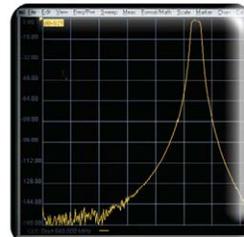
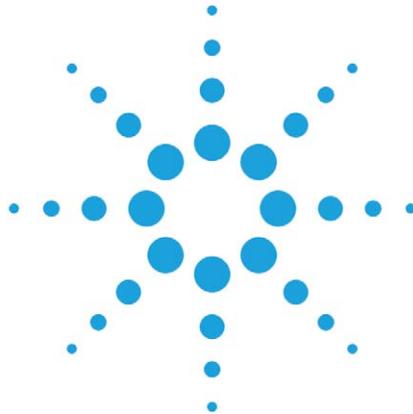
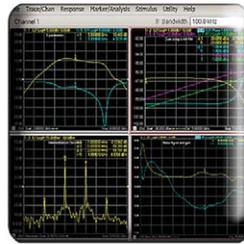
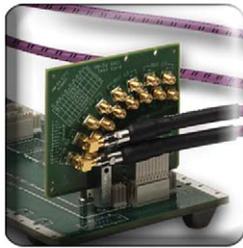


Agilent

Network Analyzer Selection Guide



Network Analyzers to Meet Your Needs

Agilent offers a variety of network analyzers with the frequency, performance, and versatility to meet your measurement needs. To help you determine which network analyzer is right for you, this selection guide provides an overview and side-by-side comparison of all our network analyzers. In addition, you will find a discussion of the typical network analyzer applications, the measurement needs of each, and how Agilent network analyzers meet those needs.



Frequency coverage for Agilent network analyzers

10 kHz 100 kHz 1 MHz 10 MHz 1 GHz 10 GHz 100 GHz

NOTE: The 8510, 871x, 8753, and 872x network analyzers have been discontinued. Visit www.agilent.com/find/na for more information about the latest network analyzer products and www.agilent.com/find/nadisco for discontinued models and migration guides.

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High Throughput for Filter and Resonator Testing

E5100 network analyzers

E5100A

The Agilent E5100A network analyzer has a frequency range of 10 kHz to 300 MHz and is best fit for production line testing of crystal/ceramic filters and resonators, as well as other electronic components, where very high test throughput is required.

The E5100A improves manufacturing efficiency by providing exceptionally fast measurement capabilities (up to 0.04 ms/point), built-in waveform analysis commands, and a part-handler interface.

The E5100A provides versatile analysis capabilities to fit your requirements for better yield and higher productivity throughout your entire manufacturing test process. The E5100A realizes high quality and high-speed tests with its fine IF bandwidth (IFBW) selection and low-noise circuitry. Convenient analysis and processing functions improve your productivity; especially in final test.



Features

- 0.04 ms/point measurement speed
- handler interface for mass-production
- filter and resonator waveform analysis commands

www.agilent.com/find/e5100

Network, Spectrum, and Impedance Analyzers in One Box

Combination analyzer series

4395A, 4396B

The Agilent combination analyzer series merges three analyzer functions into one powerful instrument: a vector network analyzer, a spectrum analyzer, and an optional impedance analyzer. The combination analyzer makes no compromise between vector-network, spectrum, and impedance performance. Use one analyzer for multiple testing needs when you want high speed and accuracy. Save equipment cost and bench space, while avoiding time-consuming, awkward cable hook-up to multiple instruments.

The Agilent 4395A/96B provides excellent LF/RF measurements for lab and production applications. In the lab, evaluate your designs completely and accurately with one instrument. Reduce test time with precise measurements and improved efficiency. On the production line, increase your throughput with the 4395A/96B by quickly and easily switching between different measurement types or tests. The 4395A/96B are breakthroughs in test instruments, delivering outstanding performance at an attractive price.



Features

- network, spectrum and optional impedance analysis
- fast narrowband spectrum measurement
- time-gated spectrum analysis option

www.agilent.com/find/combo

New Standard for Low-Cost Basic RF Network Analysis

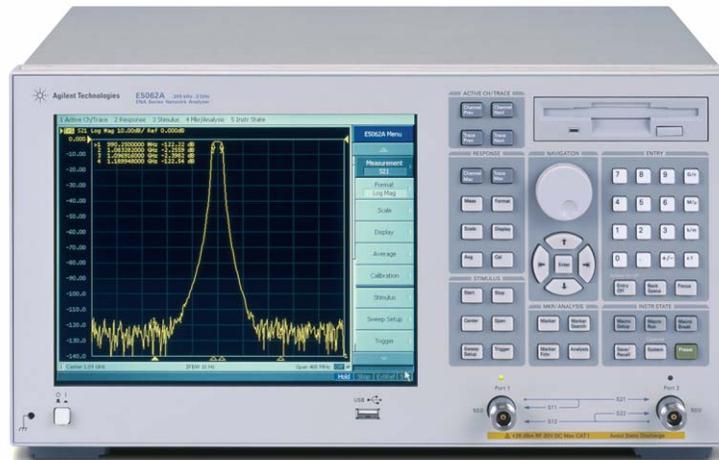
ENA-L RF network analyzers

E5061A, E5062A

Providing the latest in modern technology and flexibility, the Agilent ENA-L network analyzers provide basic vector network analysis in a wide range of industries and applications such as wireless communication, cable TV, automotive, education, and more. Designed to reduce tune and test times, these analyzers provide increased throughput to improve your measurement productivity.

The ENA-L offers all of the critical performance and features needed in R&D, manufacturing, and service to test RF components such as: filters, amplifiers, antennas, cables, CATV taps, and distribution amplifiers.

The affordably priced ENA-L, equipped with the core functions of the industry-standard ENA, includes many easy-to-use features and is optimized for efficient measurements and high reliability.



Features

- S-parameter or T/R test set models
- 50 ohm or 75 ohm system impedance available
- easy-to-use features for productivity
- optional electronic calibration (ECal) module simplifies and speeds your calibration process

www.agilent.com/find/ena

Industry Standard for Multipurpose RF Network Analysis

ENA RF network analyzers E5071C

The Agilent ENA offers fast, accurate measurements for multipoint components such as duplexers and couplers. Up to four built-in test ports are available in the E5071C (4.5 and 8.5 GHz).

The ENA offers a built-in balanced measurement capability, which enables you to test advanced handset components such as balanced SAW filters. It provides mixed-mode S-parameter measurements with a fixture simulator function that includes matching circuit embedding/de-embedding and impedance conversion capabilities.

In addition, the ENA provides frequency-offset mode to characterize your mixers and converters accurately.

Efficient measurements can be easily made in manufacturing. Using the built-in Microsoft® Visual Basic for Application (VBA) you can quickly develop test routines or automation programs. In addition, the parts-handler interface makes it easy to integrate the ENA into an automation system and enables fast communication.

These integrated measurement capabilities provide the lowest test cost per component and dramatically improve test throughput of multipoint and balanced components.



Features

- 8753x successor for general purpose use
- 2- or 4-port measurements with full port calibration
- built-in balanced measurement capability
- fixture simulator for balanced component analysis
- optional time-domain and frequency-offset capabilities
- optional electronic calibration (ECal) module simplifies and speeds your calibration process

www.agilent.com/find/ena

Premier-Performance and Versatility for Active Device Tests

PNA-X microwave network analyzer

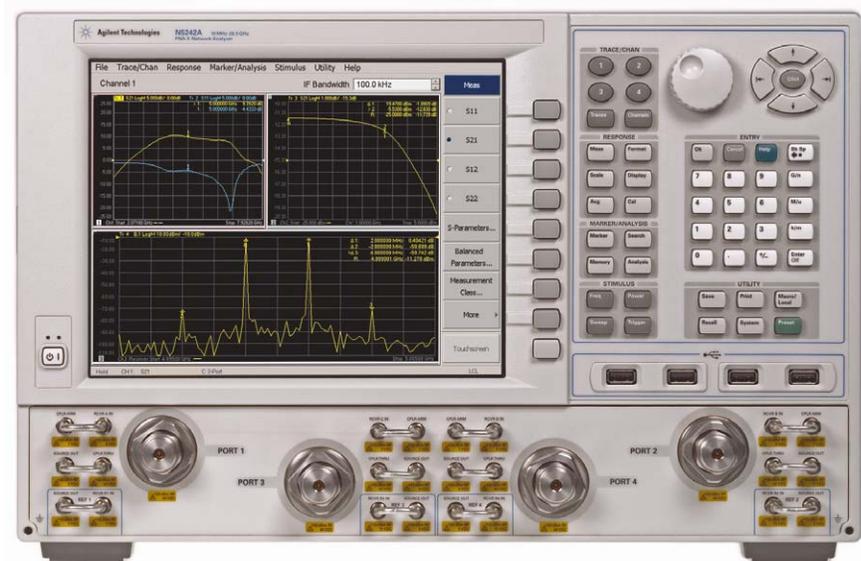
N5242A

The Agilent PNA-X premier-performance network analyzers are designed for high performance active device tests that help you minimize design iterations, test system integration, and significantly simplifies test processes. The industry-leading performance and highly integrated, configurable nature of the PNA-X makes it the ideal solution for comprehensive network analysis and tests.

The PNA-X is available with frequency range of 10 MHz to 26.5 GHz, and offers 2- or 4-port models. The PNA-X's very low harmonics internal source is ideal for active device characterization, and delivers the highest accuracy. The optional second internal source (standard for 4-port model) together with internal combining network allows fast swept intermodulation distortion measurements for amplifiers. Internal path switches and rear access loops provide maximum flexibility for integrating signal conditioning components or external instruments, and turn the PNA-X into a test hub for single-connection multiple-measurement (SCMM) solution.

The noise figure measurement option employs an innovative error-correction technique and delivers the most accurate noise figure measurements in the market.

The enhanced user interface, large and crisp display with touch screen, and flexible remote interfaces maximize productivity in design and production environments.



Features

- integrated 2- or 4-port with balanced measurements
- 130 dB dynamic range, 32 channels, 16,001 points
- second internal source (optional for 2-port model)
- optional combining network for two-tone measurements
- optional path switches for SCMM
- optional rear access loops for signal conditioning or external instruments
- optional pulse generators/modulators for fast pulsed-RF measurements
- optional noise figure measurements

www.agilent.com/find/pnax

New Standard for General Purpose Network Analysis

PNA-L network analyzers

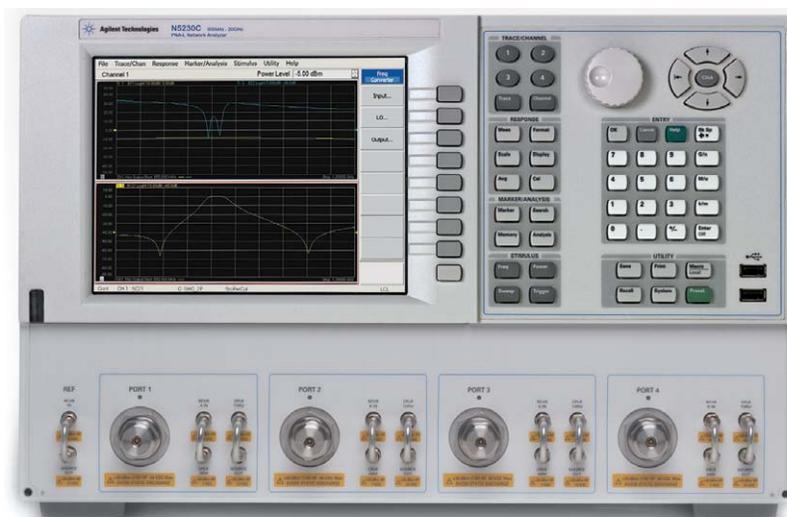
N5230C

The PNA-L is designed for your general-purpose network analysis needs and priced for your budget. Advanced features help you work quickly, easily, and accurately. With the same firmware as the PNA, the PNA-L offers the perfect balance of value and performance.

The PNA-L is available with frequency coverage from 300 kHz to 6 and 13.5 GHz, 10 MHz to 20, 40, or 50 GHz and offers capabilities that can dramatically increase your design and test efficiency. 4-port models are also available from 300 kHz to 13.5 or 20 GHz. The Windows operating system provides the ability to expand the instrument's connectivity and provides tools for maximum flexibility. From the Windows desktop you can install measurement tools, which reduce the need for a dedicated PC. Use embedded Help to quickly refer to programming and user documentation from within the instrument. Furthermore, COM/DCOM programming provides a powerful automation environment.

The enhanced user interface, crisp display with touch screen, and flexible remote interfaces maximize productivity in design and production environments.

PNA-L provides efficiency and flexibility in both manufacturing and R&D applications for industries ranging from Wireless LAN components to Aerospace & Defense.



Features

- measurement speeds as fast as 4 to 9 μ s per point
- superior performance and advanced connectivity compared to our 872x series network analyzers
- optional built-in second source (4-port models only)
- optional time-domain and frequency-offset capabilities
- optional electronic calibration (ECal) modules allow you to calibrate 10 times faster than mechanical calibration
- up to 32 independent measurements channels

www.agilent.com/find/pnal

High-Performance Microwave Measurements

PNA microwave (MW) network analyzer

E8361/2/3/4C

The Agilent E8361/2/3/4C are the microwave frequency models from the PNA series of network analyzers. These models offer an unsurpassed combination of high performance, speed, and outstanding interconnectivity capabilities to meet the challenges of component testing.

The microwave PNA network analyzers cover 10 MHz to 20, 40, 50 and 67 GHz frequency ranges with excellent accuracy. These analyzers are suitable for high-performance microwave devices, such as satellite communication components. They offer 123 dB dynamic range at the test ports and 136 dB with direct receiver access. They also provide TRL/LRM calibration capability for in-fixture and on-wafer devices. In addition, the receiver architecture enables frequency-offset mode to characterize your mixers and converters. The configurable test set allows you to connect external test sets easily and make accurate multipoint measurements.

The enhanced user interface, crisp display with touch screen, and flexible remote interfaces maximize productivity in design and production environments.

The Windows operating system provides the ability to expand the instrument's connectivity and provides tools for maximum flexibility. In addition, from the Windows desktop you can install measurement tools, which reduce the need for a dedicated PC, and use on-line Help to quickly refer to programming and user documentation. Furthermore, COM/DCOM provides a powerful automation function. These functions can increase your design and test efficiency dramatically.



Features

- 136 dB dynamic range with direct receiver access
- expandability with configurable test set
- optional advanced mixer and converter test
- optional electronic calibration (ECal) modules allow you to calibrate 10 times faster than mechanical calibration
- optional antenna and pulsed-RF measurements

www.agilent.com/find/pna

110 GHz Benchtop System for High-Performance Millimeter-Wave Measurements

PNA mm-wave network analyzers

N5250C

The Agilent N5250C is the millimeter-wave frequency model of the PNA series of network analyzers. This model offers an unsurpassed combination of high performance, speed, and outstanding interconnectivity to meet the challenges of coaxial and on-wafer device testing to 110 GHz. Banded solutions are also available to cover frequencies up to 325 GHz.

The N5250C allows you to minimize space and maintenance costs with compact test heads and two built-in synthesizers. It provides TRL/LRM calibration capability for in-fixture and on-wafer devices. In addition, optional bias-tees can be added in the combiner assembly very near the device under test, which can greatly improve device stability. The bias-tees have tri-axial connectors for force, sense, and ground. With a single sweep from 10 MHz to 110 GHz, you can maximize your frequency coverage. It offers 123 dB dynamic range at the test ports and can achieve sweep speeds up to 42 times faster than the 8510XF network analyzer.

The enhanced user interface, crisp display with touch screen, and flexible remote interfaces maximize productivity in design and production environments.

If you only need a specific band of millimeter-wave frequency coverage, you can customize the most cost-effective solution. This solution consists of a microwave PNA, N5260A test set controller, and banded test heads from Oleson Microwave.



Features

- single sweep from 10 MHz to 110 GHz
- compact test heads and two built-in synthesizers
- 29 IFBW settings, 32 independent channels, and 16,001 points
- optional frequency coverage up to 325 GHz
- Agilent 8510 to PNA code conversion assistant

www.agilent.com/find/pna

Affordable Scalar Network Analyzers

8757 scalar network analyzer 8757D

The Agilent 8757D is a scalar transmission/reflection network analyzer with three or four detector inputs and four independent color display channels, which can process the signals from detectors and directional bridges. The 8757D offers fast measurement speed, limit testing, and external-disk save/recall. AC detection improves measurement accuracy and provides greater than 76 dB dynamic range.

You can combine the 8757D with two external sources and use it to measure conversion loss and compression of mixers. For amplifier testing, in addition to measuring gain, flatness, and return loss, the 8757D can measure 1 dB gain compression with near-power-meter accuracy. For characterizing the power accuracy of the 85037 series precision detectors, you can add an internal power calibrator (Option 8757D-002) to the 8757D.

A complete scalar system includes a 8757D, a swept source, a directional bridge or coupler, and detectors. For higher frequencies, Agilent offers millimeter-wave source modules and waveguide accessories.



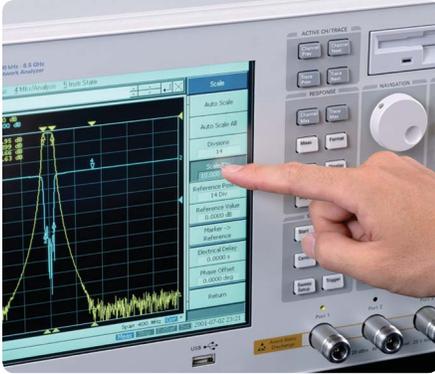
Features

- scalar measurements
- three or four detector inputs
- optional power calibrator

www.agilent.com/find/8757

Measurement Solutions for Your Application

Research and development



Network analysis and more

S-parameter measurements are the most common measurement parameters for network analysis. However, if you only need to measure transmission or reflection characteristics, you might consider a network analyzer with a T/R test set to help manage costs. In some cases, you might want to make additional types of measurements like absolute power, spectrum, impedance, time-domain and pulsed-RF. Time-domain and pulsed-RF measurements are often used for R&D activities to evaluate filters or high-power devices, respectively. Agilent's network analyzers offer a wide range of capabilities – providing you with convenient and cost-effective solutions tailored to your measurement needs.

Connector types and calibration accuracy

In an actual measurement environment, your devices might not have coaxial connectors, such as when you perform on-wafer measurements, or your devices might not have insertable connector types. In either case, it is difficult to perform an accurate calibration, which will affect measurement accuracy. Agilent network analyzers have various calibration functions, such as TRL, adapter-removal calibration, unknown thru, and embedding/de-embedding to ensure measurement accuracy in these types of situations. TRL enables our network analyzers to perform accurate on-wafer or in-fixture measurements. Adapter-removal calibration, unknown thru, or our electronic calibration (ECal) modules make it possible to perform calibration for non-insertable coaxial connectors. Embedding/de-embedding allows for the mathematical removal of fixtures. These functions will help you produce accurate measurements.

Expanding your system or using measurement data to write reports

Automation capabilities are critical for making complex component measurements. Internal and external programming capabilities like Visual Basic and Agilent VEE make it easier to develop automation programs and even control other instruments as a system.

Another common, time-consuming task for R&D engineers is incorporating analysis data into simulations and reports. Agilent network analyzers provide linkages to design tools such as Advanced Design System (ADS), that let you simulate and analyze a system without hardware — saving you valuable time and money. In addition, many of our network analyzers are compatible with IntuiLink Connectivity Software, which enables you to easily incorporate measurement results into Microsoft applications.

ADS: www.agilent.com/eesof-eda

VEE: www.agilent.com/find/vee

IntuiLink: www.agilent.com/find/intuilink

ECal: www.agilent.com/find/ecal

Measurement Solutions for Your Application

Research and development

Research and development	E5100 series	Combo series	ENA-L series	ENA series	PNA-L series	PNA-X series	PNA MW series	PNA mm-wave series	8757 series
Basic measurements									
S-parameters		• ¹	•	•	•	•	•	•	
Transmission and reflection with T/R test set	• ¹	• ¹	•						•
Absolute power	•	•		•	•	•	•	• ²	•
Spectrum analyzer function		•							
Impedance analyzer function		•							
Non-coaxial devices ³									
TRL calibration (on-wafer measurement)				•	•	•	•	•	
Waveguide measurements				•	•	•	•	•	•
Non-insertable devices ⁴									
Adapter-removal calibration using mechanical calibration				•	•	•	•	•	
SOLR (unknown thru) using mechanical calibration or ECal				•	•	•	•	•	
Different connector types supported by ECal			•	•	•	•	•	• ²	
Applications									
Time-domain mode/gating			• ⁵	•	•	•	•	•	
Frequency-offset mode				•	•	•	•	•	
TOI and harmonics					•	•	•	•	
Noise figure measurements						•			
Pulsed-RF: Wide pulse width				•	•	•	•	•	
Pulsed-RF: Narrow pulse width						•	•	•	
Frequency conversion application				•		•	•	• ²	
Scalar-calibrated converter measurements				•	•	•	•	• ²	
Antenna				•	•	•	•	•	
Materials measurement ⁶			•	•	•	•	•	•	
Signal integrity						•	•	•	
Automated gain compression						•			
Programming and connectivity									
Windows®-OS			• ⁷	• ⁸	• ⁸				
LAN interface			•	•	•	•	•	•	
Internal programming capability ⁹	•	•	•	•	•	•	•	•	
ADS linkage				•	•	•	•	•	
VEE linkage		• ¹⁰			•	•	•	•	•
IntuiLink		•	•	•	•		•	•	
LXI compliance			•	•					
Display touch screen			opt	•	•	•	•	•	

1. Requires an external S-parameter test set or T/R test set.

2. Functions up to 67 GHz.

3. For example, on-wafer, in-fixture, or waveguide applications.

4. A non-insertable device is a device that cannot be inserted in place of a zero-length through. For example, a device that has the same connectors on both ports (type and sex) or different types of connectors on each port (for example, waveguide on one port and coaxial on the another).

5. Time domain gating is not supported.

6. For more information, see page 25.

7. Closed environment, which does not allow access to a Windows® desktop operating system.

8. Open environment, which allows access to a Windows® desktop operating system and enables you to install software and manage data for easy post-measurement analysis.

9. Includes integrated programming language such as Visual Basic for Applications®, and ability of open Windows® environments to install programming languages into analyzers.

10. Available on the 4395A only.

Measurement Solutions for Your Application

Manufacturing test



Optional electronic calibration (ECal) modules for easy, accurate calibration

Unlike the traditional mechanical calibration technique, Agilent's ECal modules only require one set of connections to perform full 2-, 3-, or 4-port calibration. Controlled through the front panel USB port, and requiring only one set of connections, ECal drastically simplifies the calibration process for non-technical operators.

An ENA or PNA controls the ECal module to perform the entire calibration, providing:

- faster calibration and reduced complexity
- reduced chance of operator error
- reduced wear on connectors

Sweep and data analysis

Total measurement speed can be divided into several different components such as sweep speed, display processing, data analysis, and data transfer. In low-volume manufacturing, the data analysis and display speeds are unimportant. After the measurement, a limit test or a marker function is typically used. Conversely, in high-volume manufacturing the sweep speed and data analysis speed are important. In many cases, analysis needs to be done quickly using internal programming capability or waveform analysis commands, and the analyzer must send pass/fail results to an automated system. In both cases, the sweep speed can be maximized using segment sweep. For automation, you can choose from a variety of Windows-compatible programming environments like VBA, VB or Agilent VEE. In case you want to transfer all data to an external computer quickly, COM/DCOM provides a seamless environment between your instruments and external computers.

Communication interfaces

It is becoming more common to have a LAN interface in test and measurement instruments. A LAN is convenient to send data from your manufacturing line to your office, or to monitor measurement status, or have a central data server, or use network printers.

For high-volume automation applications, fast communication with an automated handler system is important. A parts handler interface is commonly used for this purpose. It has a dedicated pin assignment in the I/O interface so that triggers measurement-end status, and limit-test results are communicated quickly between the instrument and the automated handler system.

Measurement Solutions for Your Application

Manufacturing test

Manufacturing test	E5100 series	Combo series	ENA-L series	ENA series	PNA-L series	PNA-X series	PNA MW series	PNA mm-wave series	8757 series
Programming									
Internal programming capability ¹	•	•	•	•	•	•	•	•	
Fast data transfer ²			•	•	•	•	•	•	
Calibration									
Adapter-removal calibration ³				•	•	•	•	•	
SOLR (Unknown thru) using mechanical calibration or ECal				•	•	•	•	•	
ECal support			•	•	•	•	•	• ⁴	
Measurement and analysis									
Segment sweep ⁵	•	•	•	•	•	•	•	•	
Pass/fail testing	•	•	•	•	•	•	•	•	•
Embedding and de-embedding ⁶				•	•	•	•	•	
Waveform analysis command ⁷	•		•	•					
Interface									
LAN			•	•	•	•	•	•	
I/O port	•	•	•	•	•	•	•	•	
Parts handler interface ⁸	•	•	•	•	•	•	•	•	
VGA output	•	•	•	•	•	•	•	•	•

1. Includes integrated programming language such as Visual Basic for Applications®, and ability of open Windows® environments to install programming languages into analyzers.

2. COM/DCOM provides faster data transfer than GPIB.

3. The calibration technique used for non-insertable devices such as those with the same connectors on input and output ports.

4. Functions up to 67 GHz.

5. Segment sweep includes sweep types that are known as list and fast-swept list.

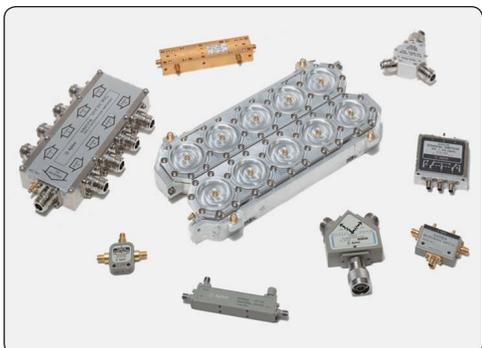
6. Functions to embed or de-embed a fixture's characteristics.

7. Programming commands to quickly retrieve parameters of filters and resonators.

8. The parts handler interface is an I/O-port specialized for communication with an automatic parts handler system.

Measurement Solutions for Your Application

Filter and duplexer measurements



Dynamic range, IF bandwidth and sweep time

Dynamic range requirements vary among applications. Agilent offers a variety of network analyzers with different dynamic ranges in different frequency ranges. For wide dynamic range, Agilent's PNA series offers a configurable test set that bypasses the couplers and improves dynamic range by approximately 15 dB. The PNA series offers 122 dB dynamic range at test port. In addition, many analyzers offer segment sweep — a convenient function that manages dynamic range and sweep speed. This function enables you to set different IFBW's for the passband or rejection band, and the sweep speed can be optimized for your measurement needs.

Calibration for filter testing

Agilent network analyzers provide various functions that help you perform efficient, accurate filter evaluations, which can help shorten your design cycles. For instance, the adapter removal calibration functions make it possible to accurately calibrate non-insertable devices. Interpolated calibration is convenient if the measurement frequency is unknown.

Time domain, multiport, and balanced measurement capabilities for advanced devices

Today's wireless devices require test instruments that have advanced measurement functionality. For example, a time-domain function is needed to easily tune coupled-cavity-resonator bandpass filters. Duplexer or front-end modules for handsets often require multiport and balanced measurement capabilities. For more details on multiport and balanced testing, see page 19.

Measurement Solutions for Your Application

Filter and duplexer measurements

Filter and duplexer measurements	E5100 series	Combo series	ENA-L series	ENA series	PNA-L series	PNA-X series	PNA MW series	PNA mm-wave series	8757 series
Dynamic range									
Wide dynamic range ¹	•	•	•	•	•	•	•	•	
Direct receiver access to obtain widest possible dynamic range					•	•	•	•	
Calibration									
Adapter removal calibration				•	•	•	•	•	
SOLR (unknown thru) using mechanical calibration or ECal				•	•	•	•	•	
Interpolated calibration	•	•	•	•	•	•	•	•	
Measurement and analysis									
Segment sweep ²	•	•	•	•	•	•	•	•	
Four-parameter display	•	•	•	•	•	•	•	•	•
Marker statistics function ³	•	•	•	•	•	•	•	•	
Other functions									
Time domain mode/gating			• ⁴	•	•	•	•	•	
Balanced measurement capability ⁵				•	• ⁶	•	• ⁶		
Multipoint measurement capability ⁵			• ⁷	• ⁷	• ⁷	•	• ⁷		

1. Wide dynamic range is defined as 120 dB or better for RF analyzers and greater than 90 dB for microwave analyzers.

2. Segment sweep includes sweep types that are known as list and fast swept list.

3. Obtains real-time calculations of device characteristics such as maximum/minimum, center frequency, and 3 dB bandwidth.

4. Time gating is not supported.

5. For more details about balanced and multipoint tests, see page 19.

6. For 2-port network analyzers, balanced measurement capability requires an external test set and software.

7. An external test set may be required to achieve these functionalities.

Measurement Solutions for Your Application

Multiport and balanced testing



E5071C ENA network analyzer with E5091A multiport test set



8-port 20 GHz PNA-L measurement solution



The Agilent N1957B Physical Layer Test System is used for 4-port 50 GHz signal integrity measurements

www.agilent.com/find/balanced
www.agilent.com/find/multiport
www.agilent.com/find/plts

Multiport testing for communication components

Many modern components have more than two ports. In order to test these devices efficiently, network analyzers with multiple ports are required. Agilent offers numerous multiport instruments for you to choose from. One example is the Agilent ENA series. ENA, PNA-L and PNA-X have optional built-in four-port measurement capability — enabling fast and accurate multiport measurements from 9 kHz to 26.5 GHz.

Calibration for multiport measurements

When doing multiport measurements, you need to use the proper calibration method to achieve accurate measurements. Agilent offers a three-, four-, or N-port full calibration function together with multiport measurement capability. Four-port ECal modules are available as well, so that calibration can be done easily and quickly. When it is not possible to place coaxial connectors on your design, Agilent provides multiport TRL and LRM calibration techniques, as well as two- and four-port de-embedding to ensure accuracy for balanced or on-wafer measurements.

Balanced measurements for balanced components

Balanced components are commonly used in communications devices to maintain RF signal quality. The ENA series has a built-in balanced capability to make fast and easy balanced measurements. It also has a fixture simulation function, including matching circuit embedding/de-embedding and impedance conversion capabilities. These capabilities are also available on the 4-port PNA-L and PNA-X. If you require higher frequency coverage, PNA series with option 550 and the N1900B series Physical Layer Test System (PLTS) enable balanced measurements up to 67 GHz.

For more details, visit www.agilent.com/find/multiport

Multiport testing for CATV components

Many CATV components, including taps, dividers, and distribution amplifiers, have multiple ports. Network analyzers with multiport test sets drastically increase the test efficiency of these components. The ENA-L network analyzer with the 87075C 75 ohm multiport test set is specifically designed for testing multiport CATV components.

Measurement Solutions for Your Application

Multiport and balanced testing

Multiport and balanced devices	E5100 series	Combo series	ENA-L series	ENA series	PNA-L series	PNA-X series	PNA MW series	PNA mm-wave series	8757 series
Multiport measurements									
Built-in 4-port measurement capability				•	•	•			
Multiport measurement capability with external test set ¹			•	•	•	•	•		
Multiport calibration									
Full 4-port calibration				•	•	•	• ²		
Full N-port calibration					• ²	• ²	• ²		
Balanced measurement									
Built-in balanced measurement capability				•	•	•			
Balanced measurement capability with external test set ³				•	•	•	•		
Fixture simulation/embedding and de-embedding				•	•	•	•	•	

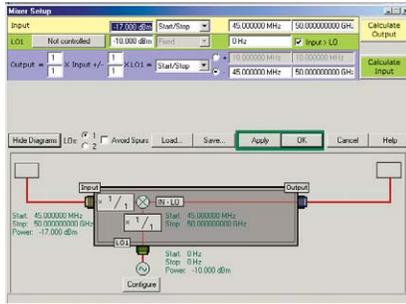
1. Refer to *Test Solutions for Multiport and Balanced Devices* brochure (literature number 5988-2461EN available on the www.agilent.com/find/multiport Web site) for more details.

2. Available only when used with external test sets and Option 550 or 551.

3. The external test set and software are available with either Option 55x or the Physical Layer Test System (PLTS). For more details on PLTS, refer to the Agilent Physical Layer Test Systems Data Sheet (literature number 5988-5288EN) available on the PLTS Web site: www.agilent.com/find/plts

Measurement Solutions for Your Applications

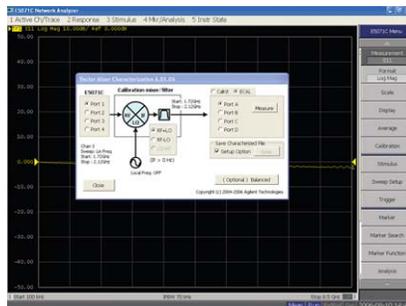
Mixer and converter measurements



The PNA Frequency Converter Application simplifies set up and calibration for advanced mixer measurements such as absolute phase and group delay.



The PNA-X drives mixers with two internal sources, making multiple measurements with a single connection.



The ENA Frequency-Offset Mode offers vector mixer calibration technique that enables you to perform accurate absolute group delay measurements for frequency-translating devices.

Measurement challenges

Frequency-translation devices such as mixers, converters, and tuners are critical components in most RF and microwave communication systems. They present unique measurement challenges because their input and output frequencies are different. Network analyzers used for testing these devices need to have a frequency-offset mode to detect output frequencies different from the input.

Improved accuracy with advanced measurement techniques

Agilent offers the scalar-mixer calibration, which corrects mismatch errors between the analyzer and the device under test, and provides the most accurate conversion loss measurements in the market. This eliminates external pads and minimizes connector wear and tear due to different padding layouts required for different measurements.

The Frequency Converter Application (FCA) is another Agilent unique solution. It includes an easy-to-use graphical user interface and vector-mixer calibration that enables absolute group delay measurements without extensive knowledge. You can accurately measure delay characteristics of your devices and no longer need to rely on a “golden” mixer.

Further more, the Embedded LO Measurements capability works with FCA, and allows the measurement receiver to be tuned at IF frequencies without accessing the LO of the device. With this technique, you can reduce the error significantly from absolute group delay measurements, even though there is no access to the LO or reference clock of your devices.

Comprehensive mixer/converter measurements with PNA-X

The PNA-X offers various advanced capabilities that simplify mixer/converter measurements significantly. The two internal sources drive RF and LO ports without an external signal generator. The built-in combining network combines the two tones internally for IMD measurements¹, and internal path switches allow switching between conversion loss and IMD measurements or even external instruments, without disconnecting the device from the PNA-X’s test ports. This dramatically reduces measurement complexity and improves test productivity.

Measurement versatility in RF with ENA

The ENA offers the frequency-offset mode (FOM) that provides frequency-offset sweep, external signal source control, and fixed IF/RF measurement capabilities. The ENA FOM option supports both scalar – and vector – mixer calibrations with inherited mixer measurement techniques from the microwave PNA. These measurement techniques are key to making extremely accurate measurements. Also, this option provides harmonics measurement capabilities for non-linear devices such as amplifiers, semiconductor switches, and front-end modules.

1. Mixer/converter IMD measurements require an external signal source.

Measurement Solutions for Your Application

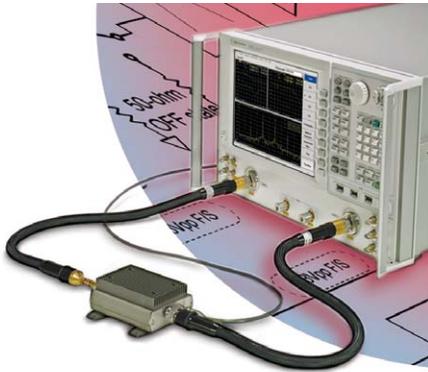
Mixer and converter measurements

Mixer measurements	E5100 series	Combo series	ENA-L series	ENA series	PNA-L series	PNA-X series	PNA MW series	PNA mm-wave series	8757 series
Measurement and analysis									
Magnitude measurement ¹				•	•	•	•	• ²	•
Phase measurement									
Relative phase					•	•	•	• ²	
Absolute phase				•		•	•	• ²	
3-port measurements ³				•	•	•	• ⁴		
Power sweep				•	•	•	•	• ²	•
Embedded LO measurements						•	•	• ²	
Internal dual-source					•	•			
External source control				• ⁵	•	•	•	•	
Calibration									
Power meter calibration				•	•	•	•	• ²	
3-port calibration				•	•	•	• ⁴		
Scalar mixer calibration				•	•	•	•	• ²	
Vector mixer calibration				•		•	•	• ²	

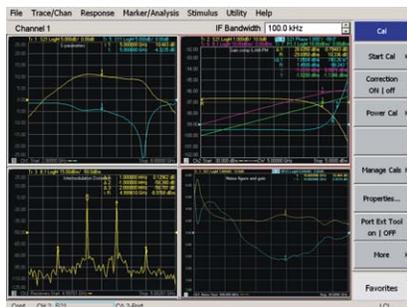
1. Frequency-offset modes of the ENA and PNA series let the source and receiver operate at different frequencies. Both magnitude and phase measurements can be made.
2. Functions available only on a stand-alone PNA, up to 67 GHz. Requires disconnecting mm-wave controller.
3. For LO return loss and LO to RF/IF leak measurements with single connection.
4. Requires an external test set and 4-port measurement option.
5. Supports one external signal source.

Measurement Solutions for Your Application

Amplifier measurements



The integrated and flexible nature of PNA-X simplifies amplifier measurements.



Fully error-corrected amplifier gain (S21), gain and phase compression, IMD, and source-correct noise figure, performed with a single connection between the amplifier and network analyzer.

Measurement challenges

Agilent network analyzers can be used to easily measure commonly specified amplifier parameters such as gain, gain and phase compression, isolation, return loss, and group delay. The power sweep function is often required to make amplifier measurements, and harmonic distortion is commonly used to understand an amplifier's nonlinear behavior. It requires the receiver to be tuned at a different frequency from the source, and the analyzer needs wide frequency coverage. Additional instruments and signal conditioning devices may be required for testing with two-tone, higher input and output power, or for other types of measurements including noise figure, ACP, and EVM. As a result, the test system becomes complicated or requires multiple stations.

Highly integrated, more accurate amplifier measurements with PNA-X

The PNA-X employs very clean signal sources, which minimizes harmonics and IMD measurement errors. The built-in combining network with two internal sources eliminates external components and cable wear, which makes two-tone measurements much simpler. The internal switches and RF access loops maximize the flexibility to add signal conditioning devices and to switch one measurement to another without disconnecting the device from the analyzer.

The integrated pulse generators/modulators with pulse measurement application software increase measurement speed, simplify the test setup, and provide full pulse measurement capabilities such as average pulse, point-in-pulse and pulse-profiling. It can be configured as a uni- or bi-directional pulsed measurement system.

Integrated noise figure measurements with industry-leading accuracy

The PNA-X's unique noise-figure calibration technique uses an ECal module as an impedance tuner to remove the effects of imperfect system source match, providing accurate measurements of 50-ohm noise figure. Measurement accuracy surpasses standalone Y-factor-based noise figure analyzers or spectrum-analyzer-based solutions. With a single connection to the amplifier, the PNA-X network analyzer offers fast, high-accuracy measurements of S-parameters, noise figure, gain and phase compression, IMD, harmonics, and more.

Evolving standard, ENA's enriched versatility

In addition to the highest measurement performance and richest capability in its class, the ENA provides the external test set mode for high power amplifier measurements. Attenuators for high gain amplifiers and other signal conditioning devices can be placed behind the external couplers so that the system is appropriately calibrated. The ENA's DC measurement capability enables power added efficiency (PAE) measurements in parallel with RF measurements.

Power meter calibration

For both mixer and amplifier testing, power meter calibration provides leveled absolute power to devices that are sensitive to absolute input or output levels. This function automatically controls power meters to set the power anywhere in the test setup with power meter accuracy, or to calibrate the network analyzer's receivers for accurate absolute-power measurements.

Measurement Solutions for Your Application

Amplifier measurements

	E5100 series	Combo series	ENA-L series	ENA series	PNA-L series	PNA-X series	PNA MW series	PNA mm-wave series	8757 series
Basic measurements									
Gain, return loss, isolation	•	•	•	•	•	•	•	•	•
Compression, AM-PM conversion	•	•	•	•	•	•	•	•	
High power measurements									
High output power ¹	•	•				•			
Source attenuator	•	•	•	•	•	•	•	•	
Receiver attenuator	• ²	•				•	•	•	
Connection loop before reference path						•			
Configurable test set	•	•		• ³	•	•	•	• ⁴	
Harmonic measurements									
Frequency-offset mode		5		•	•	•	•	•	•
Analyzer source harmonics ⁶						•			
Receiver attenuator	•	•				•	•	•	
Intermodulation distortion measurements									
Frequency-offset mode		5		•	•	•	•	•	•
Second internal source					•	•			
Internal combining network						•			
Noise figure						•			
Hot-S22					•	•			
DC inputs for power added efficiency				•		•	•		
Internal bias-tee				•		•	•	•	

1. High output power is defined as greater than +13 dBm for leveled power output.

2. Only 25 dB fixed attenuator is available.

3. Requires option 44x or 48x to use external test set mode.

4. Available up to 67 GHz.

5. Intermodulation distortion can be measured with integrated spectrum analyzer function.

6. 2nd and 3rd harmonics of the internal source are significantly lower than 20 to 30 dBc.

Related Network Analyzer Products

Electronic calibration (ECal) modules

ECal is a precision, single-connection calibration technique for Agilent vector network analyzers. Agilent ECal modules are fully traceable and verifiable against electronic impedance standards and can simplify your daily calibration routine. RF ECal modules are available for Type N-50, N-75, 7 mm, 3.5 mm, Type F, and 7-16 (300 kHz to 13.5 GHz) connectors. Modules are available in microwave frequency ranges from 300 kHz to 67 GHz for 7 mm, Type N-50, 3.5 mm, 2.92 mm, 2.4 mm and 1.85 mm. 4-port modules are available in 13.5 and 20 GHz frequency ranges.



www.agilent.com/find/ecal

85070E Dielectric Probe Kit 85071E Materials Measurement Software 85072A Split Cylinder Resonator

Trust Agilent to deliver leading-edge techniques for measuring dielectric and magnetic properties of materials. The new 10 GHz Split Cylinder Resonator measures complex permittivity and loss tangent of thin films, un-clad substrates, and other low loss sheet materials as part of a turn key solution for IPC standard TM 650 2.5.5.13. The Materials Measurement Software automates a variety of techniques across a wide frequency span, including transmission line, free space, NRL arch and resonant cavity. The Dielectric Probe Kit offers hardware and software for measuring complex permittivity of liquids and conformable solids from 200 GHz to 50 GHz.



Measuring electromagnetic properties of materials is critical in all stages a products lifecycle: design, incoming inspection, process monitoring and quality assurance. Agilent sets the measurement standard with 20 years experience and innovative new products.

www.agilent.com/find/materials

N1900B Series Physical Layer Test Systems (PLTS)

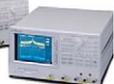
Agilent's PLTS solutions provide the highest accuracy and most comprehensive tool set for model extraction and characterization of single-ended and differential physical-layer interconnects, or balanced RF and microwave components with frequency coverage up to 67 GHz. These test solutions offer single-ended, balanced, and mixed-mode measurements in both frequency and time domain, and eye-diagram analysis with a simple to use graphical user interface.



www.agilent.com/find/plts

Specification and Feature Comparison

Low frequency network analyzers

	E5100 series	Combination analyzer series
Model number	E5100A 	4395A  4396B 
Frequency range	E5100A: 10 kHz to 300 MHz	4395A: 10 Hz to 500 MHz 4396B: 100 kHz to 1.8 GHz
Number of ports ¹	2 ²	2
Balanced measurements ¹	no	no
System impedance	50 ohm	50 or 75 ohms
System dynamic range	120 dB	4395A: 115 dB 4396B: 120 dB
Power at test port	-48 dBm to +22 dBm (Option 801) -65 dBm to +5 dBm (at RF OUT 2 with Option 600)	4395A: -50 to +15 dBm 4396B: -60 to +20 dBm
Power sweep range	70 dB (Option 801)	20 dB
Sweep type	linear, segment ³ , power	linear, log, segment ³ , power
Error correction		
Full 2-port	no	yes
Full 3 or 4-port	no	no
TRL	no	no
Adapter-removal	no	no
ECal support	no	no
Measurement channels	2	2
Maximum number of data traces	4	4
Windows-OS	no	no
Internal automation	IBASIC	IBASIC
I/O	GPIB, VGA, parallel, mini-DIN	GPIB, VGA, parallel, mini-DIN
ADS linkage	no	no
Built-in source attenuator	no	no
DC bias input	no	no
Time domain	no	no
Corrected specifications ⁴	do not specify system performance	do not specify system performance
Trace noise	0.01 dB rms (1 kHz IFBW)	4395A: 0.005 dB rms (300 Hz IFBW) 4396B: 0.002 dB rms (300 Hz IFBW)
Measurement speed ⁵ (1 sweep, 201 points)	8 ms (1-port cal, ramp-sweep) 64 ms (1-port cal, step-sweep)	165 ms (response cal, gain, 30 kHz BW) 215 ms (response cal, gain and phase, 30 kHz BW)

1. Table shows the capabilities of the stand-alone instrument. Possible to add capabilities with external test sets. See page 19.

2. See the Network Analyzer brochure for the port configuration details.

3. Segment includes sweep types that are known as list and fast swept list.

4. Dir = directivity; SM = source match; LM = load match; Refl trk = reflection tracking; Trans trk = transmission tracking

5. Includes system retrace time, but does not include source bandswitch times. Refer to product data sheets for detailed measurement conditions.

Specification and Feature Comparison

RF network analyzers

	ENA-L series	ENA series	PNA-L series
Model number	E5061A E5062A 	E5071C 	N5230C 
Frequency range	E5061A: 300 kHz to 1.5 GHz E5062A: 300 kHz to 3 GHz	E5071C: 9 kHz to 4.5 GHz (Option 240, 440) 100 kHz to 4.5 GHz (Option 245, 445) 9 kHz to 8.5 GHz (Option 280, 480) 100 kHz to 8.5 GHz (Option 285, 485)	N5230C: 300 kHz to 6 GHz (Option 020, 025) 300 kHz to 13.5 GHz (Option 120, 125, 140, 145, 146)
Number of ports	2	2 or 4	2 (Option x2x) or 4 (Option 14x)
Balanced measurements	no	yes ¹	yes (Option 140, 145, 146)
System impedance	50 ohms or 75 ohms	50 ohms	50 ohms
System dynamic range	120 dB (1 MHz to 3 GHz)	97 dB (9 to 300 kHz) 107 dB (300 kHz to 10 MHz) 123 dB (10 MHz to 6 GHz) 117 dB (6 to 8.5 GHz)	122 dB (Option x20, 10 MHz to 6 GHz) 121 dB (Option x25, 10 MHz to 6 GHz) 120 dB (Option 14x, 10 MHz to 4 GHz)
Power at test port	-5 to +10 dBm -45 to +10 dBm (Option 1E1, 250 or 275)	-55 dBm to +10 dBm	-30 to +2 dBm (Option x20, 300 kHz to 6 GHz) -90 to +1 dBm (Option x25, 300 kHz to 6 GHz) -27 to +8 dBm (Option 140, 10 MHz to 4 GHz) -87 to +8 dBm (Option 145, 146, 10 MHz to 4 GHz)
Power sweep range	15 dB	65 dB	37 dB (Option x20, 300 kHz to 6 GHz) 36 dB (Option x20, 300 kHz to 6 GHz) 33 dB (Option 14x, 10 MHz to 4 GHz)
Sweep type	linear, log, segment ² , power, CW	linear, log, segment ² , power, CW	linear, log, CW, power, segment
Error correction			
Full 2-port	yes (S-parameter test sets only)	yes	yes
Full 4-port	no	yes ¹	yes (also Full N-port)
TRL	no	yes	yes
Adapter-removal	no	yes	yes
SOLR	no	no	yes
ECal support	yes	yes	yes
Measurement channels	4	36	32
Maximum number of data traces	16	864 (96 channels/9 traces mode)	unlimited
Windows-OS	yes (closed)	yes	yes
Internal automation	VBA, SCPI, COM	VBA, SCPI, COM	SCPI, D/COM
I/O	LAN, USB, GPIB, VGA, parallel, handler, mini-DIN	LAN, USB, GPIB, XGA, parallel, handler, mini-DIN	LAN, USB, GPIB, VGA, parallel, RS-232
ADS linkage	no	software driver supported	supported
Built-in source attenuator	yes (with Option 1E1, 250 or 275)	yes	yes (Option 025, 145, 146)
DC bias input	no	yes ³	no
Time domain	yes (with Option 100) ⁴	yes (with Opt. 010)	yes (with Option 010)
Corrected specifications⁵	(type-N, 50 ohms, 2-port cal) Dir 46 to 49 dB SM 40 to 41 dB LM 46 to 49 dB Refl trk ± 0.011 to ± 0.021 dB Trans trk ± 0.015 to ± 0.018 dB	(2-port cal, type-N, 50 ohms) Dir 49 to 38 dB SM 41 to 35 dB LM 48 to 37 dB Refl trk ± 0.011 to 0.054 dB Trans trk ± 0.035 to 0.088 dB	(2-port cal or 4-port cal, 3.5 mm) Dir 44 to 48 dB SM 31 to 40 dB LM 44 to 48 dB Refl trk ± 0.003 to 0.006 dB Trans trk ± 0.015 to 0.131 dB
Trace noise	0.005 dB rms @ 3 kHz IFBW ≥ 1 MHz	0.004 dB rms (10 MHz to 4.38 GHz) (70 kHz BW)	10 MHz to 10.5 GHz 0.004 dB rms (Option x2x) 0.006 dB rms (Option 140) 0.008 dB rms (Option 145) 0.016 dB rms (Option 146)
Measurement speed (1 sweep, 201 points, correction off)	35 ms (2-port cal, 30 kHz BW)	8.85 ms (2-port cal) (500 kHz BW)	6 ms (600 kHz BW)

1. Only on 4-port models.

2. Segment includes sweep types that are known as list and fast swept list.

3. Option E5071C-xx5 (with bias tees option) is required. Minimum frequency is limited to 100 kHz.

4. Time domain gating is not supported.

5. Dir = directivity; SM = source match; LM = load match; Refl trk = reflection tracking; Trans trk = transmission tracking

Specification and Feature Comparison

Microwave network analyzers

	MW PNA-L series	PNA-X series	PNA series
Model numbers	N5230C 	N5242A 	E8362C E8363C E8364C E8361C 
Frequency range	10 MHz to 20 GHz (Option 220, 225, 240, 245, 246) 10 MHz to 40 GHz (Option 420, 425) 10 MHz to 50 GHz (Option 520, 525)	10 MHz to 26.5 GHz	E8362C 10 MHz to 20 GHz E8363C 10 MHz to 40 GHz E8364C 10 MHz to 50 GHz E8361C ¹ 10 MHz to 67 GHz
Number of ports	2 (Option x2x), 4 (Option x4x)	2 (Option 200), 4 (Option 400)	2
Balanced measurements	yes (Options 240, 245, 246)	yes (Option 400)	no
System impedance	50 ohms	50 ohms	50 ohm
System dynamic range (at 20 GHz)	103 dB (Option 240) 98 dB (Option 245, 246) 108 dB (Option x2x) (additional 12 to 16 dB with direct receiver access)	121 to 130 dB depends on configuration 124 to 141 dB with direct receiver access (typical)	94 to 125 dB 136 dB with direct receiver access (typical)
Power at test port (at 20 GHz)	-27 to -3 dBm (Option 240) -87 to -8 dBm (Option 245, 246) -27 to +3 dBm (Option 220) -87 to +3 dBm (Option 225) -27 to 0 dBm (Option 420, 520) -87 to 0 dBm (Option 425, 525)	-25 to +13 dBm (Option 200, 400) -90 to +10 dBm (Option 219, 419) -90 to +15 dBm (Option 224) -90 to +10 dBm (Option 423)	-25 to +5 dBm at 10 GHz (60 dB source attenuator option expands min. power to -82 dBm at 10 GHz)
Power sweep range	22 to 33 dB (Option 240) 17 to 33 dB (Option 245, 246) 23 to 25 dB (Option 220, 225) 17 to 25 dB (Option 420, 425) 10 to 25 dB (Option 520, 525)	27 to 38 dB (Option 200, 400) 24 to 38 dB (Option 219, 419) 23 to 38 dB (Option 224, 423)	31 dB
Sweep type	linear, log CW, power, segment	linear, log, CW, power, segment	linear, log CW, power, segment
Error correction			
Full 2-port	yes	yes	yes
Full 4-port	yes	yes	yes ²
Full N-port ²	yes	yes	yes
TRL	yes	yes	yes
Adapter-removal	yes	yes	yes
SOLR	yes	yes	yes
ECal support	yes	yes	yes
Measurement channels	32	32	32
Maximum number of data traces	unlimited	unlimited	unlimited
Windows-OS	yes ³	yes ³	yes ³
Internal automation	SCPI, D/COM	SCPI, D/COM	SCPI, D/COM
I/O	LAN, USB, GPIB, VGA, parallel, RS-232	LAN, USB, GPIB, VGA, parallel, RS-232	LAN, USB ⁴ , GPIB, VGA, parallel, RS-232
ADS linkage	supported	supported	Software driver supported
Built-in source attenuator	yes (with Option 225, 245, 246, 425, 525)	yes (with Option 219, 419)	yes (with Option UNL)
DC bias input	no	yes	yes (with Option UNL)
Time domain	yes (with Option 010)	yes (with Option 010)	yes (with Option 010)
Corrected specifications⁴	(Option 2xx, 2-or 4-port cal, 3.5 mm) Dir 44 to 48 dB SM 31 to 40 dB LM 44 to 48 dB Refl trk ± 0.003 to .006 dB Trans trk ± 0.01 to .125 dB	(2-port cal, 3.5 mm) Dir 44 to 48 dB SM 31 to 40 dB LM 44 to 48 dB Refl trk +/-0.003 to 0.006 dB Trans trk +/-0.017 to 0.119 dB	(2-port cal, 2.4 mm) Dir 36 to 42 dB SM 31 to 41 dB LM 35 to 42 dB Refl trk ± 0.001 to 0.027 dB Trans trk ± 0.014 to 0.200 dB
Trace noise	0.01 dB rms (Option 240) 0.014 dB rms (Option 245) 0.038 dB rms (Option 246) 0.006 dB rms (Option 22x) 0.01 dB rms (Option 42x, 52x)	0.002 dB rms (1 kHz BW)	0.006 dB rms (1 kHz BW)
Measurement speed (1 sweep, 201 points correction off)	9 ms (250 kHz BW)	6 ms (600 kHz BW)	12 ms (35 kHz BW)

1. Specified to 67 GHz, with operation to 70 GHz.

2. Available when used with external test sets and software.

3. Open Windows environment. You can load any software on the instrument, such as Visual Basic.

4. Dir = directivity; SM = source match; LM = load match; Refl trk= reflection tracking; Trans trk = transmission tracking

Specification and Feature Comparison

Microwave network analyzers

	8757 series	PNA mm-wave series
Model numbers	8757D 	N5250C 
Frequency range	10 MHz to 110 GHz, depends on configuration	10 MHz to 110 GHz, and extendable to 325 GHz
Number of ports	2	2
Balanced measurements	no	no
System impedance	50 ohms	50 ohms
System dynamic range (at 20 GHz)	75 dB/70 dB (AC/DC detection modes)	111 dB
Power at test port (at 20 GHz)	depends on signal source: +10 or +17 dBm (to 26.5 GHz) +6 dBm (to 40 GHz)	-5 dBm
Power sweep range	25 dB	20 dB ¹
Sweep type	linear, power, CW	linear, log CW, power, segment
Error correction		
Full 2-port	no	yes
Full 4-port	no	no
Full N-port	no	no
TRL	no	yes
Adapter-removal	no	yes
SOLR	no	yes
ECal support	no	yes ¹
Measurement channels	2	32
Maximum number of data traces	4	64
Windows-OS	no	yes ²
Internal automation	no	SCPI, COM/DCOM
I/O	GPIB, VGA	LAN, USB, GPIB, VGA, parallel, RS-232
ADS linkage	no	Software driver supported
Built-in source attenuator	no	yes
DC bias input	no	yes
Time domain	no	yes (with Option 010)
Corrected specifications ³	(coaxial) Dir 40 dB SM source dependent LM 20 dB	—
Trace noise	unspecified	—
Measurement speed (1 sweep, 201 points correction off)	—	—

1. Functions up to 67 GHz.

2. Open Windows environment. You can load any software on the instrument, such as Visual Basic.

3. Dir = directivity; SM = source match; LM = load match; Refl trk= reflection tracking; Trans trk = transmission tracking

Literature

Our product and application literature is available for viewing and download from our product Web sites listed under "Web Resources" on the back page of this selection guide.

Brochures

Test Solutions for Multiport and Balanced Devices
literature number 5988-2461EN

E5100A Network Analyzer (10 kHz to 300 MHz)
literature number 5968-1873E

4395A Network/Spectrum/Impedance Analyzer 500 MHz
4396B Network/Spectrum/Impedance Analyzer 1.8 GHz
literature number 5965-9374E

ENA-L RF Network Analyzers
E5061A, 300 kHz to 1.5 GHz E5062A, 300 kHz to 3 GHz
literature number 5989-0167EN

ENA RF Network Analyzers E5071C, 9 kHz to 8.5 GHz
literature number 5989-5478EN

PNA Microwave Network Analyzers
E8361/2/3/4C, 10 MHz to 20, 40, 50, 67, or 110 GHz
N5230C, 300 kHz to 6, 13.5, or 20 GHz
N5230C, 10 MHz to 20, 40, or 50 GHz
N5242A, 10 MHz to 26.5 GHz
literature number 5989-7604EN

PNA Millimeter-Wave Network Analyzers 10 MHz to 110 GHz,
and extensions to 325 GHz
literature number 5989-7620EN

Signal Integrity Solutions
literature number 5988-5405EN

Application Notes

Amplifiers –
How to Characterize CATV Amplifiers Effectively
literature number 5965-9434E

Amplifier Linear and Gain Compression Measurements
literature number 5988-8644EN

Amplifier Swept-Harmonic Measurements
literature number 5988-9473EN

Amplifier and CW Swept Intermodulation-Distortion
Compression Measurements
literature number 5988-9474EN

Advanced Measurement Techniques for RF Amplifiers
Using Unique Functions of the Agilent E5071C ENA
literature number 5989-6522EN

Making Accurate Intermodulation Distortion Measurements
with the PNA-X Network Analyzer
literature number 5989-7265EN

Mixers/Converters –
Mixer Conversion-Loss and Group Delay Measurement
Techniques and Comparisons
literature number 5988-9619EN

Measuring Absolute Group Delay of Multistage Converters
using PNA Microwave Network Analyzers
literature number 5989-0219EN

Mixer Transmission Measurements
Using The Frequency Converter Application
literature number 5988-8642EN

Novel Method for Vector Mixer Characterization and
Mixer Test System Vector Error Correction
literature number 5988-7826EN

Pulsed Measurements –
Pulsed-RF S-Parameter Measurements Using Wideband
and Narrowband Detection
literature number 5989-4839EN

Pulsed Antenna Measurements Using PNA Network Analyzer
literature number 5989-0221EN

Antenna and RCS Measurement Configurations
Using PNA Microwave Network Analyzers
literature number 5989-0220EN

Triggering PNA Microwave Network Analyzers for
Antenna Measurements
literature number 5988-9518EN

Additional ENA Application Notes

On-Wafer Impedance Measurements Using the ENA
and Impedance Parameter Display Software
literature number 5989-0033EN

Differential S-parameter Measurements of PCI Express
Connectors using the ENA Series Network Analyzer
literature number 5988-9848EN

High Speed f_T vs. I_C Characterization of Bipolar Transistors Using
Agilent E5270A and ENA Series Network Analyzer
literature number 5988-9994EN

In-Fixture Characterization Using the ENA Series RF Network
Analyzer with Cascade Microtech Probing System
literature number 5988-6522EN

Evolution of Test Automation Using the Built-In VBA with the
ENA Series RF Network Analyzers
literature number 5988-6192EN

ADSL Copper Loop Measurements
literature number 5968-1196E

Web Resources

Visit our Web sites for additional product information and literature.

Microwave and RF network analyzers:
www.agilent.com/find/na

ENA RF series network analyzers:
www.agilent.com/find/ena

PNA Microwave series network analyzers:
www.agilent.com/find/pna

Combination analyzers:
www.agilent.com/find/combo

Electronic calibration (ECal):
www.agilent.com/find/ecal

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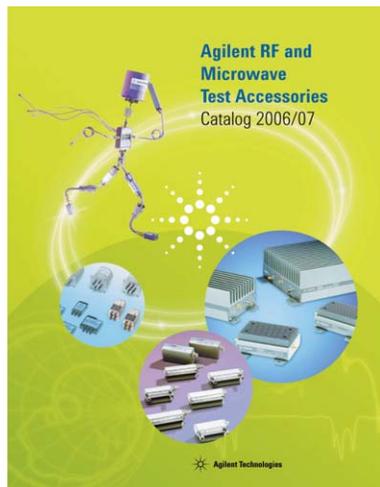
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