receiver ³	N524xAS-H29	n/a	Requires Option 423 and for measuring frequency converters, requires Option 082 or 083 Not available on 13.5, 26.5 and 67 GHz models
Frequency offset	N524xA-080	N522xA-080	
Scalar-calibrated converter measurements ⁴	N524xA-082	N522xA-082	Requires Option 080
Vector- and scalar-calibrated converter measurements ^{4,5}	N524xA-083	N522xA-083	Requires Option 080

1. Must choose one test set and power configuration.
2. Order special model N524xAS instead of N524xA. Order N524xA-xxx items for other standard options. Option H85 requires Option 285 or 485 which includes the extended power range of Option 219 or 419, therefore these options cannot be combined.
3. For source-corrected measurements, requires an ECal for use as an impedance tuner. For calibration, Option 028 requires a power meter, and Options 029 and H29 require a 346-series noise source (Agilent 346C recommended). All options require a power meter for measuring mixers and converters.
4. Option 082 is a subset of Option 083; therefore, they cannot be ordered together.
5. For vector mixer calibration, configurable test set is required for connecting a reference mixer (when ordered with N522xA-200 or -400, it adds only phase measurements using scalar mixer calibration).

PNA Family Network Analyzer Configurations *(continued)*

PNA-X Series		PNA Series	
N5241A 10 MHz to 13.5 GHz	N5242A 10 MHz to 26.5 GHz	N5221A 10 MHz to 13.5 GHz	N5222A 10 MHz to 26.5 GHz
N5244A 10 MHz to 43.5 GHz	N5245A 10 MHz to 50 GHz	N5224A 10 MHz to 43.5 GHz	N5225A 10 MHz to 50 GHz
N5247A 10 MHz to 67 GHz		N5227A 10 MHz to 67 GHz	

PNA-X/PNA option configurations

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

Description	For PNA-X Series	For PNA Series	Additional information
Measurement application <i>(continued)</i>			
Embedded LO measurements	N524xA-084	N522xA-084	Requires at least one of Options 028, 029, H29, 082, 083, 086, or 087
Gain compression application	N524xA-086	N522xA-086	For measuring frequency converters, requires Option 082 or 083
Intermodulation distortion application	N524xA-087	N522xA-087	Requires Option 080 Requires Option 082 or 083 for measuring frequency converters Not available with N522xA-200 and 400
Source phase control	N524xA-088	N522xA-088	Not available with N522xA-200
Integrated true-mode stimulus application	N524xA-460	N522xA-460	Requires one of Options 400, 401, 417, 419, or 423
N-port capabilities ¹	N524xA-551	N522xA-551	Not available with N522xA-200 and -400
Pulse, antenna, mm-wave			
Pulsed-RF measurements	N524xA-008	N522xA-008	Requires Option 025
Add IF inputs	N524xA-020	N522xA-020	
Add pulse modulator to internal 1st source	N524xA-021	N522xA-021	
Add pulse modulator to internal 2nd source	N524xA-022	N522xA-022	For PNA-X, requires Option 224 or 400 For PNA, requires one of Option 400, 401, 417 or 419
Add four internal pulse generators	N524xA-025	N522xA-025	
Fast CW sweep	N524xA-118	N522xA-118	
Nonlinear vector network analysis²			
Nonlinear component characterization	N524xA-510	n/a	Requires Options 419 and 080, or 400, H85 and 080
Nonlinear X-parameters ³	N524xA-514	n/a	Requires Options 423 and 510, requires MXG or PSG except 10 MHz tone-spacing
Nonlinear pulse envelope domain	N524xA-518	n/a	Requires Options 021, 025 and 510
Arbitrary load-impedance X-parameters	N524xA-520	n/a	Requires Option 514, requires MXG or PSG except 10 MHz tone-spacing

1. When configured N524xA as a multiport analyzer using Option 551 and a multiport test set, the combiner feature of Option 224 or 423 is temporarily disabled. When configured N524xA as a standalone analyzer, the combiner feature is enabled. When ordering a test set, select an appropriate interface kit. Refer to page 23 Multiport Measurements for more details.
2. To configure NVNA, requires two comb generators, Agilent calibration kits (mechanical or ECal), power meter and sensor or USB power sensor. Requires MXG or PSG for X-parameter extraction (internal 10 MHz reference output can be used for 10 MHz tone-spacing applications).
3. X-parameters is a trademark of Agilent Technologies.

PNA Family Network Analyzer Configurations *(continued)*

PNA-X Series

N5241A 10 MHz to 13.5 GHz N5242A 10 MHz to 26.5 GHz
 N5244A 10 MHz to 43.5 GHz N5245A 10 MHz to 50 GHz
 N5247A 10 MHz to 67 GHz

PNA Series

N5221A 10 MHz to 13.5 GHz N5222A 10 MHz to 26.5 GHz
 N5224A 10 MHz to 43.5 GHz N5225A 10 MHz to 50 GHz
 N5227A 10 MHz to 67 GHz

PNA-X/PNA option configurations

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

Description	For PNA-X Series	For PNA Series	Additional information
Accessories			
Rack mount kit for use without handles	N524xA-1CM	N522xA-1CM	
Rack mount kit for use with handles	N524xA-1CP	N522xA-1CP	
Pulse I/O adapter	N1966A	N1966A	
10 MHz to 26.5 GHz comb generator	U9391C	n/a	Requires two for NVNA using N5241A/2A
10 MHz to 50 GHz comb generator	U9391F	n/a	Requires two for NVNA using N5244A/5A
Calibration software			
Perpetual license for built-in performance test software for Agilent inclusive calibration ¹	N524xA-897	N522xA-897	
Perpetual license for built-in performance test software for standard compliant calibration ¹	N524xA-898	N522xA-898	
Calibration documentation			
ISO 17025 compliant calibration	N524xA-1A7	N522xA-1A7	
Commercial calibration certificate with test data	N524xA- UK6	N522xA- UK6	
ANSI Z540 compliant calibration	N524xA- A6J	N522xA- A6J	

1. Additional hardware required. Please refer to the analyzer's Service Guide for required service test equipment.

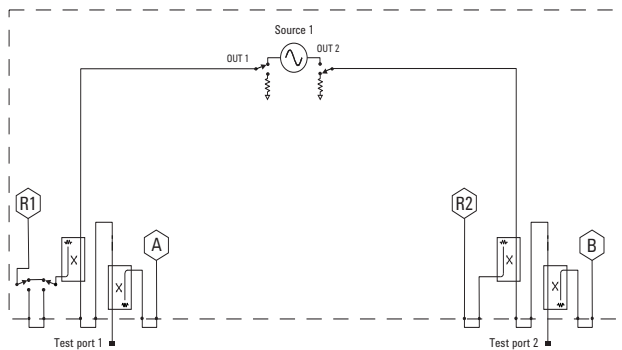
PNA-X Series test set and power configuration options

The PNA-X is an integrated vector network analyzer featuring a built-in S-parameter test set, one or two synthesized sources used for device stimulus, a hard disk drive, USB interfaces, and a 10.4" LCD touch screen display. The N5241A and the N5242A have 50 ohm, ruggedized 3.5 mm (m) test ports. The N5244A and the N5245A have 50 ohm, ruggedized 2.4 mm (m) test ports. The N5247A has 50 ohm, ruggedized 1.85 mm (m) test ports. Included with each instrument is a mouse, keyboard (U.S. style), and a 1-year return-to-Agilent service warranty.

Must choose one test set and power configuration option.

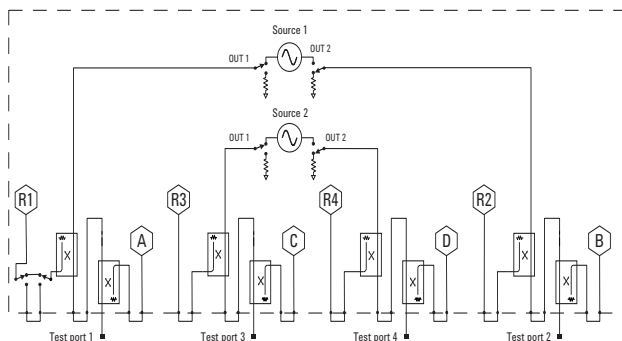
- **2-port standard test set and power range (Option 200)**

The standard 2-port test set comes with six front-panel access loops. 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. The standard test set also includes a solid-state internal RF transfer switch in the R1 reference-receiver path.



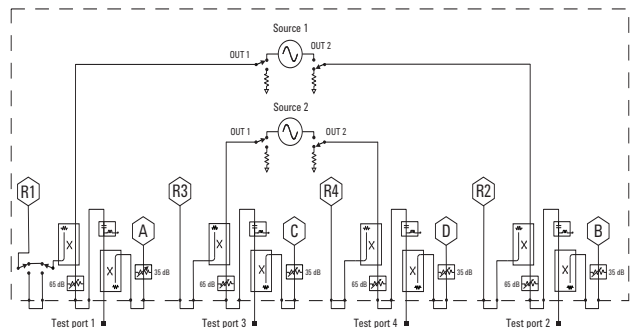
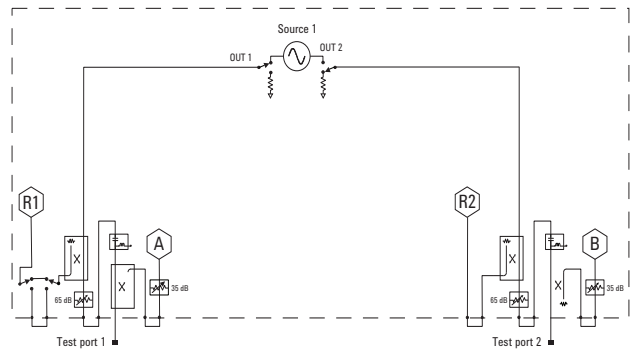
- **4-port standard test set, power range and an internal second source (Option 400)**

The standard 4-port test set comes with 12 front-panel access loops and a built-in second source. 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. The internal second source 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. With two sources, source 1 is accessible through test ports 1 and 2, and source 2 is accessible through test ports 3 and 4. The standard test set also includes a solid-state internal RF transfer switch in the R1 reference-receiver path. Recommends Option 080.



- **Extended power range and bias-tees (Option 219, 419)**

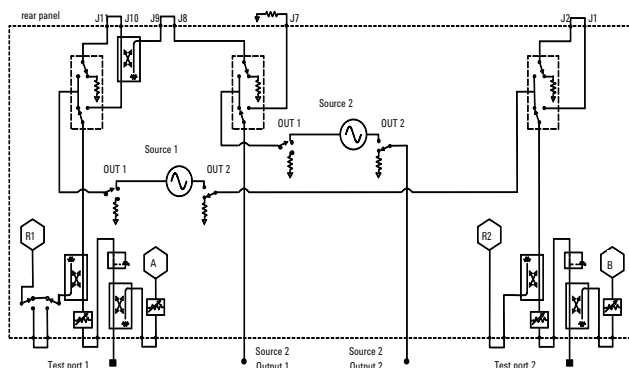
Adds to the standard test set one 65 dB for N5241A/52A, 60 dB for N5244A/45A, and 50 dB for N5247A source attenuator (settable in 5 dB increments for N5241A/42A and 10 dB increments for N5244/45A/47A), one 35 dB receiver attenuator (settable in 5 dB increments) for N5241A/42A/44A/45A and 50 dB receiver attenuator (settable in 10 dB increments) for N5247A, and one bias-tee to each test port. Option 219 requires Option 200, and Option 419 requires Option 400.



PNA-X Series test set and power configuration options *(continued)*

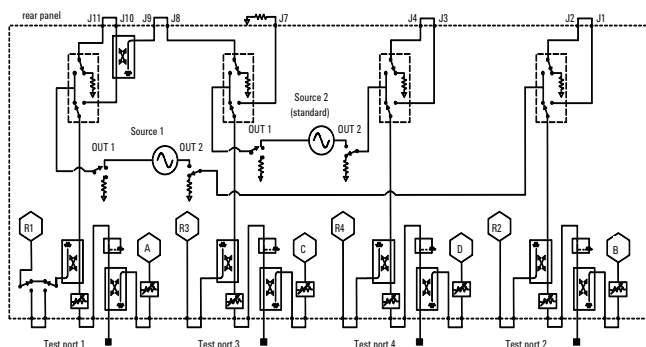
- **Add an internal second source, a combiner and mechanical switches to 2-port analyzer (Option 224)**

Available with 2-port model only, this option adds an internal second source, a combiner and mechanical switches. The internal second source 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. The mechanical switches provide increased flexibility by having rear panel access (front panel access for the N5247A source 1/2 out 1) to signal paths for advanced applications. Access to the second source is available through two output connectors on the front panel. Requires Options 200, 219 and 080.



- **Add an internal combiner and mechanical switches to 4-port analyzer (Option 423)**

Available with 4-port model only, this option adds a combiner and mechanical switches. The mechanical switches provide increased flexibility by having rear panel access (front panel access for the N5247A source 1/2 out 1) to signal paths for advanced applications. Requires Options 400, 419 and 080.



- **High-power test set (Model N524xAS Option H85)**

With extended power range and bias-tees (Option 219, 419), the internal bias-tees limit the maximum test port input power to +30 dBm. The high-power test set removes the bias-tees between the source attenuators and the test port couplers. This extends the maximum port power that the analyzer can safely handle to +43 dBm. Selecting Option H85 adds internal attenuators and cables (Option 285 for 2-port or Option 485 for 4-port analyzers). The high-power test set modifies Options 219 and 419, and therefore, they can not be ordered together. Option H85 is not available for the N5247A.

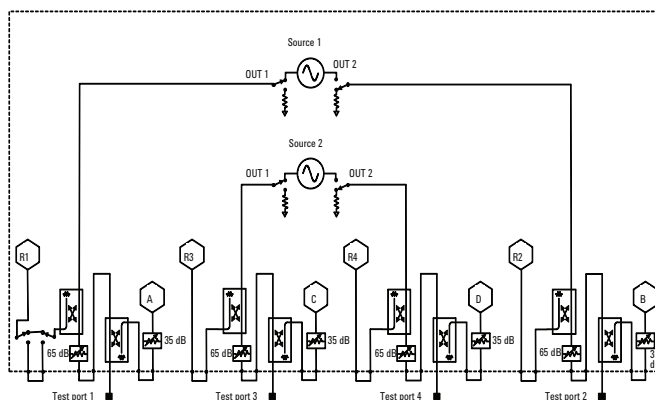
Minimum order configuration

2-port

N524xAS
N524xAS-H85
N524xAS-285
N524xA-200

4-port

N524xAS
N524xAS-H85
N524xAS-485
N524xA-400



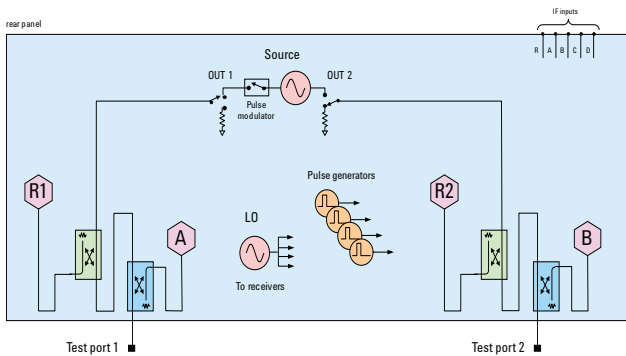
PNA Series test set and power configuration options

The PNA is an integrated vector network analyzer featuring a built-in S-parameter test set, one or two synthesized sources used for device stimulus, a hard disk drive, USB interfaces, and a 10.4" LCD touch screen display. The N5221A and the N5222A have 50 ohm, ruggedized 3.5 mm (m) test ports. The N5224A and the N5225A have 50 ohm, ruggedized 2.4 mm (m) test ports. The N5227A has a 50 ohm, ruggedized 1.85 mm (m) test ports. Included with each instrument is a mouse, keyboard (U.S. style), and a 1-year return-to-Agilent service warranty.

A test set and power configuration option is mandatory, must choose one test set and power configuration option.

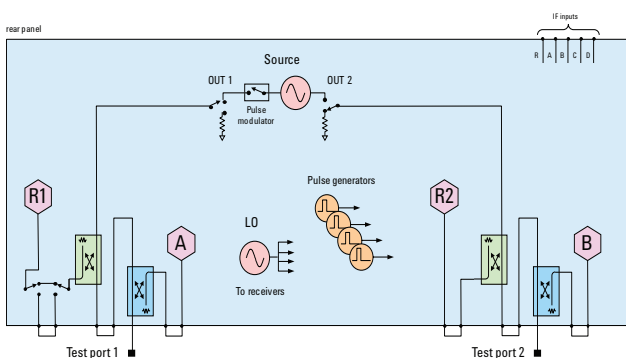
- **2-ports, single source, base configuration (Option 200)**

The 2-port with base configuration is available on all frequency models.



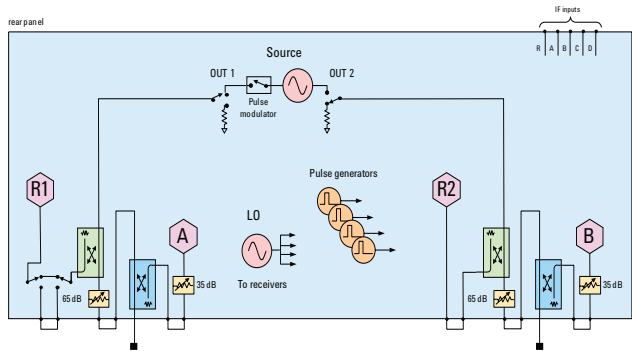
- **2-ports, single source, with configurable test set (Option 201)**

The 2-port configurable test set comes with six front-panel access loops. 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 at all ports. It also includes a solid-state internal RF transfer switch in the R1 reference-receiver path.



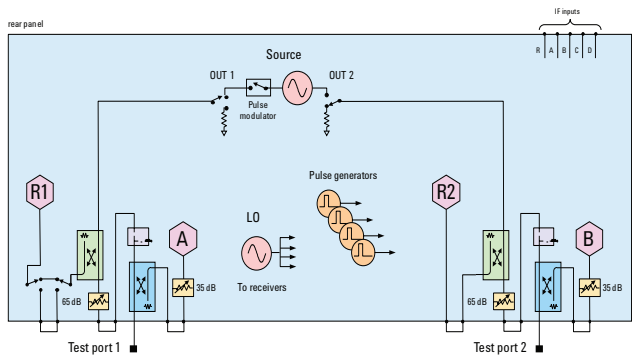
- **2-ports, single source, with extended power range (Option 217)**

The 2-port test set with extended power range comes with a configurable test set, source and receiver attenuators at each port. For N5221A/2A, the source attenuators are 65 dB in 5 dB step and the receiver attenuators are 35 dB in 5 dB step. For N5224A/5A, the source attenuators are 60 dB in 10 dB step and the receiver attenuators are 35 dB in 5 dB step. It also includes a solid-state internal RF transfer switch in the R1 reference-receiver path. This configuration is not available on N5227A.



- **2-ports, single source, with extended power range and bias-tee (Option 219)**

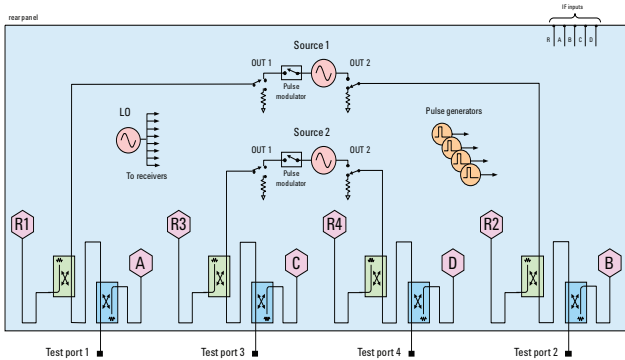
The 2-port test set with extended power range and bias-tee comes with a configurable test set, source and receiver attenuators, and bias-tee at each port. For N5221A/2A, the source attenuators are 65 dB in 5 dB step and the receiver attenuators are 35 dB in 5 dB step. For N5224A/5A, the source attenuators are 60 dB in 10 dB step and the receiver attenuators are 35 dB in 5 dB step. For N5247A, both source and receiver attenuators are 50 dB in 10 dB step. It also includes a solid-state internal RF transfer switch in the R1 reference-receiver path.



PNA Series test set and power configuration options (continued)

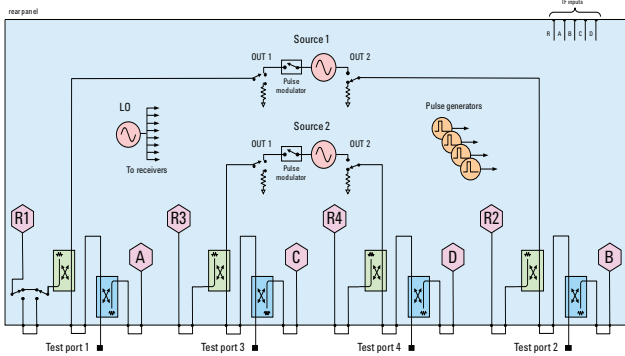
- **4-ports, dual source, base configuration (Option 400)**

The 4-port with base configuration is available on all frequency models.



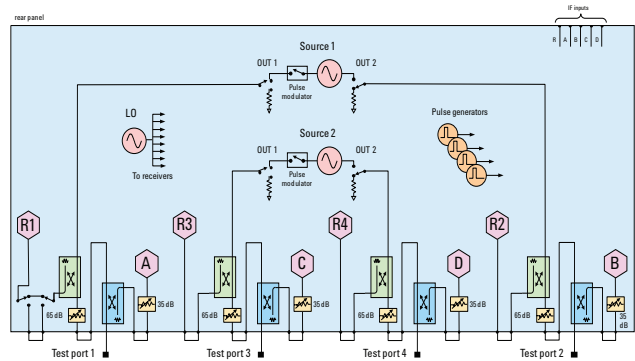
- **4-ports, dual source, with configurable test set (Option 401)**

The 4-port configurable test set comes with two internal sources, twelve front-panel access loops. 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 at all ports. It also includes a solid-state internal RF transfer switch in the R1 reference-receiver path.



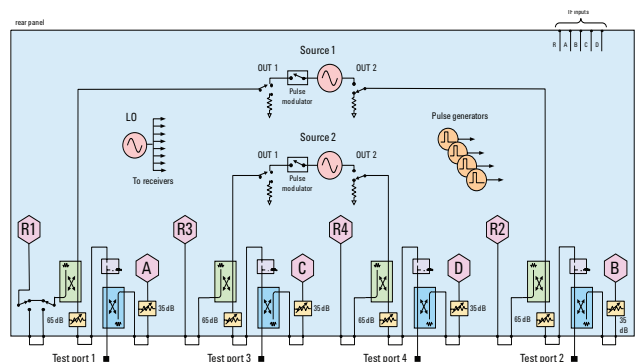
- **4-ports, dual source, with extended power range (Option 417)**

The 4-port test set with extended power range comes with two internal sources, configurable test set, source and receiver attenuators at each port. For N5221A/2A, the source attenuators are 65 dB in 5 dB step and the receiver attenuators are 35 dB in 5 dB step. For N5224A/5A, the source attenuators are 60 dB in 10 dB step and the receiver attenuators are 35 dB in 5 dB step. It also includes a solid-state internal RF transfer switch in the R1 reference-receiver path. This configuration is not available on N5227A.



- **4-ports dual source, with extended power range and bias-tee (Option 419)**

The 4-port test set with extended power range and bias-tee comes with two internal sources, configurable test set, source and receiver attenuators, and bias-tee at each port. For N5221A/2A, the source attenuators are 65 dB in 5 dB step and the receiver attenuators are 35 dB in 5 dB step. For N5224A/5A, the source attenuators are 60 dB in 10 dB step and the receiver attenuators are 35 dB in 5 dB step. For N5247A, both source and receiver attenuators are 50 dB in 10 dB step. It also includes a solid-state internal RF transfer switch in the R1 reference-receiver path.



PNA-L Series Network Analyzer Configurations

PNA-L Series

N5230C 400 kHz to 6, 13.5, or 20 GHz
10 MHz to 20, 40, or 50 GHz

PNA-L option configurations

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

	Description	For N5230C	Additional information
Frequency range and test set (Mandatory, choose only one)			
Option 020	300 kHz–6 GHz 2-port standard test set	N5230C-020	
Option 025	300 kHz–6 GHz 2-port configurable test set and extended power range	N5230C-025	
Option 120	300 kHz–13.5 GHz 2-port standard test set	N5230C-120	
Option 125	300 kHz–13.5 GHz 2-port configurable test set and extended power range	N5230C-125	
Option 140	300 kHz–13.5 GHz 4-port standard test set	N5230C-140	
Option 145	300 kHz–13.5 GHz 4-port configurable test set and extended power range	N5230C-145	
Option 146	300 kHz–13.5 GHz 4-port configurable test set, extended power range and internal second source	N5230C-146	Option 080 recommended
Option 220	10 MHz–20 GHz 2-port standard test set	N5230C-220	
Option 225	10 MHz–20 GHz 2-port configurable test set and extended power range	N5230C-225	
Option 240	300 kHz–20 GHz 4-port standard test set	N5230C-240	
Option 245	300 kHz–20 GHz 4-port configurable test set and extended power range	N5230C-245	
Option 246	300 kHz–20 GHz 4-port configurable test set, extended power range and internal second source	N5230C-246	Option 080 recommended
Option 420	10 MHz–40 GHz 2-port standard test set	N5230C-420	
Option 425	10 MHz–40 GHz 2-port configurable test set and extended power range	N5230C-425	
Option 520 ¹	10 MHz–50 GHz 2-port standard test set	N5230C-520	
Option 525 ¹	10 MHz–50 GHz 2-port configurable test set and extended power range	N5230C-525	
Measurement applications			
Option 010	Time domain for 6 GHz model	N5231C-010	
Option 010	Time domain for 13.5, 20, 40 or 50 GHz model	N5230C-010	
Option 080	Frequency offset measurements	N5230C-080	
Option 082	Scalar-calibrated converter measurements	N5230C-082	Option 080 required
Option 550 ²	4-port measurement application	N5230C-550	Not available on 4-port models. Requires test set Option xx5 or xx6
Option 551 ²	N-port capabilities for 6, 13.5 or 20 GHz model	N5231C-551	Requires test set Option xx5 or xx6
Option 551 ²	N-port capabilities for 40 or 50 GHz model	N5230C-551	Requires test set Option xx5 or xx6
Accessories			
Option 1CM	Rack mount kit without handles	N5230C-1CM	
Option 1CP	Rack mount kit with handles	N5230C-1CP	
Calibration documentation			
Option 1A7	ISO 17025 compliant calibration	N5230C-1A7	
Option A6J	ANSI Z540 compliant calibration	N5230C-A6J	
Option UK6	Commercial calibration certificate with test data	N5230C-UK6	
Calibration software for self-maintainers			
Option 897 ³	Perpetual license for built-in performance test software for Agilent inclusive calibration	N5230C-897	
Option 898 ³	Perpetual license for built-in performance test software for standards compliant calibration	N5230C-898	

1. Not available in all countries

2. Option 550 is a subset of 551; therefore they cannot be ordered together. When ordering a test set, select appropriate interface kit. Refer to page 23 Multipoint Measurements for more details.

3. Additional hardware required. Please refer to the analyzer's Service Guide for required service test equipment.

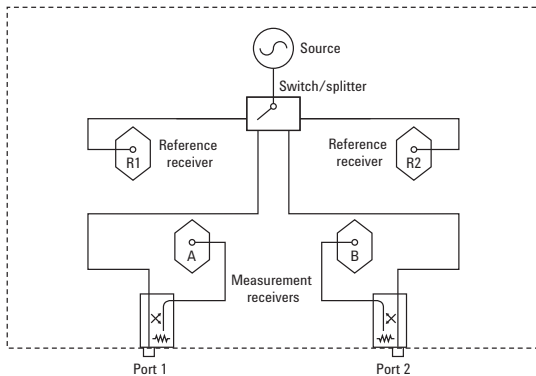
PNA-L Series test set and power configuration options

The PNA-L is an integrated vector network analyzer equipped with a built-in S-parameter test set, one or two synthesized sources used for device stimulus, a hard disk drive, USB interfaces, and an 8.4" LCD color touch screen display. 40 and 50 GHz models have 2.4 mm ruggedized male 50-ohm connectors, while all other models have 3.5 mm ruggedized male 50-ohm connectors. Included with each instrument is a mouse, keyboard (U.S.) and a 1-year return-to-Agilent service warranty.

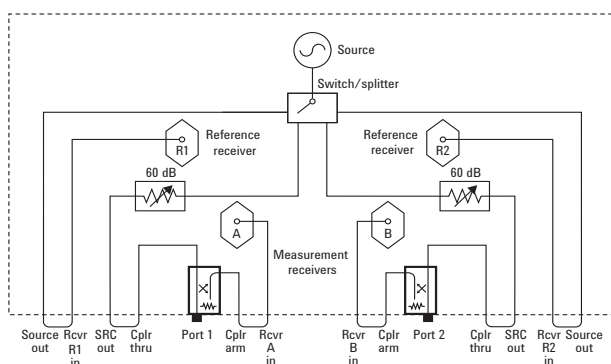
Must choose one test set and power configuration option.

- 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 (Option 080 recommended. *Please note, Option 080 is needed in order to have independent control of the two internal sources.*)

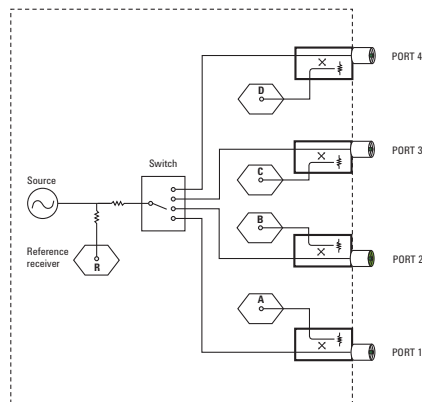
2-port standard test set



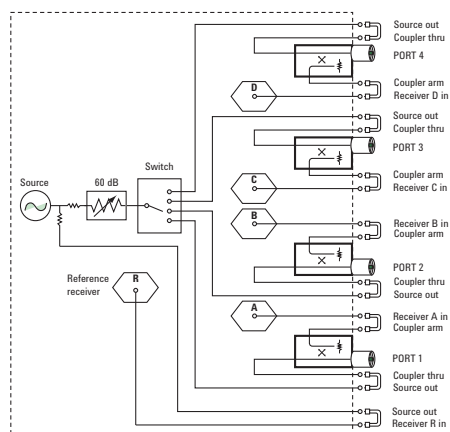
2-port configurable test set and extended power range



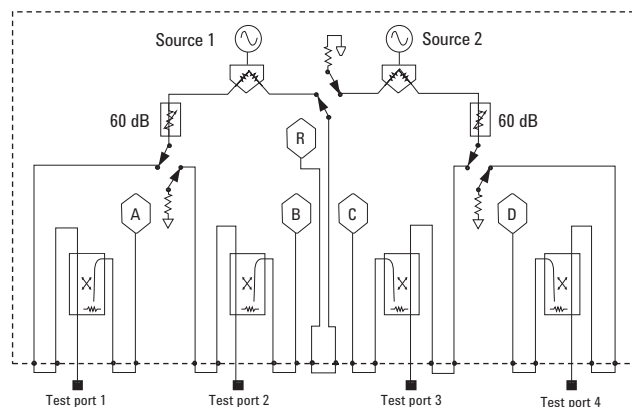
4-port standard test set



4-port configurable test set and extended power range



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



PNA Family Application Options

Measurement applications

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

PNA: Available on PNA Series

PNA: Not available on PNA Series

Time domain (Option 010)

PNA-X PNA PNA-L

This option 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.

Frequency offset (Option 080)

PNA-X PNA PNA-L

This option enables the analyzer to set the source frequency independently from where the receivers are tuned. This ability is important for measuring amplifiers, mixers, and frequency converters.

Scalar-calibrated converter measurements (Option 082)

PNA-X PNA PNA-L

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. Option 082 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 Agilent ESG, PSG, and MXG Series, as well as other SCPI-controlled signal generators. Option 082 requires Option 080, and cannot be ordered with Option 083. It is compatible with Option 084, which enables measurements of converters with internal LOs.

Vector- and scalar-calibrated converter measurements (Option 083)

PNA-X PNA PNA-L

This application includes the new scalar mixer/converter plus phase measurement class which provides fully calibrated conversion gain/loss, relative phase, and absolute group delay measurements of mixers and converters without the need for a reference mixer. A vector mixer/converter measurement class is also included for measurements with the least amount of trace noise for phase/delay measurements. Option 083 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 Agilent ESG, PSG, and MXG Series, as well as other SCPI-controlled signal generators. Option 083 requires Option 080, and cannot be ordered with Option 082. It is compatible with Option 084, which enables measurements of converters with internal LOs.

Embedded LO measurements (Option 084)

PNA-X PNA PNA-L

This option 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. For converters with embedded LOs, this option enables measurements of match-corrected conversion loss/gain and absolute group delay (requires Option 082 or 083), gain compression versus frequency (requires Option 086), intermodulation distortion (requires Option 087), and noise figure (requires Option 028, 029, or H29).

Gain compression application (Option 086)

PNA-X PNA PNA-L

The Gain Compression Application (GCA) provides input power, output power, gain, and phase at the compression point of an amplifier or frequency converter, over a specified frequency and power 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.

Intermodulation distortion application (Option 087)

PNA-X PNA PNA-L

The intermodulation distortion (IMD) application makes it very easy to set up and calibrate swept-IMD measurements of both amplifiers and frequency converters. It controls the frequency and power of internal and external sources and tunes the receivers at main tones as well as IMD tones in the single measurement channel. The user can sweep either the center frequency of the two stimulus signals, the frequency spacing of the two stimulus signals about a fixed center frequency, or the power of one or both stimulus signals or the power of the LO signal. The analyzer can measure intermodulation distortion products of order 2, 3, 5, 7, or 9, and can display the associated intercept points. In addition, an IM Spectrum mode gives a spectrum-analyzer-like display for con firming or trouble-shooting measurements. Requires Option 080. Not available with PNA Option 200 and 400.

Source phase control (Option 088)

PNA-X PNA PNA-L

This option allows users to set calibrated, arbitrary phase differences between two signal sources. The sources can be the analyzer's internal sources or external signal generators routed through the analyzer's test set. The phase difference can be fixed, or swept between two specified phase values. Option 088 also controls the relative power level between the sources using the receiver-leveling feature. Option 088 is useful for two applications. The first is for active-load control, where the analyzer provides a precise, electronically settable impedance to the output port of a device, while gain and output power are measured. This capability can be combined with external load-pull software to create traditional load-pull power contours. The second application is to provide a pair of phase-controlled sources for differential, quadrature, or arbitrary phase-off set signals at a fixed or swept frequency. Typically in this case, another instrument, receiver, or detector would be used to measure the response of the DUT. Not available with PNA Option 200.

PNA Family Application Options *(continued)*

Measurement applications *(continued)*

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

PNA: Available on PNA Series

PNA: Not available on PNA Series

Integrated true-mode stimulus application (Option 460)

PNA-X PNA PNA-L

Integrated true-mode stimulus application (iTMSA) provides mismatch-corrected true-mode (true differential and true common) stimulus and enables accurate balanced measurements under real operating conditions. iTMSA also provides balanced measurements with forward-only sweep, reverse-only sweep, and frequency or power sweep with arbitrary phase and amplitude offsets. Requires one of Options 400, 401, 417, 419 and 423.

4-port measurement application (Option 550)

PNA-X PNA PNA-L

Adds multiport analyzer mode to any 2-port PNA-L network analyzer with configurable test set (Option xx5), which enables full 4-port error correction and measurement capabilities using an external test set. Only standard measurement class is available in the multiport analyzer mode.

N-port capabilities (Option 551)¹

PNA-X PNA PNA-L

Adds a multiport analyzer mode, which enables full N-port error correction and measurement capabilities using an external test set. Only standard measurement class is available in the multiport analyzer mode.

Noise figure options

Noise figure measurements using standard receivers (Option 028)

PNA-X PNA PNA-L

This option adds firmware for high-accuracy noise figure measurements of amplifiers, frequency converters, and mixers using the analyzer's standard receivers, and utilizing Agilent's unique source-correction technique. Using an Agilent ECal module configured as an impedance tuner, the effects of imperfect system source match are removed, greatly improving the accuracy of the cold-source technique. This approach surpasses the accuracy provided by the Y-factor method. For fully corrected noise figure measurements, this option requires an ECal module (m-f recommended) and a power meter (both must be ordered or supplied separately). A scalar calibration choice is also available that offers less accuracy, but is faster and does not require the ECal module used as an impedance tuner. The power meter is only used during calibration of the analyzer. During calibration of the analyzer, an additional ECal or mechanical calibration kit is required (also must be ordered or supplied separately). To use the recommended m-f ECal module as a tuner (N4691B/93A/94A-M0F), Option 028 includes a semi-rigid cable and a m-f adapter (3.5 mm N5242-20137 and 85052-60013 for N5241A/2A and N5221A/2A, 2.4 mm N5245-20140 and 85056-60007 for N5244A/5A and N5224A/5A, or 1.85 mm N5247-20142 and 85058-60115 for N5247A/27A). For use with f-f ECal modules (N4691B/3A/4A-00F), order a m-m adapter (3.5 mm 85052-60014, 2.4 mm 85056-60005, or 1.85 mm 85058-60113). No external preamplifier is required for devices with 30 dB or more of excess noise (gain plus noise figure). Front panel jumpers provide a convenient spot for adding a preamplifier and filter(s) for low gain, low noise figure devices.

1. When configured N524xA as a multiport analyzer using Option 551 and a multiport test set, the combiner feature of Option 224 or 423 is temporarily disabled. When configured as a standalone analyzer, the combiner feature is enabled. When ordering a test set, select an appropriate interface kit. Refer to page 23 Multiport Measurements for more details.

PNA Family Application Options (continued)

Noise figure options (continued)

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

PNA: Available on PNA Series

PNA: Not available on PNA Series

□ Fully-corrected noise figure measurements (Option 029)

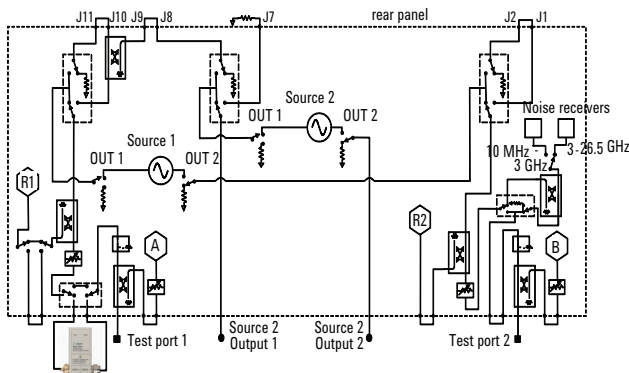
PNA-X PNA PNA-L

This option adds high-sensitivity noise receivers and firmware to the N5241A/2A PNA-X for high-accuracy noise figure measurements of amplifiers, frequency converters, and mixers, utilizing Agilent's unique source-correction technique. Using an Agilent ECal module configured as an impedance tuner, the effects of imperfect system-source match are removed, greatly improving the accuracy of the cold-source technique. This approach surpasses the accuracy provided by the Y-factor method. For fully corrected noise figure measurements, this option requires a 3.5 mm N4691B ECal module (m-f recommended) and a 346C noise source (both must be ordered or supplied separately). A scalar calibration choice is also available that offers less accuracy, but is faster and does not require the ECal module used as an impedance tuner. For measurements of mixers and converters, a power meter is also required. The noise source and power meters are only used during calibration of the analyzer. During calibration of the analyzer, an additional ECal or mechanical calibration kit is required (also must be ordered or supplied separately). To use a 3.5 mm m-f ECal module as a tuner (N4691B-M0F), Option 029 includes a 3.5 mm semi-rigid cable (N5242-20137) and 3.5 mm m-f adapter (85052-60013). For use with 3.5 mm f-f ECal modules (N4691B-00F), order a 3.5 mm m-m adapter (85052-60014). Option 029 also allows noise figure measurements using the standard receivers for high-gain (> 60 dB) devices that might otherwise overload the noise receivers.

□ Add 26.5 GHz noise receivers (Option H29)

PNA-X PNA PNA-L

This option adds 26.5 GHz high-sensitivity noise receivers to N5244A 43.5 GHz and N5245A 50 GHz PNA-X models. The option also enables use of the standard receivers for noise figure measurements up to 43.5 or 50 GHz. Both receiver choices yield high-accuracy noise figure measurements of amplifiers, frequency converters and mixers, utilizing Agilent's unique source-correction technique. Using the PNA-X and an Agilent ECal module configured as an impedance tuner, the effects of imperfect system-source match are removed, greatly improving the accuracy of the cold-source technique. This approach surpasses the accuracy provided by the Y-factor method. For fully corrected noise figure measurements, this option requires an ECal module (2.4 mm N4693A m-f recommended) and a 346C noise source (both must be ordered or supplied separately). A scalar calibration choice is also available that offers less accuracy, but is faster and does not require the ECal module used as an impedance tuner. For measurements of mixers and converters, a power meter is also required. The noise source and power meter are only used during calibration of the analyzer. During calibration of the analyzer, an additional ECal or mechanical calibration kit is required (also must be ordered or supplied separately). To use a 2.4 mm m-f ECal module as a tuner (N4693A-M0F), Option H29 includes a 2.4 mm semi-rigid cable (N5245-20140) and 2.4 mm m-f adapter (85056-60007). For use with f-f ECal modules (N4693A-00F), order a 2.4 mm m-m adapter (85056-60005). For use with 3.5 mm m-f ECal modules (N4691B-M0F), order two 2.4 mm to 3.5 mm m-f adapters (11901C), plus a 3.5 mm semi-rigid cable (N5242-20137) and a 3.5 mm m-f adapter (85052-60013). For use with 3.5 mm f-f ECal modules (N4691B-00F), order two 2.4 mm to 3.5 mm m-f adapters (11901C), plus a 3.5 mm semi-rigid cable (N5242-20137) and a 3.5 mm m-m adapter (85052-60014).



Noise figure options summary

Overview	Option 028	Option 029	Option H29
Description	Noise figure application using standard receivers only, for all PNA-X/PNA models.	Noise figure application using standard or low-noise receivers, for N5241A/2A models.	Noise figure application using standard or low-noise receivers, for N5244A/5A models.
Required options	082 or 083 for measuring frequency converters.	One of 219, 224, 419, 423, or H85, and for measuring frequency converters, requires Option 082 or 083.	423 and for measuring frequency converters, requires Option 082 or 083.
Includes low-noise receivers	No	Yes	Yes, up to 26.5 GHz
Includes filters for LO-harmonic rejection	No	Yes	Yes, up to 26.5 GHz
Includes source tuner bypass switch	No	Yes	Yes
Use standard receivers for noise figure measurements ¹	Yes	Yes	Yes
Vector noise calibration available (using ECal as tuner)	Yes	Yes	Yes
Scalar noise calibration available	Yes	Yes	Yes
Recommended ECal for vector noise calibration	N4691B-M0F (N52x1A/2A), N4693A-M0F (N52x4A/5A) N4694A-M0F (N52x7A)	N4691B-M0F	N4693A-M0F
S-parameter, conversion gain/loss measurements			
Max freq (GHz)	13.5/26.5/43.5/50/67	13.5/26.5	43.5/50
Noise figure measurements, amplifiers			
Max frequency, using low-noise receivers (GHz)	N/A	13.5/26.5	26.5
Max frequency, using standard receivers (GHz) ¹	13.5/26.5/43.5/50/67	13.5/26.5	43.5/50
Calibration accessories for low-noise receivers	N/A	Cal kit or ECal, 346C noise source	Cal kit or ECal, 346C noise source
Calibration accessories for standard receivers	Cal kit or ECal, power meter	Cal kit or ECal, power meter	Cal kit or ECal, power meter
Noise figure measurements, converters			
Max input frequency (GHz)	13.5/26.5/43.5/50/67	13.5/26.5	43.5/50
Max output frequency, using low-noise receivers (GHz)	N/A	13.5/26.5	26.5
Max output frequency, using standard receivers (GHz) ¹	13.5/26.5/43.5/50/67	13.5/26.5	43.5/50
Calibration accessories for low-noise receivers	N/A	Cal kit or ECal, 346C noise source, power meter	Cal kit or ECal, 346C noise source, power meter
Calibration accessories for standard receivers	Cal kit or ECal, power meter	Cal kit or ECal, power meter	Cal kit or ECal, power meter

1. External preamp and filter(s) required if DUT gain + NF < 30 dB

PNA Family Application Options *(continued)*

Pulse, antenna, mm-wave

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

PNA: Available on PNA Series

PNA: Not available on PNA Series

Pulsed-RF measurements (Option 008)

PNA-X **PNA** **PNA-L**

This option adds narrowband pulse detection mode and extends the pulsed-RF measurement capability to narrower pulse widths below the limit for the standard wideband detection mode. The PNA-X and PNA are complete pulsed-RF solutions with built in pulse generators and modulators, so external test sets and pulse generators are not required. With narrowband detection mode, Option 008 sets the coefficient of the analyzer's digital-IF filters to null out unwanted spectral components, enables the internal receiver IF gates, controls internal pulse generators (Option 025), internal pulse modulators (Option 021 and/or 022), and external pulse modulators, and performs optimization for measurement sensitivity. Option 008 also includes conventional pulsed-RF measurement software (Option H08). Option 025 is required. Option 021 is recommended for forward-only pulsed-RF measurements. Option 021 and 022 are recommended for bi-directional pulsed-RF measurements. The N1966A pulse I/O adapter is recommended if using external pulse generators and/or external pulse modulators

Add IF inputs for antenna and millimeter-wave (Option 020)

PNA-X **PNA** **PNA-L**

This option enables external IF inputs on the rear panel of the analyzer for applications such as antenna and millimeter-wave test.

Add pulse modulator to internal first source (Option 021)

PNA-X **PNA** **PNA-L**

This option enables the internal pulse modulator on Source1 Out1. Control of the modulator can also be done via pin 8 of the Pulse I/O D-sub connector on the rear panel of the analyzer using an external pulse generator, or by using one of the internal pulse generators (Option 025). The N1966A pulse I/O adapter is recommended if using an external pulse generator.

Add pulse modulator to internal second source (Option 022)

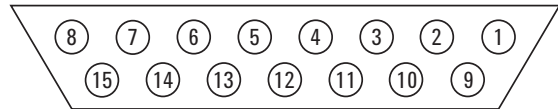
PNA-X **PNA** **PNA-L**

This option enables the internal pulse modulator on Source2 Out1. Control of the modulator can also be done via pin 8 of the Pulse I/O D-sub connector on the rear panel of the analyzer using an external pulse generator, or by using one of the internal pulse generators (Option 025). The N1966A pulse I/O adapter is recommended if using an external pulse generator. Option 224 or 400 is required for PNA-X, and one of Option 400, 401, 417, or 419 is required for PNA.

Add four internal pulse generators (Option 025)

PNA-X **PNA** **PNA-L**

This option enables four internal pulse generators. These pulse generators can be used to control the internal pulse modulators and internal receiver IF gates, and are also available on pins 10 through 13 of the Pulse I/O D-sub connector on the rear panel of the analyzer to control external modulators and/or gates. The N1966A pulse I/O adapter is recommended if using external pulse modulators.



Pulse I/O D-sub connector (DB-15 female)

Fast CW Sweep (Option 118)

PNA-X **PNA** **PNA-L**

This option uses FIFO (first-in first-out) to allow external point-trigger acquisition of 400,000 data points per second on five measurement receivers. When enabled, there is no display update, no background computation, or other interference from the vector network analyzer application. All the data gathered is placed into a 500 million points FIFO buffer. While the data is going into FIFO it can be read from the FIFO buffer.

Nonlinear vector network analysis

Please refer to 5989-8575EN Nonlinear Vector Network Analyzer brochure for more information.

PNA Family Application Options *(continued)*

Accessories

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

PNA: Available on PNA Series

PNA: Not available on PNA Series

Rack mount kit without handles (Option 1CM)

PNA-X PNA PNA-L

Adds a rack mount (5063-9217) and rail kit (E3663AC) for use without handles.

Rack mount kit with handles (Option 1CP)

PNA-X PNA PNA-L

Adds handles (5063-9230), a rack mount (5063-9237) and rail kit (E3663AC) for use with handles.

Pulse I/O adapter (N1966A)

PNA-X PNA PNA-L

An adapter for connecting between the Pulse I/O connector on the rear panel of the analyzer and the coaxial inputs and outputs of external pulse generators and external pulse modulators. Coaxial connectors are SMB-male. The PULSE IN connectors are for controlling the analyzer's internal IF gates, which are enabled with Option 008 and used with narrowband detection. The PULSE OUT connectors are from the four internal pulse generators, which are enabled with Option 025. The PULSE SYNC IN connector is used to synchronize the internal pulse generators with an external timing pulse. The RF PULSE MOD IN connector controls the internal pulse modulator(s) which are enabled with Options 021 and 022.



Pulse I/O adapter (N1966A) simplifies connections

10 MHz to 26.5 GHz comb generator (U9391C)

PNA-X PNA PNA-L

The U9391C generates frequency harmonics from an input RF signal of up to 26.5 GHz and provides precision phase calibration, traceable to the National Institute of Standards and Technology (NIST) standard, for nonlinear measurements using the PNA-X nonlinear vector network analyzer (NVNA). NVNA requires two comb generators, one is connected during measurements and another is used only during calibration.

10 MHz to 50 GHz comb generator (U9391F)

PNA-X PNA PNA-L

The U9391F generates frequency harmonics from an input RF signal of up to 50 GHz and provides precision phase calibration, traceable to the National Institute of Standards and Technology (NIST) standard, for nonlinear measurements using the PNA-X nonlinear vector network analyzer (NVNA). NVNA requires two comb generators, one is connected during measurements and another is used only during calibration.



Comb generator enables vector-corrected measurements in fundamental/harmonic frequencies

PNA Family Network Analyzer Upgrades

PNA-X/PNA upgrade kits

Upgrade kits are available to add options after initial purchase. To upgrade the PNA-X/PNA, order the corresponding item number. The model and serial numbers of the instrument to be retrofitted are required as part of the order.

Description	Required option	For PNA-X Series	For PNA Series	User installable
Frequency upgrade¹				
Extend analyzer's frequency range to 26.5 GHz	N5241A or N5221A	N5241AU-960	N5221AU-960	No
Extend analyzer's frequency range to 50 GHz	N5244A or N5224A	N5244AU-990	N5224AU-990	No
Test ports				
Expand 2-ports, single source without configurable test set to 4-ports	N522xA-200	n/a	N522xAU-600	No
Expand 2-ports, single source with configurable test set to 4-ports	N524xA-200 or N522xA-201	N524xAU-940	N522xAU-601	No
Expand 2-ports, single source, with extended power range to 4-ports	N522xA-217	n/a	N522xAU-617	No
Expand 2-ports, single source, with extended power range and bias-tees to 4-ports	N524xA-219 or N522xA-219	N524xAU-942	N522xAU-619	No
Expand 2-ports, with extended power range, internal second source, combiner and mechanical switches to 4-ports	N524xA-224	N524xAU-944	n/a	No
Test set and power configuration				
Add configurable test set, 2-ports	N522xA-200	n/a	N522xAU-201	No
Add extended power range, 2-ports ²	N522xA-201	n/a	N522xAU-217	No
Add bias-tees, 2-ports ²	N522xA-217	n/a	N522xAU-219	No
Add extended power range and bias-tees, 2-ports	N524xA-200 or N5227A-201	N524xAU-921	N5227AU-217/219	No
Add internal 2nd source, combiner and mechanical switches, 2-ports	N524xA-219	N524xAU-922	n/a	No
Add high power configurable, 2-ports	N524xA-219 or 224	N524xAU-H85	n/a	No
Add configurable test set, 4-ports	N522xA-400	n/a	N522xAU-401	No
Add extended power range, 4-ports ²	N522xA-401	n/a	N522xAU-417	No
Add bias-tees, 4-ports ²	N522xA-417	n/a	N522xAU-419	No
Add extended power range and bias-tees, 4-ports	N524xA-400 or N5227A-401	N524xAU-926	N5227AU-417/419	No
Add internal combiner and mechanical switches, 4-ports	N524xA-419	N524xAU-927	n/a	No
Add high power configurable, 4-ports	N524xA-419 or 423	N524xAU-H85	n/a	No

1. Frequency upgrade options from 13.5/26.5 GHz to 43.5/50 GHz and 43.5/50 GHz to 67 GHz are not available. Trade-in is recommended.

2. Not available on N5227A.

PNA Family Network Analyzer Upgrades

PNA-X/PNA upgrade kits *(continued)*

Upgrade kits are available to add options after initial purchase. To upgrade the PNA-X/PNA, order the corresponding item number. The model and serial numbers of the instrument to be retrofitted are required as part of the order.

Description	Required option	For PNA-X Series	For PNA Series	User installable
Measurement applications				
Time-domain measurements		N524xAU-010	N522xAU-010	Yes
Noise figure measurements using standard receivers	see Footnote 1	N524xAU-028	N522xAU-028	Yes
Fully-corrected noise figure measurements for N5241A/2A, 2-ports	Option 219, 224 or H85 ¹	N524XAU-924	n/a	No
Fully-corrected noise figure measurements for N5241A/2A, 4-ports	Option 419, 423, or H85 ¹	N524xAU-929	n/a	No
Add 26.5 GHz noise receiver for N5244A/5A, 4-ports	Option 423 ¹	N524xAU-H29	n/a	No
Frequency offset		N524xAU-080	N522xAU-080	Yes
Scalar-calibrated converter measurements	Option 080	N524xAU-082	N522xAU-082	Yes
Vector- and scalar-calibrated converter measurements	Option 080	N524xAU-083	N522xAU-083	Yes
Embedded LO measurements	Option 028, 029, H29, 082, 083, 086, or 087	N524xAU-084	N522xAU-084	Yes
Gain compression application	See Footnote 1	N524xAU-086	N522xAU-086	Yes
Intermodulation distortion application	Option 080 ^{1, 2}	N524xAU-087	N522xAU-087	Yes
Source phase control	See Footnote 3	N524xAU-088	N522xAU-088	Yes
Integrated true-mode stimulus application	Option 400, 401, 417, 419, or 423	N524xAU-460	N522xAU-460	Yes
N-port capabilities	See Footnote 4	N524xAU-551	N522xAU-551	Yes
Pulse, antenna, mm-wave				
Pulsed-RF measurements	Option 025 ¹	N524xAU-008	N522xAU-008	Yes
Add IF inputs		N524xAU-020	N522xAU-020	Yes
Add pulse modulator to internal 1st source		N524xAU-021	N522xAU-021	Yes
Add pulse modulator to internal 2nd source	Option 224, 400, 401, 417, 419, or 423	N524xAU-022	N522xAU-022	Yes
Add four internal pulse generators		N524xAU-025	N522xAU-025	Yes
Fast CW sweep		N524xAU-118	N522xAU-118	Yes
Nonlinear vector network analysis				
Nonlinear component characterization	Options 419 and 080, or 400, H85 and 080	N524xAU-510	n/a	Yes
Nonlinear X-parameters	Options 423 and 510	N524xAU-514	n/a	Yes
Nonlinear pulse envelope domain	Options 021, 025, and either one of 510 or 514	N524xAU-518	n/a	Yes
Arbitrary load-impedance X-parameters	Option 514	N524xAU-520	n/a	Yes
Calibration software				
Perpetual license for built-in performance test software for Agilent inclusive calibration		N524xAU-897	N522xAU-897	Yes
Perpetual license for built-in performance test software for standard compliant calibration		N524xAU-898	N522xAU-898	Yes

1. For measuring frequency converters, Option 082 or 083 is required.

2. Two-tone signal must be routed to R1 receiver after an external combiner; therefore it is not available with N522xA-200 and 400.

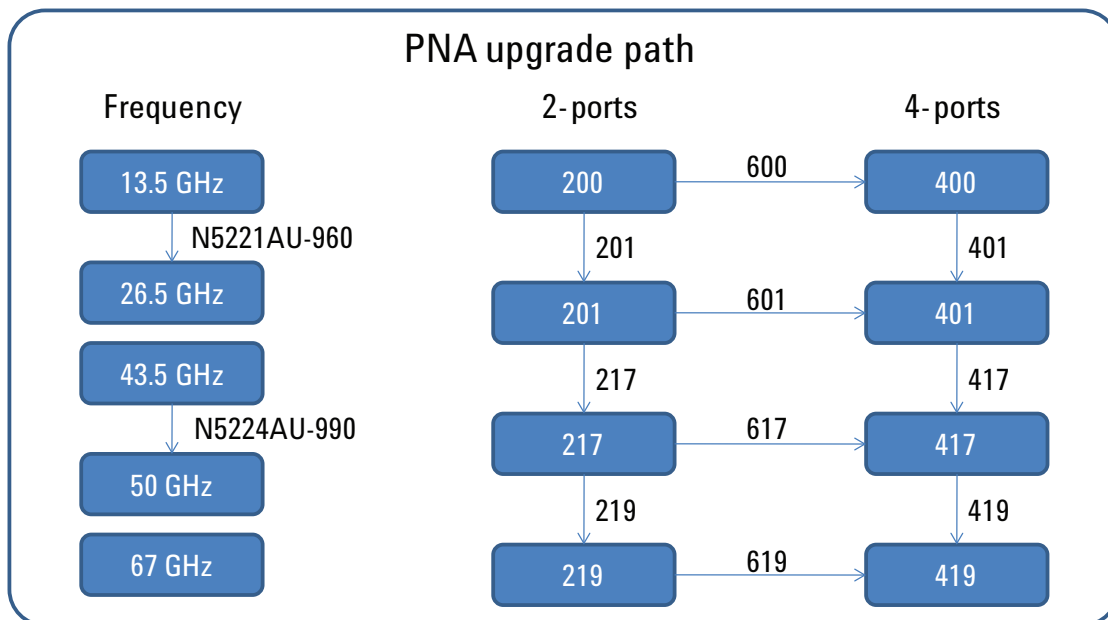
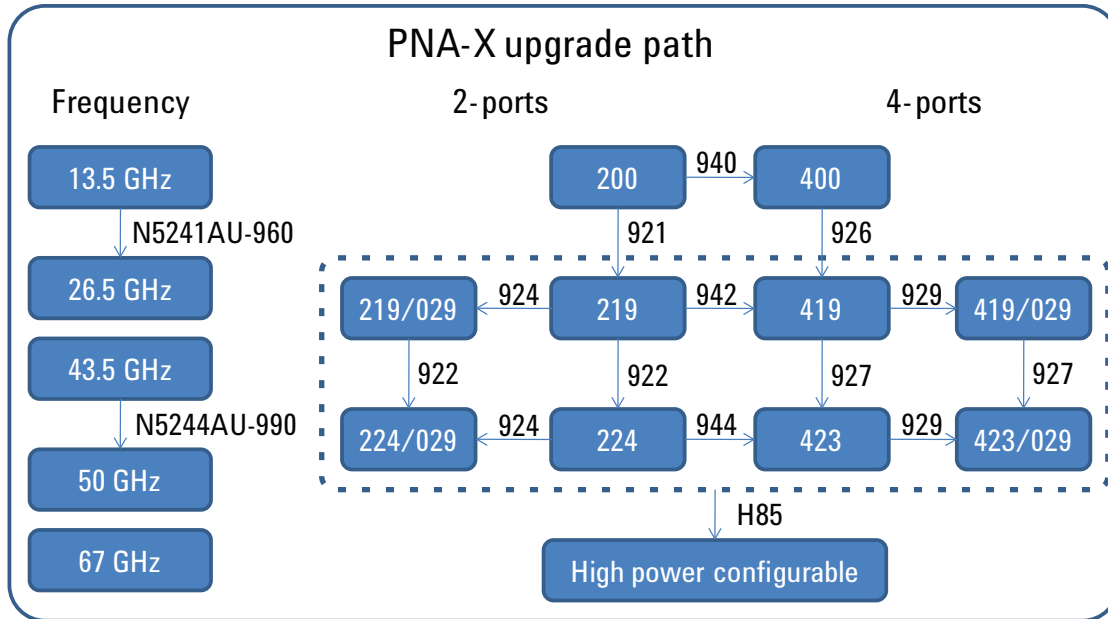
3. When used with an external signal generator, configurable test set is required to access a receiver. Therefore it is not available with N522xA-200.

4. To connect a multiport test set, configurable test set is required. Therefore it is not available with N522xA-200 and 400.

PNA Family Network Analyzer Upgrades

PNA-X/PNA upgrade kits (continued)

Upgrade kits are available to add options after initial purchase. To upgrade the PNA-X/PNA, order the corresponding item number. The model and serial numbers of the instrument to be retrofitted are required as part of the order.

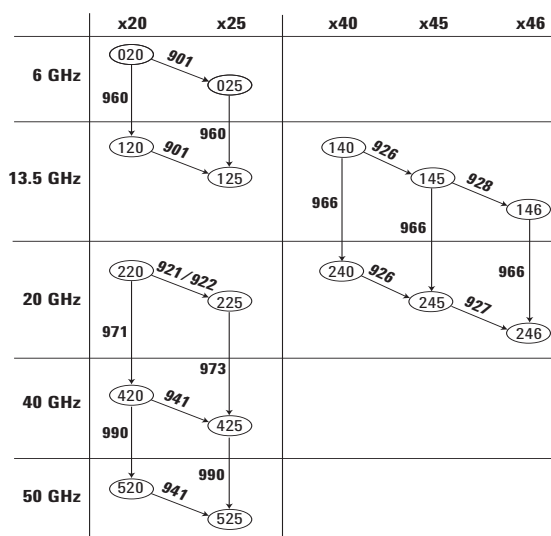


PNA Family Network Analyzer Upgrades

PNA-L upgrade kits

Upgrade kits are available to add options after initial purchase. To upgrade the PNA-L, order the corresponding item number. The model and serial numbers of the instrument to be retrofitted are required as part of the order.

Description	Required option	For PNA-L Series	User installable
Frequency upgrade¹			
Extend analyzer's frequency range to 13.5 GHz	N5230C-020 or 025	N5230CU-960	No
Extend analyzer's frequency range to 20 GHz	N5230C-140, 145, or 146	N5230CU-966	No
Extend analyzer's frequency range to 40 GHz	N5230C-220	N5230CU-971	No
Extend analyzer's frequency range to 40 GHz	N5230C-225	N5230CU-973	No
Extend analyzer's frequency range to 50 GHz	N5230C-420, or 425	N5230CU-990	No
Test set and power configuration			
Add configurable test set and extended power range to 6 or 13.5 GHz PNA-L	N5230C-020 or 120	N5230CU-901	No
Add configurable test set and extended power range to 20 GHz PNA-L, 2-ports	N5230C-220	N5230CU-922	No
Add configurable test set and extended power range to 40 or 50 GHz PNA-L, 2-ports	N5230C-420 or 520	N5230CU-941	No
Add configurable test set and extended power range to 13.4 or 20 GHz PNA-L, 4-ports	N5230C-140 or 240	N5230CU-926	No
Add internal second source to 13.5 GHz PNA-L, 4-ports	N5230C-145	N5230CU-928	No
Add internal second source to 20 GHz PNA-L, 4-ports	N5230C-245	N5230CU-927	No
Measurement applications			
Time-domain measurements		N5230CU-010 or N5231CU-010 ¹	Yes
Frequency offset		N5230CU-080	Yes
Scalar-calibrated converter measurements	Option 080	N5230CU-082	Yes
4-port measurement application	Option x25	N5230CU-550	Yes
N-port capabilities	Option xx5 or 246	N5230CU-551 or N5231CU-551 ²	Yes
Calibration software			
Perpetual license for built-in performance test software for Agilent inclusive calibration		N5230CU-897	Yes
Perpetual license for built-in performance test software for standard compliant calibration		N5230CU-898	Yes
User interface			
PNA-L A to C model upgrade, 2-ports	N5230A-x2x	N5230AU-221	No
PNA-L A to C model upgrade, 4-ports	N5230A-x4x	N5230AU-241	No



PNA-L upgrade path examples.

1. For 6 GHz PNA-L (N5230C-02x), order N5231CU-010. For other frequency options, order N5230CU-010.
2. For 6, 13.5, 20 GHz PNA-L, order N5231CU-551. For 40 and 50 GHz PNA-L, order N5230CU-010.

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 , $\tan \delta$ 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 , $\tan \delta$, or Cole-Cole μ). The software can be run in the PNA analyzer or on a PC.

Signal integrity measurements

- **N1930B** Physical Layer Test System (PLTS) Software
The PLTS software platform has become an industry standard for calibration, measurement and analysis of linear passive interconnects such as cables, connectors, backplanes and printed circuit boards. Utilizing either a vector network analyzer (VNA) or a time domain reflectometer (TDR), fast and accurate measurements can be obtained without in-depth knowledge of microwave measurement techniques. Refer to www.agilent.com/find/plts or the technical overview, literature number 5989-6841EN for more details.

Multiport measurements

The multiport test sets are designed to work with the PNA Family of network analyzers and provide network analysis with a single set of connections for devices that have multiple ports. The test sets are configured in a variety of ways, for extension or switching, electro-mechanical or solid-state switches, number of test ports, frequency range, and 2- or 4-ports depending on your analyzer.

Test set types—extension and switching test sets

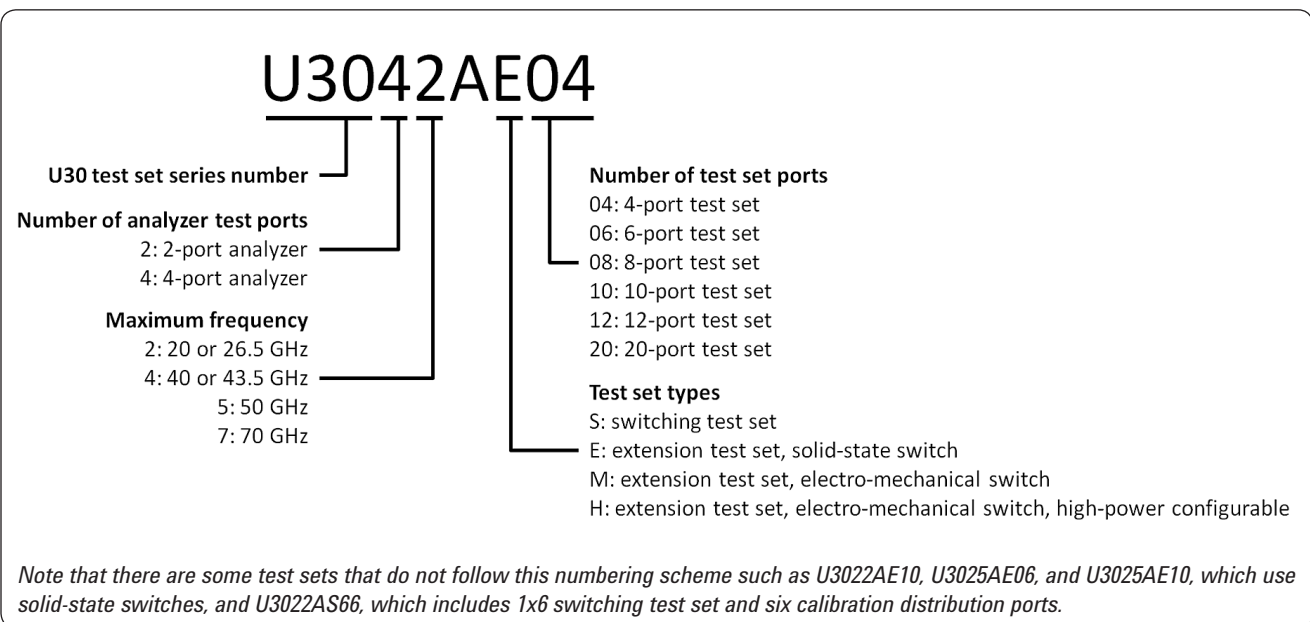
Switching test sets provide an economical solution for RF applications. This test set is connected to the test ports of the VNA, and group of test ports share the directional couplers and receivers in the VNA. An extension test set is connected to the sources and test receivers through configurable test set of the VNA. It features a directional coupler for every test port and all switching occurs behind the directional couplers, which provides the ultimate in flexibility, stability, and performance for RF and microwave applications.

Switch types – electro-mechanical and solid-state switches

The electro-mechanical switches have less insertion loss, higher power handling, and linear responses. Thus it is recommended for testing active devices, high-power devices, and devices that require wide dynamic range. However, they have limited switching life (mostly 5 million cycles) and long setting time. On the other hand, the solid-state switches have unlimited switching life, very fast switching speed and excellent repeatability thus they are often used for high volume passive device tests, and S-parameter measurements of passive components can be performed.

Test set model number

Multiport test set model numbers represent the test set types, note the numbering scheme below.



Test set options

One of the following test set options must be selected.

Standard configuration (Option 700)

The standard configuration is the basic test set configuration, which does not include signal conditioning devices such as amplifiers.

Add amplifiers for improved dynamic range (Option 001)

Option 001 adds an amplifier between each test port coupler and the receiver switch to improved system dynamic range. It is primarily offered for the test set with solid-state switches to compensate for the insertion loss.

Add amplifiers and bias-tees (Option 002)

Option 002 adds an amplifier between each test port coupler and the receiver switch to improved system dynamic range and bias-tees for all test ports on the test set as well as the analyzer. It is primarily offered for the test set with solid-state switches to compensate for the insertion loss.

Interface kits

The interface kit includes a set of semi-rigid RF jumper cables and two pairs of rear rocking feet that connect and lock the analyzer and the test set together. When ordering a multiport test set, the analyzer that is used with the test set must be specified to add one of the following interface kits. The availability depends on the test set model. There are following three interface kit models based on the jumper connector layouts on the test set. Therefore, only one interface kit model ("PX", "PN", or "PL") is available on each test set. Each interface kit model has one digit suffix indicating the connector type; 1 for 1.85 mm, 2 for 2.4 mm and 3 for 3.5 mm (or SMA).

- U3021PXx** Interface kit for test set with jumper connectors to align with N524xA PNA-X and N522xA PNA
- U3021PNx** Interface kit for test set with jumper connectors to align with E836xB/C PNA and N5230A/C-x25 2-port PNA-L
- Option 261** For use with E8361A/C 2-port PNA
- Option 262** For use with E8362B/C 2-port PNA or N5230A/C-225 2-port PNA-L
- Option 263** For use with E8363B/3C/4B/4C 2-port PNA or N5230A/C-425/525 2-port PNA-L
- Option 430** For use with N5230A/C-245/246 4-port PNA-L
- Option 242** For use with N5241A/2A-2xx 2-port PNA-X or N5221A/2A-2xx 2-port PNA
- Option 442** For use with N5241A/2A-400 4-port PNA-X or N5221A/2A-4xx 4-port PNA
- Option 245** For use with N5244A/5A-200 2-port PNA-X or N5224A/5A-2xx 2-port PNA
- Option 445** For use with N5244A/5A-400 4-port PNA-X or N5224A/5A-4xx 4-port PNA
- Option 247** For use with N5247A-200 2-port PNA-X or N5227A-2xx 2-port PNA
- Option 447** For use with N5247A-400 4-port PNA-X or N5227A-4xx 4-port PNA

When ordering an additional cable set, a spare cable or rear locking feet, refer to the multiport test set user's guide or go to: www.agilent.com/find/multiport

Millimeter-wave measurements

Single sweep solution to 110 GHz

The 67 GHz PNA and PNA-X network analyzers allow extending the maximum frequency to 110 GHz with a 1.0 mm coaxial connector, enabling 10 MHz to 110 GHz single sweep measurements using a millimeter-wave controller and frequency extenders with built-in combiner.

The 10 MHz to 110 GHz broadband millimeter-wave system provides high performance and capabilities including power control, 4-port true-differential, and frequency converter measurements. It is configured with an N5227A PNA with Option 201 (2-ports) or Option 401 (4-ports), or N5247A with Option 200 (2-ports) or Option 400 (4-ports), Option 020 IF access, an N5261A 2-port or an N5262A 4-port millimeter-wave test set controller with 1.85 mm coaxial cables (Option 112 for N5261A, Option 114 for N5262A) and RF/LO/IF/DC cables sets (to select the cable length and quantities), and one (for 2-ports) or two (for 4-ports) each of right and left frequency extenders with required attenuators and bias-tee configurations.

Waveguide banded solutions to 1.05 THz

The waveguide banded millimeter-wave solution covers waveguide bands from 50 GHz to 1.05 THz. A 2- or 4-port PNA or PNA-X in conjunction with N5261A (for 2-port) or N5262A (for 4-port) configures for the most complete millimeter wave solution. It is configured with a PNA Series with Option 020 IF access, configurable test set (Option 201 or 401), and frequency offset mode (Option 080), or PNA-X Series with 2-port (Option 200) or 4-port (Option 400) and IF access (Option 020). For the millimeter-wave test controller, appropriate RF cable option and RF/LO/IF/DC cable set option for frequency extenders must be selected for the analyzer's connector type, number of test ports, and lengths. Add appropriate frequency extenders with required quantity for the measurements.

For complete list of millimeter-wave products and options, and ordering instructions, please refer to 5989-7620EN Millimeter-wave Network Analyzers Technical Overview.

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

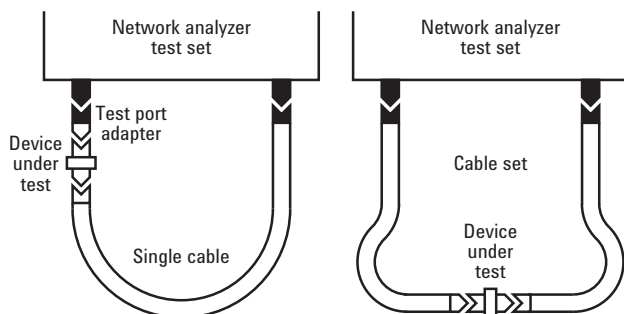
Agilent offers cables in the following types:

- 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

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

- N4697E²** Single, flexible: 1.85 mm (f) to 1.85 mm (f), 96.5 cm, 38 inches
- N4697F²** 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
- N4421B-K67** Single, flexible: 1.85 mm (f) to 1.85 mm (m), 91.4 cm, 36 inches

Adapter set

- 85130H²** 1.85 mm 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

Note: Agilent offers the following 2.4 mm test port cables. Adapters will be necessary when using these cables for 2.92 mm measurements.

- **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
- **85133H**¹ Single, flexible: 2.4 mm (f) to 2.4 mm (m), 63 cm, 25 inches
- **N4421AK20** Single, flexible: 2.4 mm (f) to 2.4 mm (m), 91.4 cm, 36 inches

Adapter set

- **85130F** 2.4 mm¹ to 3.5 mm
- **85130F** 2.5 mm¹ to 3.5 mm
- **85130G** 2.4 mm¹ to 2.4 mm

For devices with K connectors (2.92 mm)

Mechanical calibration kits

- **85056KE01** DC to 40 GHz

For use with user supplied 2.9 mm test port cables. 2.92 mm (K connector) calibration kit with fixed and sliding loads. The Agilent 85056KE01 calibration kit is an ordering convenience to allow the pass through ordering from Agilent Technologies, Inc. for the Maury 8770C47 calibration kit.

- **85056KE02** DC to 40 GHz

For use with user supplied 2.92 mm test ports cables. 2.92 mm (K connector) calibration kit with fixed loads only. The Agilent 85056KE02 calibration kit is an ordering convenience to allow the pass through ordering from Agilent Technologies, Inc. for the Maury 8770D47 calibration kit.

The 85056KE01 and 85056KE02 contains one NMD 2.4 mm² (f) to 2.92 mm (f) and one NMD 2.4 mm² (f) to 2.92 mm (m) test port adapter to adapt the 2.4 mm test ports of the PNA to 2.92 mm. It also supplies 2.92 mm to 2.92 mm in-series adapters (3 adapters) and a PNA Cal Coefficients on a USB stick. Users must supply their own 2.92 mm or K-connector test port cables. Also included is a 2.92 mm torque wrench.

Maury Microwave Terms and Conditions for Warranty and Return apply. Maury Microwave Corp. calibration kits are to be returned directly to Maury Microwave for service, repair, or calibration issues and not to Agilent Technologies. For additional information go to www.maurymicrowave.com.

Agilent Technologies does not guarantee the performance of the Maury calibration kits or the system performance when connected to Agilent Microwave PNA Series network analyzers.

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

1. Special rugged female connector specifically for connecting to the network analyzer test port, but does not mate with a standard male connector.
2. Special rugged female connector specifically for connecting to the network analyzers NMD 2.4 mm test port, but does not mate with standard 2.4 mm male connector

Cables

Note: Agilent offers the following 2.4 mm test port cables. Adapters will be necessary when using these cables for 2.92 mm measurements.

- 85133C¹** single, semi-rigid: 2.4 mm (f) to PSC-2.4 mm (f),
81 cm, 32 inches
- 85133D¹** 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
- 85133E¹** single, flexible: 2.4 mm (f) to PSC-2.4 mm (f),
97 cm, 38 inches
- 85133F¹** 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
- 85133H¹** Single, flexible: 2.4 mm (f) to 2.4 mm (m),
63 cm, 25 inches
- N4421AK20** Single, flexible: 2.4 mm (f) to 2.4 mm (m),
91.4 cm, 36 inches

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

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

For devices with 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 (f) to 3.5 mm (f) adapter
85052-60014 3.5 mm (m) to 3.5 mm (m) 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:
N4691-60004 3.5 mm (f) to 3.5 mm (m) ECal module
Option 00M module with:
N4691-60005 3.5 mm (m) to 3.5 mm (m) ECal module
Option 00F module with:
N4691-60006 3.5 mm (f) to 3.5 mm (f) ECal module
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

Cables

- **85131C¹** single, semi-rigid: 3.5 mm (f) to PSC-3.5 mm (f), 81 cm, 32 inches²
- **85131D¹** set, semi-rigid:
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
- **85131E¹** single, flexible: 3.5 mm (f) to PSC-3.5 mm (f), 96.5 cm, 38 inches²
- **85131F¹** 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

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 E8362C.

- 85131H¹** single, flexible: 3.5 mm (f) to 3.5 mm (m), 62.2 cm, 24.5 inches
- 85134E¹** single, flexible: PSC-3.5 mm (f) to 2.4 mm (f), 96 cm, 38 inches
- 85134F¹** set, flexible:
 - 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
- 85134H¹** single, flexible: 2.4 mm (f) to PSC-3.5 mm (m), 53 cm, 21 inches
- N4419AK20** single, flexible: 3.5 mm (m) to 3.5 mm (f), 91.4 cm, 36 inches
- Z5623A-K20** single, flexible: 3.5 mm (m) to 3.5 mm (m), 91.4 cm, 36 inches

Adapter sets

- 85130D** 3.5 mm¹ to 3.5 mm

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

Adapter sets

- 85130C** 3.5 mm² to Type-N

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:
 - N4690-60004 Type-N (f) to Type-N (m) ECal module
 - Option 00M** module with:
 - N4690-60005 Type-N (m) to Type-N (m) ECal module
 - Option 00F** module with:
 - N4690-60006 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

Cables²

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. 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 E8362C.

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

Cables¹

- 85132E** single, flexible: 3.5 mm (f) to 7 mm, 97.2 cm, 38.25 inches²
- 85132F** set, flexible: two 3.5 mm (f) to 7 mm cables, 62.9 cm each, 24.75 inches each², p/n 85132-60004
- 85135E** single, flexible: 2.4 mm (f) to 7 mm, 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 mm¹ 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 3.5 mm (f) to 7 mm, 62.9 cm each, 24.75 inches each²)
- 85135F** cable set (set, flexible, 2.4 mm (f) to 7 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, 3.5 mm (f) to 7 mm, 62.9 cm each, 24.75 inches each²)
- 85135F** cable set (set, flexible, 2.4 mm (f) to 7 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, 2.4 mm (f) to 3.5 mm (f) and (m), 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)

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)

1. For use with E8362C.

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

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/W-band short
 - 11644-20013 V-band shim
 - 11644-60012 V-band standard section

W Band

- W11644A** standard, WR-10: 75 to 100 GHz.
Includes:
 - 11643-60026 W-band termination
 - 11644-20015 V/W-band short
 - 11644-20014 W-band shim
 - 11644-60013 W-band standard section

Verification kits

All Agilent verification kits include:

- precision Z_0 airline or match thru
 - mismatched airline or mismatch thru
 - fixed attenuators
 - traceable measured data and uncertainties
- 85051B** 45 MHz to 18 GHz 7 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.
 - 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

Hard drive¹

- N8981A** spare hard drive with mounting cradle
For E836xA/B and N5230A.
- N8982A** spare hard drive with mounting cradle
For E836xC and N5230C.
- N5242-60035** spare hard drive
For N5242A with 1.6 GHz Pentium M CPU.
- N5242-60037** spare CPU board with hard drive
For N5242A with 1.6 GHz Pentium M CPU.
- N5242-60044** spare hard drive with mounting cradle
For N524xA with 2.0 GHz Core 2 Duo CPU.

Probe

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

Power meters and sensors²

Recommended for self support, adjustments and performance tests to verify proper instrument operation.

- N1913A** EPM power meter (single channel)
- N1914A** EPM power meter (dual channel)
- N8481A** power sensor, 10 MHz to 18 GHz, -35 to +20 dBm
- N8481B** power sensor, 10 MHz to 18 GHz, -5 to +44 dBm
- N8481H** power sensor, 10 MHz to 18 GHz, -15 to +35 dBm
- N8482A** power sensor, 100 kHz to 6 GHz, -35 to +20 dBm
- N8482B** power sensor, 100 kHz to 6 GHz, -5 to +44 dBm
- N8482H** power sensor, 100 kHz to 6 GHz, -15 to +35 dBm
- N8485A** power sensor, 50 MHz to 26.5 GHz, -35 to +20 dBm
- N8485A-033** average power, 10 MHz to 33 GHz, -35 to +20 dBm,
3.5 mm (m)
- N8486AQ** waveguide, 33 to 50 GHz, -35 to +20 dBm
- N8486AR** waveguide, 26.5 to 40 GHz, -35 to +20 dBm
- N8487A** power sensor, 50 MHz to 50 GHz, -35 to +20 dBm
- N8488A** power sensor, 10 MHz to 67 GHz, -35 to +20 dBm
- V8486A** waveguide power sensor, 50 to 75 GHz, -30 to +20 dBm
- W8486A** waveguide power sensor, 75 to 110 GHz, -30 to +20 dBm
- U2000A** USB sensor, 10 MHz to 18 GHz, -60 to +20 dBm
- U2000B** USB sensor, 10 MHz to 18 GHz, -30 to +44 dBm
- U2000H** USB sensor, 10 MHz to 18 GHz, -50 to +30 dBm
- U2001A** USB sensor, 10 MHz to 6 GHz, -60 to +20 dBm
- U2001B** USB sensor, 10 MHz to 6 GHz, -30 to +44 dBm
- U2001H** USB sensor, 10 MHz to 6 GHz, -50 to +30 dBm
- U2002A** USB sensor, 50 MHz to 24 GHz, -60 to +20 dBm
- U2002A-H26** USB sensor, 10 MHz to 26.5 GHz, -60 to +20 dBm
- U2002H** USB sensor, 50 MHz to 24 GHz, -50 to +30 dBm
- U2004A** USB sensor, 9 kHz to 6 GHz, -60 to +20 dBm
- E4412A** CW power sensor, 10 MHz to 18 GHz, -70 to +20 dBm
- E4413A** CW power sensor, 50 MHz to 26.5 GHz, -70 to +20 dBm
- E4413A-H33** specified performance for 50 MHz to 33 GHz

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** 90 ° coaxial coupler, 1 to 18 GHz, SMA (f), 3 dB coupling

Equipment rack accessories

- E3663AC** Rail kit
- 5063-9217** Rack mount kit, for use without handles
(included with Option 1CM)
- 5063-9205** Front handle kit³
- 5063-9224** Rack mount kit with handles³
- 5063-9237** Rack mount kit, for use with standard supplied
handles (included with Option 1CP)³

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)
- 82357B** GPIB to USB interface

1. For more information on hard drive, refer to na.tm.agilent.com/pna/hdnumbers.html

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

3. Front handles and Option 1CP (rack mount with handles) are not available for the N5242A.



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Revised: October 14, 2010

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Printed in USA, May 27, 2011
5990-7745EN

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