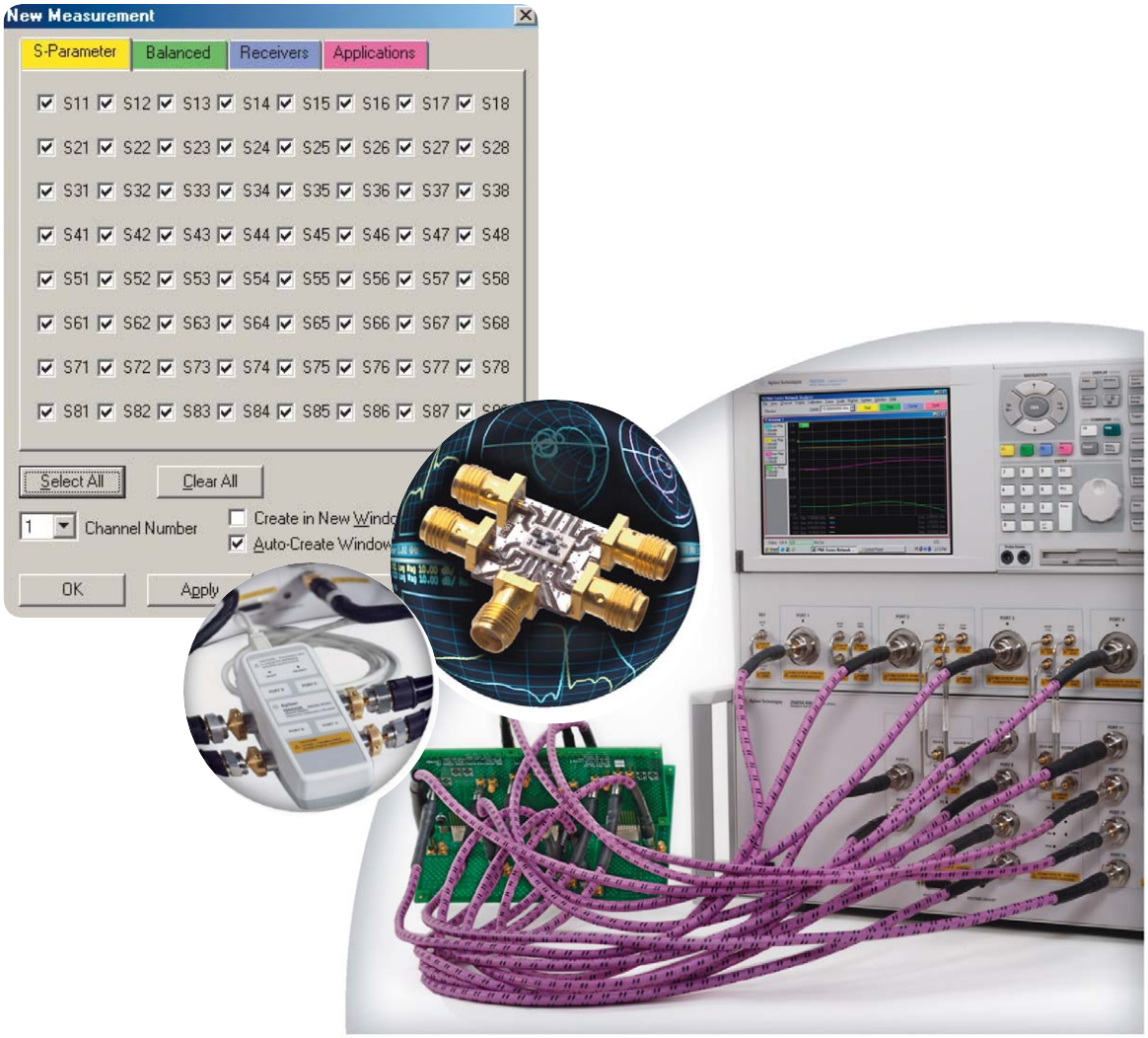
Agilent
Test Solutions *for Multiport and Balanced Devices*



Agilent Technologies

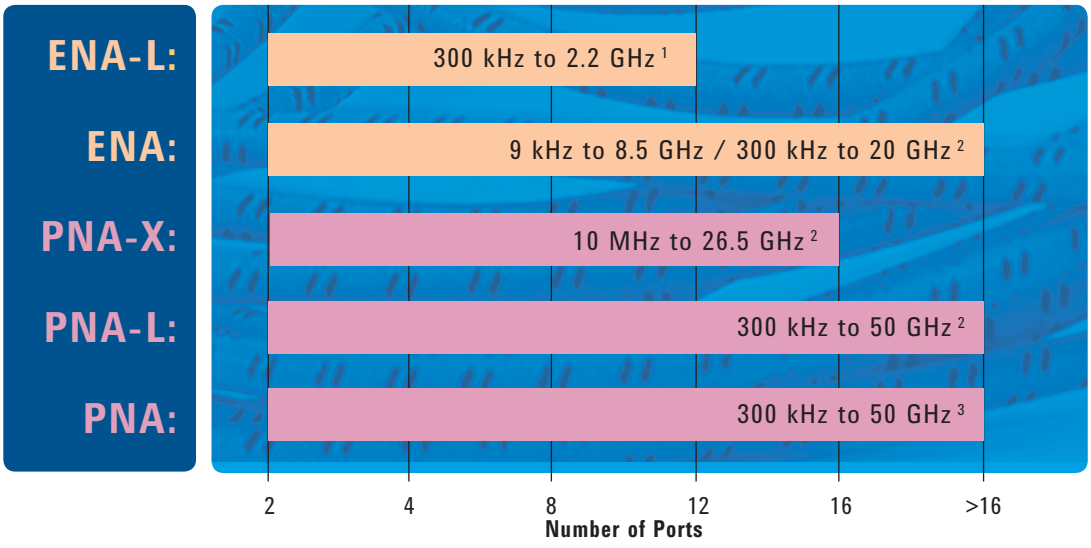
As your Multiport Devices Expand, Agilent Expands with You

Many of today's wireless communications and broadband components have four or more ports. These components require multiple connections for complete characterization with a network analyzer. However, time-to-market pressures require that today's components be tested quickly while maintaining high levels of accuracy and high repeatability to achieve production volumes.

Network analyzer sweep speed is only one factor that contributes to the overall throughput that can be achieved in measuring multiport components. The overall throughput depends on how quickly the component can be connected and the system can transition from one measurement path to the next and process that data. Multiport test sets dramatically reduce overall tune and test times because the DUT only needs to be connected once to test multiple signal paths. Minimizing the number of connections also reduces operator fatigue and lowers the chance of connecting to the wrong port. In addition, fewer connections mean less wear on cables, connectors, fixtures, and DUTs. A multiport test set is especially valuable in manufacturing applications where the time required for device connection, handling, and/or configuration is significantly greater than the test time. In these situations, a test set provides a solution that supports operators or part handlers in increasing throughput.

Agilent provides the highest performing multiport test solutions to meet the demands of the never-ending trend to decrease size through integration in modules and at the same time address the pressure to increase throughput and lower test cost. A range of solutions are available for many devices from simple duplexers, for both front-end passive and active and wireless infrastructure components, to more complex integrated modules. Agilent has a portfolio of multiport test solutions including, integrated 4-port, standard extension test sets, and custom multiport test systems that are built for your individual need. These solutions optimize key hardware, firmware, and software features, which provide the best accuracy with the convenience of multiport connections and electronic calibration to achieve exceptionally fast measurement speeds.

Multiport Network Analyzer Solutions



1 Available up to 3 GHz for two ports, up to 2.2 GHz used with 87050E test set.
2 Integrated 4-port is available for frequency coverage up to 20 GHz (ENA), 20 GHz (PNA-L) and 0.5 THz (PNA-X).
3 Available up to 67 GHz for four ports and 0.5 THz for two ports.

www.agilent.com/find/multiport

Agilent Test Solutions for Multiport and Balanced Devices

ENA Series Network Analyzers

ENA

- Integrated, one-box solution for 2, 4-port, and balanced devices
- Best price performance up to 20 GHz
- High measurement speed
- Optional dedicated multiport test set (E5092A) for up to 22-port measurements

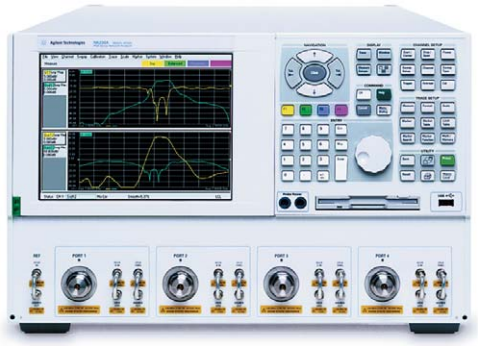
ENA-L

- Lowest cost solution for 50 and 75 ohm devices up to 2.2 GHz
- Up to 12-port when combined with the 87050E [1]
- Test set cal and self cal for simplified calibration

ENA (9 kHz up to 20 GHz)

PNA Series Microwave Network Analyzers

- Efficient and flexible for both manufacturing and R&D
- Optional dedicated test sets for up to 16-port and beyond
- Frequency coverage up to 0.5 THz
- Integrated 4-port with balanced capabilities (PNA-X and PNA-L)
- Flexible solutions with configurable test set, open Windows® architecture, custom multiport test sets available



PNA Series (300 kHz up to 67 GHz)

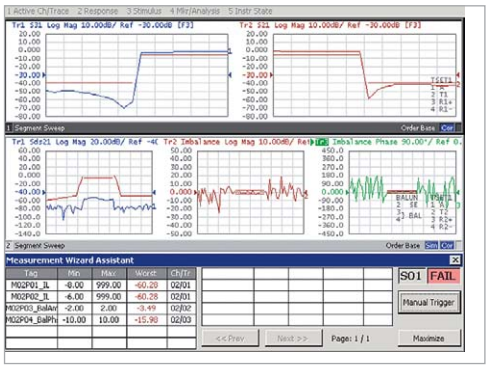
RF and Microwave Electronic Calibration (ECal)

- Fast 2- and 4-port calibrations up to 67 GHz: 2-port up to 67 GHz and 4-port up to 20 GHz
- NIST traceable, accurate calibration
- Direct control via single USB interface
- Reliable solid-state switching
- Mixed connectors available

ECal (300 kHz up to 67 GHz)

Measurement Wizard Assistant (MWA) [2]

- Increase productivity of multiport measurements
- Simplify measurement setup and operation
- Go/no-go test management function



MWA for ENA

1 Upper frequency limited to 2.2 GHz with the 87050E.

2 Measurement Wizard Assistant software is offered as an ENA option (E5071C-790). Upgrade product (E5005A) is also available.

www.agilent.com/find/multiport

4-port Measurements up to 4.5/8.5/20 GHz with ENA Network Analyzers

20 GHz ENA with four built-in test ports

New-generation wireless equipment depends on advanced RF components, from duplexers and couplers to differential SAW filters and amplifiers. These components need to be measured efficiently in R&D and the production process. Fast and accurate testing is crucial, and Agilent's ENA network analyzers offers comprehensive measurement capabilities for advanced multiport devices.

Four built-in test ports provide simultaneous measurement of all signal paths in components with up to four ports. This advanced architecture minimizes the number of sweeps required for multiport S-parameter measurements and helps increase test throughput.

Built-in balanced measurements, matching-circuit simulation, and port characteristic impedance conversion all enable accurate characterization of the most advanced RF components. These test capabilities contribute to shortened time to market and reduced cost of test.

The ENA network analyzer holds up to 160 measurement channels in a single instrument state. Independent frequency list, calibration data, measurement parameters, trace layout, triggering, and limit test are applied in each measurement channel, which acts as if it is an independent network analyzer. This multi-channel capability eliminates recall time for sequencing multiple instrument setup states that are often required for multiport devices used in multi-frequency applications.

E5071C

Features

- Wide dynamic range > 123 dB
- Fast measurement speed: 42 ms at 1601 points, full 2-port calibration
- Low trace noise: < 0.004 dBrms at 70 kHz IFBW
- High stability: 0.005 dB /degree C
- Built-in 2- and 4-port S-parameter test set
- Fully specified 9 kHz/100 kHz[1] to 4.5 GHz or 8.5 GHz, or 300 kHz to 20 GHz
- The industry's highest RF performance ensures measurement accuracy
- Built-in bias tees and a DC measurement AUX port enable simultaneous DC evaluation
- Up to 160 measurement channels
- Up to 16 traces per channel
- Up to 20,001 measurement points
- Up to 22-port device measurement with a multiport test set
- Powerful analysis capabilities solve difficult test problems
- State-of-art calibration techniques reduce measurement errors
- Various test automation tools increase speed and efficiency
- Advanced characterization of mixers and amplifiers with frequency offset mode (optional)
- Powerful connectivity with Open Windows OS, USB, LAN, and GPIB
- Complete upgradability of available ENA options at any time

The ENA also accelerates test system development and expands customization capabilities. Built-in Visual Basic for Applications (VBA) allow you to develop and customize test programs in the ENA series, or import Visual Basic programs from an external PC. A custom user interface using a touch screen can be created on the 10.4" LCD display.

1 A bias tee option limits the start frequency to 100 kHz.

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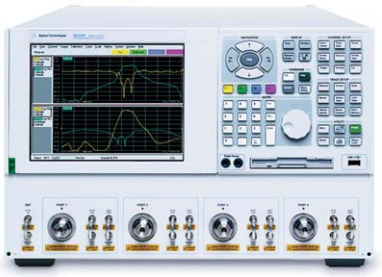
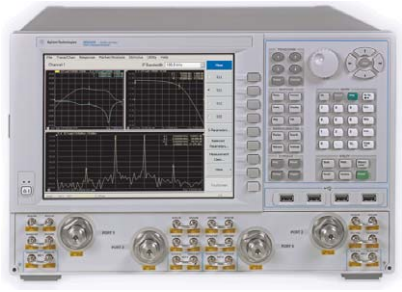
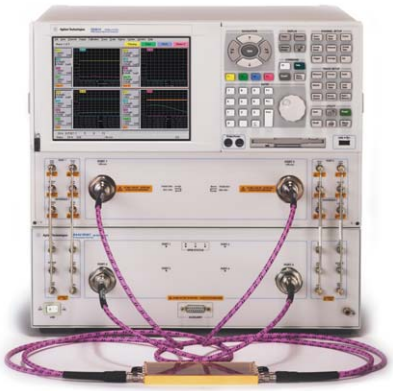
4-port Measurements up to 0.5 THz with the PNA Series



20 GHz PNA-L with four built-in test ports



26.5 GHz PNA-X with four built-in test ports



67 GHz 2-port PNA expanded to 4-port with N4421B H67 test set

PNA-X expanded to 4-Port 110 GHz with N5262A test set

Whether for wireless LAN front-end modules or satellite filters, the Agilent 4-port PNA-L/PNA-X network analyzer offers the industry's best combination of speed and accuracy to meet modern measurement challenges. Ideal for in-fixture measurements, the 4-port PNA-L/PNA-X allows a variety of easy and accurate methods to correct for fixtures. Making fast and accurate multiport measurements has never been easier.

Differential technologies and component integration continue to push higher in frequency. Now the PNA series, when combined with an external test set and Option 550, can perform 4-port measurements up to 0.5 THz.

Features

- Integrated 4-port from 300 kHz to 13.5 GHz N5230C with Option 140, 145 or 146
- Integrated 4-port from 300 kHz to 20 GHz N5230C with Option 240, 245 or 246
- Integrated 4-port from 10 MHz to 26.5 GHz N5242A with Option 400
- N5262A when configured with a dual source N5242A will allow differential and mixed mode measurements in waveguide bands up to 0.5THz
- Built-in single-ended and balanced measurements
- Configurable test set for added flexibility
- Fast measurement speed: less than 4 µs/point
- Excellent dynamic range, 120 dB
- Low trace noise, 0.006 dB rms
- Automatic Port Extension feature for easy and accurate test fixture calibration
- Time-domain analysis and frequency-offset measurements

Expand your PNA Series to 4 port

PNA: E8362/3/4B, E8361C

PNA-L: N5230C Option 225/425/525

Features

- External test set controlled directly by PNA/PNA-L
  - N4420B (10 MHz to 40 GHz)[1]
  - N4421B (10 MHz to 50 GHz)[1]
  - N4421B H67 (10 MHz to 67 GHz)[1]
- Option 550 4-port measurement application adds 4-port error correction and differential measurements

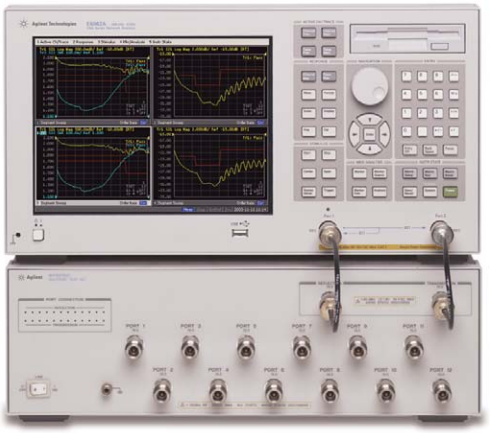
1 PNA is recommended for signal integrity applications.

www.agilent.com/find/multiport

ENA Series with External Multiport Test Sets

20 GHz ENA with E5092A configurable multiport test set

The Agilent E5092A configurable multiport test set, combined with the E5071C ENA network analyzer, is a complete solution for multiport device measurements. This test set offers various configurations for multiport characterization and up to a 22-port measurement can be performed with a 4-port ENA. The ENA provides optional measurement setup software, Measurement Wizard Assistant (MWA), that enables you to easily setup multiport measurement systems and simplifies the operation dramatically.



1.5 GHz ENA-L with 87075C 75 ohm multiport test set[2]

An Agilent 87050E or 87075C multiport test set, combined with an ENA-L network analyzer, offers a complete and economical solution for mulitport device measurements. The 87075C provides 75 ohm system impedance, optimally suited for multiport CATV device measurements. A test set calibration technique eliminates redundant connection of the calibration standard, while self cal (an internally automated calibration) reduces the effects of test system drift without connecting an external standard.

Expand up to 22 ports

ENA with E5092A configurable multiport test set

Features

- Various multiport configurations with specified performance up to 20 GHz
- Up to 10-port full crossbar measurement
- Single connection measurement of up to 22-port devices
- Exceptionally fast measurement speed
- Solid-state switches for fast and reliable measurement
- Easy-to-use operation with full test set control from ENA
- Increase productivity with Measurement Wizard Assistant (MWA) software[1]

Expand up to 12 ports

ENA-L with 87050E or 87075C test set

Features

- 50 or 75 ohm single connection measurement of up to 12-port devices
- Test set cal and self cal drastically reduces calibration time
- Solid-state switching for fast and reliable measurements
- Easy-to-use full test set operation from ENA-L
- Available in 4-, 6-, 12-port configurations with specified performance up to 2.2 GHz (87050E)
- Available in 6 or 12-port configurations with specified performance up to 1.3 GHz (87075C)

1 Measurement Wizard Assistant software is offered as an ENA option (E5071C-790). Upgrade product (E5005A) is also available.
2 3 MHz to 1.3 GHz specified frequency of 87075C.

www.agilent.com/find/multiport

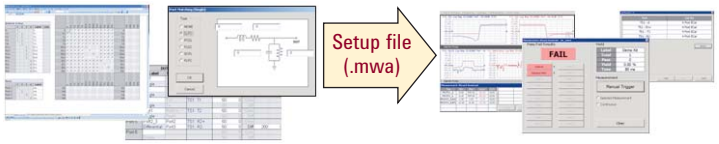
Simplify Your Multiport Setup and Measurements with the Measurement Wizard Assistant (MWA)

Front-End Application

- Software based on Microsoft Excel
- Operate on any PC with Microsoft Excel installed

Back-End Application

- Software based on the Microsoft VBA Macro working in the ENA
- Option E5071C-790 for the ENA is required for full operation capability



- Easy and fast multiport measurement setup for the ENA
- Generates one setup file (.mwa) that includes all measurement parameters
- "Step-by-step setup wizard with an Excel-based user interface

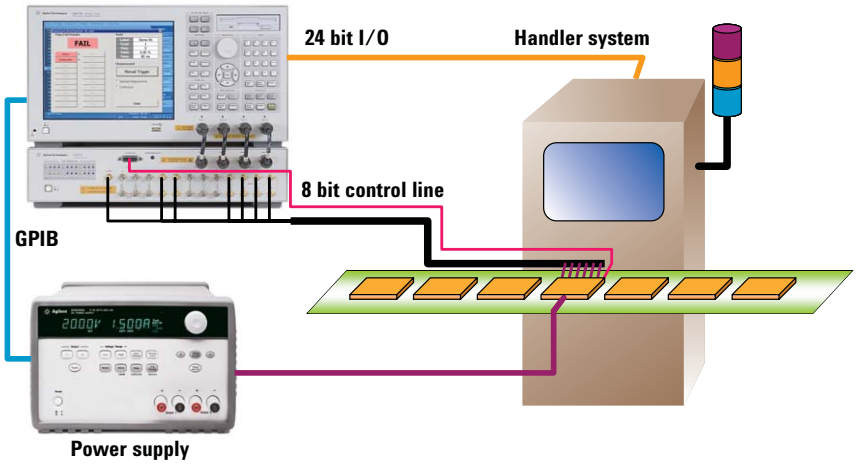
- Imports the .mwa setup file and sets all the parameters on the ENA automatically
- Calibration wizard minimizes operation time
- Automatic test procedures with go/no go limit test

Agilent offers Measurement Wizard Assistant (MWA) software that can dramatically improve your productivity in multiport device testing when using the ENA and the E5092A configurable multiport test set.

The MWA software simplifies the setup of complicated multiport measurements. The software assists not only with complex measurement parameter setups such as segment sweep, limit testing and calibration, but also handler system control via the handler I/O port.

After you enter the necessary measurement parameters, the software automatically generates a setup file. All you have to do is load the file into the ENA and immediately begin executing measurements.

The software provides the step-by-step calibration wizard that completes the measurement procedure which dramatically reduces your measurement setup and operation time.



MWA software for ENA and E5092A test set

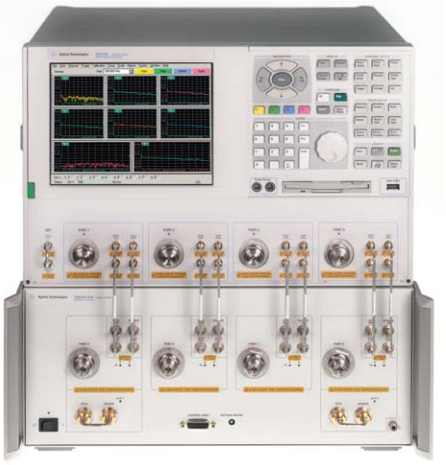
Features

- Simplify complex multiport measurement setups
- Easily define limit line test parameters
- Calibration Wizard function for minimizing calibration procedure of multiport measurements
- External instrument control via GPIB and 24 bit I/O interface
- Monitoring function for go/no-go testing

MWA evaluation software is available at:
http://www.agilent.com/find/mwa

www.agilent.com/find/multiport

PNA Series with External Multiport Test Sets



4-port PNA-L with Z5623A K44 test set

2-port PNA with U3022A E10 test set

4-port PNA-L with U3042A E12 test set

Agilent's extension test sets are designed to work with PNA series network analyzers to configure 8-, 12-, and 16-port systems. These test sets include couplers for each test port in order to maintain the measurement accuracy in the multiport system. The test set is controlled directly from the analyzer and enables error-corrected N-port measurements (with option 551). The high performance option is available for the test sets configured with solid-state switches to compensate losses and provides nearly identical dynamic range performance to stand alone network analyzers. Agilent multiport test sets configured with PNA series network analyzers provide truly flexible solutions with maximized accuracy for your multiport measurement challenges.

16-port measurements up to 26.5 GHz

Features

- Solid-state switches for fast and reliable measurements
- Optional increased dynamic range performance
- Full N-port calibration (with Option 551)
- DUT control lines control the device during the measurements

PNA-L/PNA-X with Z5623A K44
- 10 MHz to 20 GHz
- Adds 4 ports for total of 8 ports
- Measures all 64 S-parameters
- AUX channels to connect external instruments

PNA-L/PNA-X
- 10 MHz to 20 GHz/26.5 GHz
- Adds 8 ports for total of 12 ports
- Measures all 144 S-parameters

PNA-L/PNA-X with U3042A E12
- 10 MHz to 20 GHz/26.5 GHz[1]
- Adds 12 ports for total of 16 ports
- Measures all 256 S-parameters

12-port measurements up to 50 GHz

Features

- Mechanical switches for maximized performance
- Full N-port calibration (with Option 551)
- Compatible with 2-port PNA and PNA-L

PNA/PNA-L/PNA-X with U3022A E10
- 10 MHz to 20 GHz/26.5 GHz
- Adds 10 ports for total of 12 ports
- Measures all 144 S-parameters

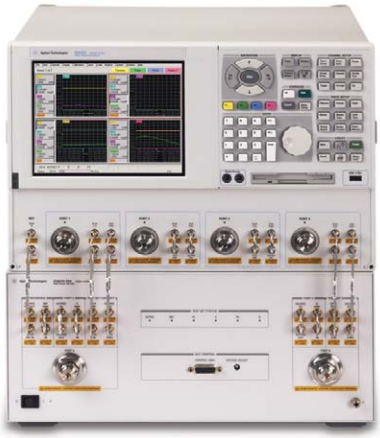
PNA/PNA-L with U3025A E10
- 10 MHz to 50 GHz
- Adds 10 ports for total of 12 ports
- Measures all 144 S-parameters

For more information:

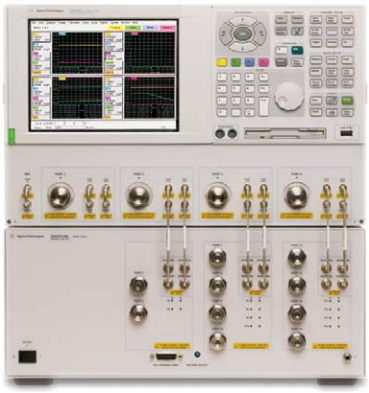
Contact your local Agilent Field Engineer for customized multiport test solutions or *http://www.agilent.com/find/multiport*

1 Test set, with option 700 standard configuration, can be used up to 26.5 GHz with PNA-X.

PNA Series Customized Multiport Solutions



4-port PNA-L with Z5623A K64 test set



4-port PNA-L with Z5623A K66 test set

Agilent can improve your test time efficiency with a test system to fit your exact measurement need whether it is for a 4, 6, 8, 12, 14, 16, or more test ports. Agilent offers customized test sets to work with the PNA Series of network analyzers. Customizing a test set for a specific DUT allows complete testing of all transmission paths and reflection characteristics. This can greatly reduce setup and testing time, as well as operator fatigue. Minimizing the number of connections also lowers the chance of connecting to the wrong port. Fewer connections result in less wear on cables, connectors, fixtures, and DUTs.

PNA Series with custom multiport test sets

Features

- Multiport configurations optimized for measuring your specific device
- Simple measurement setup and instrument calibration for increased productivity
- Solid-state or mechanical switches available for fast, reliable measurement, and best RF microwave performance
- External control lines on test set for DUT control during testing
- Automation interface provides programmers with a choice of development environments to design custom test executives
- Built-in LAN interface makes it easy to connect to company network

PNA/PNA-L with Z5623A K64

- 10 MHz to 20 GHz
- Adds 2 ports for total of 4 or 6 ports
- Full 4-port calibration, 4-port PNA-L or 2-port PNA/PNA-L with Option 550
- Full 6-port calibration, 4-port PNA-L with Option 551
- High power capability on test set ports, +38 dBm

PNA-L with Z5623A K66

- 10 MHz to 20 GHz
- Adds 10 ports for total of 14 ports
- 9-port full crossbar
- Dual full 9-port calibration (with Option 551)

For more information:

Contact your local Agilent Field Engineer for customized multiport test solutions or *http://www.agilent.com/find/multiport*

www.agilent.com/find/multiport

Reduce Calibration Time with Electronic Calibration (ECal)

Agilent offers both 2- and 4-port ECal modules from 300 kHz to 67 GHz

Multiport applications can quickly increase calibration complexity. Connecting mechanical standards to multiple ports requires intensive operator interaction, which is prone to error. With ECal, a full one- to four-port calibration can be accomplished with a single connection to the ECal module and minimal operator interaction. The operator simply connects the ECal module via a single USB cable to the network analyzer. The network analyzer controls the calibration process. Easy-to-use operation of the multiport system minimizes measurement setup time and results in faster and more repeatable calibrations.

Agilent ECal modules are state-of-the-art, solid state devices with programmable and highly repeatable impedance states. ECal modules use fully traceable and verifiable electronic impedance standards. They can be ordered with connectors that match your device under test. Agilent's unique user characterization capability allows you to change the ECal characterization based on your adapter or fixture.

Product Number	Frequency Range	# of Ports	Connector Type 1
85096C	300 kHz to 3 GHz	2	Type-N, 75 ohm
85099C	300 kHz to 3 GHz	2	Type-F
85098C	300 kHz to 7.5 GHz	2	7-16
85091C	300 kHz to 9 GHz	2	APC-7
85092C	300 kHz to 9 GHz	2	Type-N, 50 ohm
85093C	300 kHz to 9 GHz	2	3.5 mm
N4431B	300 kHz to 13.5 GHz	4	3.5 mm, 7-16, Type-N, 50 ohm
N4690B	300 kHz to 18 GHz	2	Type-N, 50 ohm
N4696B	300 kHz to 18 GHz	2	APC-7
N4432A	300 kHz to 18 GHz	4	Type-N, 50 ohm
N4433A	300 kHz to 20 GHz	4	3.5 mm
N4691B	300 kHz to 26.5 GHz	2	3.5 mm
N4692A	10 MHz to 40 GHz	2	2.92 mm
N4693A	10 MHz to 50 GHz	2	2.4 mm
N4694A	10 MHz to 67 GHz	2	1.85 mm

ECal module coverage up to 67 GHz

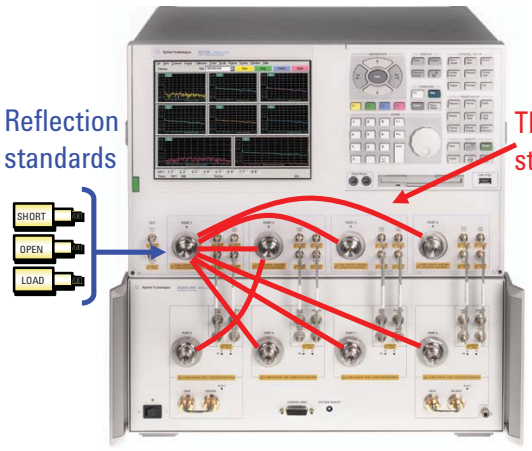
Features

- Fast full 2-, 3-, or 4-port calibration with a single connection
- Ideal calibration technique for manufacturing
- NIST traceable, accurate calibration
- Reliable solid-state switching
- Reduced connector wear and less error prone (as compared to mechanical calibration)
- USB interface for direct control with PNA and ENA Series network analyzers
- 2-port electronic calibration available from 300 kHz to 67 GHz
- 4-port electronic calibration available from 300 kHz to 20 GHz
- Nine connector types available
- Mixed connector options available
- 75 ohm modules available

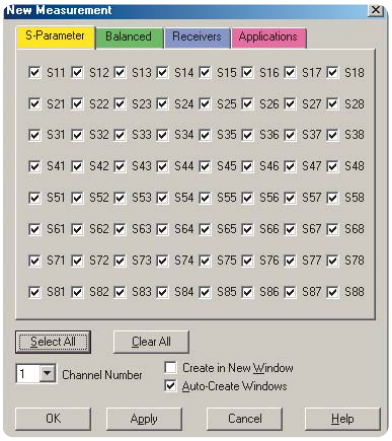
For more information:
http://www.agilent.com/find/ecal

www.agilent.com/find/multiport

Enabling Accurate and Simplified Multiport Network Analysis



Calibration standard connections for 8-port QSOLT



Option 551 enables N x N S-parameters measurements

The physical connection is only one of many multiport measurement challenges. As the port count increases, the number of connection increases, more errors are introduced, and calibration becomes extremely complicated. Agilent offers unique features that enable accurate multiport measurements while keeping the calibration and setup simple.

PNA series with Option 551 provides error corrected N-port network analysis. The PNA's calibration wizard guides you through the entire calibration process with graphical instruction, which eliminates operational errors during multiport calibration.

Unknown Thru calibration technique allows using simple adapters as thru standard for calibration without knowing the adapter characteristics. It significantly simplifies thru connections between mixed-type or non-insertable connectors and increases accuracy compared to other thru methods, such as defined thru or adapter removal.

The traditional full N-port calibration requires three known reflection standards (Open, Short and Load) at each test port, and thru standards for every possible port combinations among the ports, resulting in 12 reflections and 6 thru for 4-port, 24 reflections and 28 thru for 8-port, or 48 reflections and 240 thru for 16-port. The new technique called QSOLT (Quick SOLT) dramatically reduces the number of standard connections for multiport calibration. It requires reflection standards on only one of the ports, and thru standards between the calibrated port and all other ports[1]. As a result, the number of connections is reduced to 3 reflections and 3 thru for 4-port, 7 thru for 8-port, or 15 thru for 16-port.

Full N-port calibration, Option 551

- Provides full N-port error correction
- Measures all N x N S-parameters
- Enables Mixed-mode, imbalanced, and Common Mode Rejection Ratio (CMRR) parameters

Unknown thru calibration

- Available on PNA, PNA-L, PNA-X and ENA
- Recommended thru method for non-insertable, mixed connector type or multiport calibration

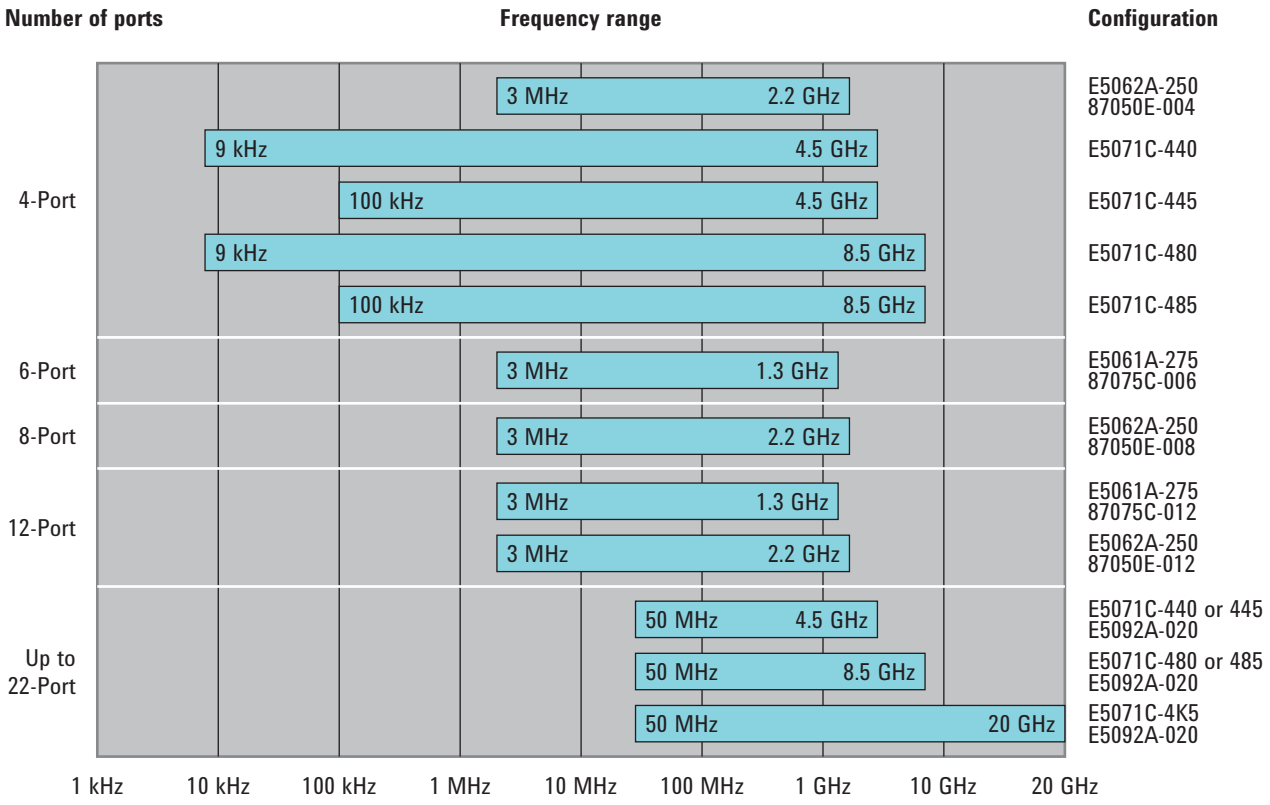
QSOLT calibration

- Reduces number of standard connections
- Requires only SOL standards on one port, and minimum thru standards to connect all ports

1 The ports sharing a test receiver cannot be a part of the thru connections in QSOLT. Alternative paths are shown in the calibration wizard.

www.agilent.com/find/multiport

ENA Multiport Selections



Switching test set

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.

Available switching test set:

- E5092A
- 87050E
- 87075C
- 87050A

Extension test set

Extension Test set is connected to the source 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.

Available extension test set:

- Z5623A K44
- Z5623A K64
- U3022A E10
- U3025A E10
- U3042A E08
- U3042A E12

www.agilent.com/find/multiport

ENA and ENA-L Test Sets (typical performance)

E5092A configurable multiport test set [1]

Frequency range: 50 MHz to 20 GHz
Connectors: SMA (f)
Impedance: 50 ohm

Test set type: Switching test set, switching or full crossbar
Switch type: Solid state
I/O control: USB

Option	Designed for:	Ports	Raw (uncorrected) return loss [2]	Raw (uncorrected) insertion loss
020	4-port ENA (E5071C Option 440/445/480/485/4K5)	Full crossbar: 10 Maximum: 22	**SPDT Switch** 17 dB, 50 M to 3 GHz 11 dB, 3 to 10 GHz 8 dB, 10 to 16 GHz 6 dB, 16 to 18 GHz 4 dB, 18 to 20 GHz **SP4T Switch** 17 dB, 50 M to 3 GHz 11 dB, 3 to 10 GHz 8 dB, 10 to 16 GHz 6 dB, 16 to 18 GHz 4 dB, 18 to 20 GHz	**SPDT Switch** 4 dB, 50 to 100 MHz 3.5 dB, 100 M to 2 GHz 4.5 dB, 2 to 3 GHz 5 dB, 3 to 4 GHz 5.5 dB, 4 to 6 GHz 7 dB, 6 to 8 GHz 8 dB, 8 to 10 GHz 8.5 dB, 10 to 14 GHz 10 dB, 14 to 18 GHz 11.5 dB, 18 to 20 GHz **SP4T Switch** 4 dB, 50 to 100 MHz 3.5 dB, 100 M to 2 GHz 4.5 dB, 2 to 3 GHz 5.5 dB, 3 to 4 GHz 6 dB, 4 to 6 GHz 7.5 dB, 6 to 8 GHz 8.5 dB, 8 to 10 GHz 9.5 dB, 10 to 14 GHz 10.5 dB, 14 to 18 GHz 12 dB, 18 to 20 GHz

87075C test sets

Special calibration features include test set cal to reduce redundant connections during calibration and self cal to reduce the effects of test-system drift.

Frequency range: 3 MHz to 1.3 GHz
Connectors: Type-N (f)
Impedance: 75 ohm

Switch type: Solid state
Switching speed: 60 ms
I/O control: GPIB and Parallel

Option	Designed for:	Ports	Raw (uncorrected) return loss [3]	Raw (uncorrected) insertion loss [4]		Test set type
006	ENA-L	6	~15 dB, 3 MHz to 1.3 GHz	Refl. to Port N	Port N to Trans.	Full crossbar
012		12		~6 dB	~10 dB	

87050E test sets

Special calibration features include test set cal to reduce redundant connections during calibration and self cal to reduce the effects of test-system drift.

Frequency range: 3 MHz to 2.2 GHz
Connectors: Type-N (f)
Impedance: 50 ohm

Switch type: Solid state
Switching speed: 70 ms
I/O control: GPIB and Parallel

Option	Designed for:	Ports	Raw (uncorrected) return loss [3]	Raw (uncorrected) insertion loss [4]	Test set type
004	ENA-L	4	~17 dB, 3 MHz to 1.3 GHz	~6 dB, 3 MHz to 1.3 GHz	Full crossbar
008		8	~14 dB, 1.3 MHz to 2.2 GHz	~8 dB, 1.3 MHz to 2.2 GHz	
012		12	~11 dB, 2.2 MHz to 3 GHz	~12 dB, 2.2 MHz to 3 GHz	

1 ENA-L does not support the E5092A configurable multiport test set.
2 Return loss for each unselected port of internal switches in the E5092A.
3 Typical data.
4 Test set cal and self cal are not supported.

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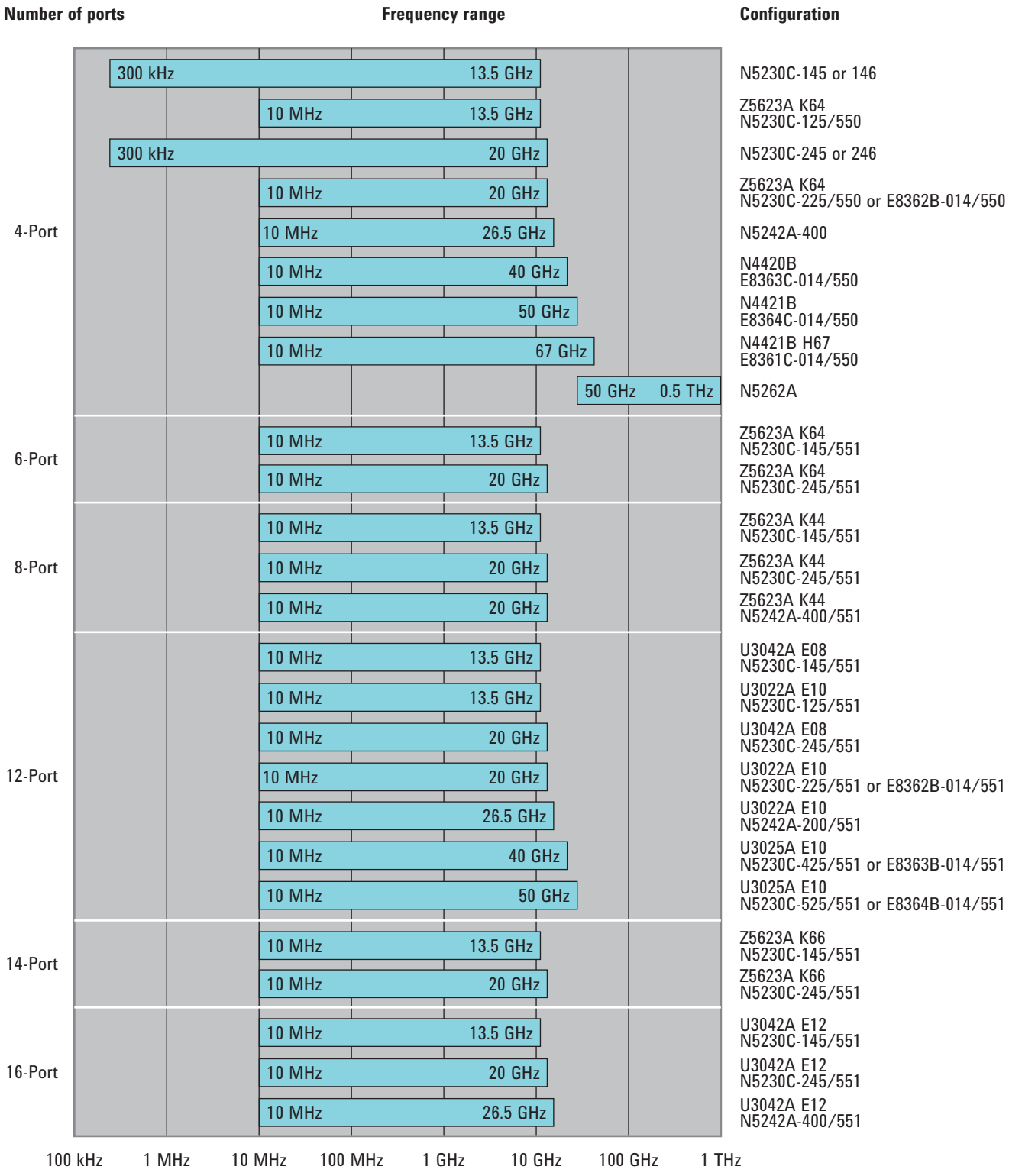
PNA Multiport Selections



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PNA Series Test Sets

N44xx series test sets

Switch type: Solid state **Test set type:** Extension test set

Model number		Total ports	Connector type	Frequency	Dynamic range (dB)[1]		Source loss (dB)
Test Set	PNA				@ Maximum power	@ Maximum leveled power[2]	
N4420B	E8363C	4	2.4 mm (m)	10 MHz to 45 MHz	73	65	3
				45 MHz to 500 MHz	89	81	2
				500 MHz to 2 GHz	112	101	3
				2 GHz to 10 GHz	113	102	4
				10 GHz to 20 GHz	107	99	7
				20 GHz to 30 GHz	95	91	7
				30 GHz to 40 GHz	85	85	11
N4420B	N5230C-425[3]	4	2.4 mm (m)	10 MHz to 45 MHz	82	67	3
				45 MHz to 500 MHz	85	70	2
				500 MHz to 2 GHz	103	88	3
				2 GHz to 10 GHz	91	76	4
				10 GHz to 20 GHz	86	71	7
				20 GHz to 30 GHz	76	69	7
				30 GHz to 40 GHz	65	58	11
N4421B	E8364C	4	2.4 mm (m)	10 MHz to 45 MHz	72	53	3
				45 MHz to 500 MHz	87	67	2
				500 MHz to 2 GHz	110	90	3
				2 GHz to 10 GHz	112	92	4
				10 GHz to 20 GHz	105	88	7
				20 GHz to 30 GHz	94	81	7
				30 GHz to 40 GHz	83	74	11
				40 GHz to 45 GHz	77	71	12
				45 GHz to 50 GHz	64	64	16
N4421B	N5230C-525[3]	4	2.4 mm (m)	10 MHz to 45 MHz	82	67	3
				45 MHz to 500 MHz	85	70	2
				500 MHz to 2 GHz	103	88	3
				2 GHz to 10 GHz	91	76	4
				10 GHz to 20 GHz	86	71	7
				20 GHz to 30 GHz	76	69	7
				30 GHz to 40 GHz	65	58	11
				40 GHz to 45 GHz	49	49	12
				45 GHz to 50 GHz	44	44	16
N4421B H67	E8361C	4	1.85 mm (m)	10 MHz to 45 MHz	47	47	7
				45 MHz to 500 MHz	71	71	8
				500 MHz to 2 GHz	97	91	7
				2 GHz to 10 GHz	95	88	8
				10 GHz to 20 GHz	90	83	11
				20 GHz to 30 GHz	82	75	10
				30 GHz to 40 GHz	76	71	13
				40 GHz to 45 GHz	65	64	15
				45 GHz to 50 GHz	60	59	19
				50 GHz to 60 GHz	58	45	19
				60 GHz to 67 GHz	52	52	19

1 Transmission measurements at 10 Hz IF bandwidth, with full N-port error correction. Expected performance of an average unit, which is not covered by product warranty.
2 At maximum source power level within the range of analyzer's level accuracy specification.
3 Not recommended for signal integrity applications.

PNA Series Test Sets *(continued)*

Z5623A series test set

Switch type: Solid state **Test set type:** Extension test set, full crossbar[1]

Model number / Test Set	PNA	Total ports	Connector type	Frequency	Dynamic range (dB)[2] @ Maximum power	Dynamic range (dB)[2] @ Maximum leveled power[3]	Source loss (dB)
Z5623A K44 Opt 001	N5230C-245	8	3.5 mm (m)	10 MHz to 45 MHz	112	96	5
				45 MHz to 500 MHz	121	105	5
				500 MHz to 2 GHz	118	102	6
				2 GHz to 10 GHz	106	97	9
				10 GHz to 20 GHz	78	78	13
Z5623A K44 Opt 700	N5230C-245	8	3.5 mm (m)	10 MHz to 45 MHz	103	87	5
				45 MHz to 500 MHz	111	95	5
				500 MHz to 2 GHz	110	94	6
				2 GHz to 10 GHz	98	89	9
				10 GHz to 20 GHz	74	74	13
Z5623A K66	N5230C-245	14	3.5 mm (m)	10 MHz to 45 MHz	96[4]	80[4]	Port 2, 5-6: 7 Port 3, 4, 7-14: 11
				45 MHz to 500 MHz	104[4]	88[4]	Port 2, 5-6: 8 Port 3, 4, 7-14: 12
				500 MHz to 2 GHz	102[4]	86[4]	Port 2, 5-6: 9 Port 3, 4, 7-14: 13
				2 GHz to 10 GHz	87[4]	78[4]	Port 2, 5-6: 12 Port 3, 4, 7-14: 18
				10 GHz to 20 GHz	58[4]	58[4]	Port 2, 5-6: 18 Port 3, 4, 7-14: 26

Contact Agilent for performance information: Z5623A K64 and Z5623A K44 with PNA-X.

U302xA test set

Switch type: Mechanical **Test set type:** Extension test set , full crossbar

Model number / Test Set	PNA	Total ports	Connector type	Frequency	Dynamic range (dB)[2] @ Maximum power	Dynamic range (dB)[2] @ Maximum leveled power[3]	Source loss (dB)
U3022A E10	N5230C-225	12	3.5 mm (m)	10 MHz to 45 MHz	109	93	1
				45 MHz to 500 MHz	118	102	1
				500 MHz to 2 GHz	116	100	2
				2 GHz to 10 GHz	106	97	3
				10 GHz to 20 GHz	87	87	5
U3022A E10	E8362C	12	3.5 mm (m)	10 MHz to 45 MHz	77	70	1
				45 MHz to 500 MHz	90	82	1
				500 MHz to 2 GHz	113	105	2
				2 GHz to 10 GHz	113	105	3
				10 GHz to 20 GHz	108	103	5
U3025A E10	E8364C	12	2.4 mm (m)	10 MHz to 45 MHz	82	63	1
				45 MHz to 500 MHz	103	81	1
				500 MHz to 2 GHz	127	105	1
				2 GHz to 10 GHz	129	107	2
				10 GHz to 20 GHz	125	103	4
				20 GHz to 30 GHz	104	89	6
				30 GHz to 40 GHz	98	87	6
				40 GHz to 45 GHz	94	84	7
				45 GHz to 50 GHz	83	78	7

Contact Agilent for performance information: U3022A E10 with PNA-X.

U3042A test set

Switch type: Solid state **Test set type:** Extension test set, full crossbar

Model number / Test Set	PNA	Total ports	Connector type	Frequency	Dynamic range (dB)[2] @ Maximum power	Dynamic range (dB)[2] @ Maximum leveled power[3]	Source loss (dB)
U3042A E12 Opt 001	N5230C-245	12	3.5 mm (m)	10 MHz to 45 MHz	114	98	3
				45 MHz to 500 MHz	125	109	3
				500 MHz to 2 GHz	123	107	4
				2 GHz to 10 GHz	111	102	6
				10 GHz to 20 GHz	83	83	11
U3042A E12 Opt 700	N5230C-245	12	3.5 mm (m)	10 MHz to 45 MHz	105	89	3
				45 MHz to 500 MHz	113	97	3
				500 MHz to 2 GHz	112	96	4
				2 GHz to 10 GHz	100	91	6
				10 GHz to 20 GHz	76	76	11

Contact Agilent for performance information: U3042A E12 with PNA-X.

1 Z5623A K66: Dual 9-port full crossbar.
2 Transmission measurements at 10 Hz IF bandwidth, with full N-port error correction. Expected performance of an average unit, which is not covered by product warranty.
3 At maximum source power level within the range of analyzer's level accuracy specification.
4 At port combinations with maximum source loss.

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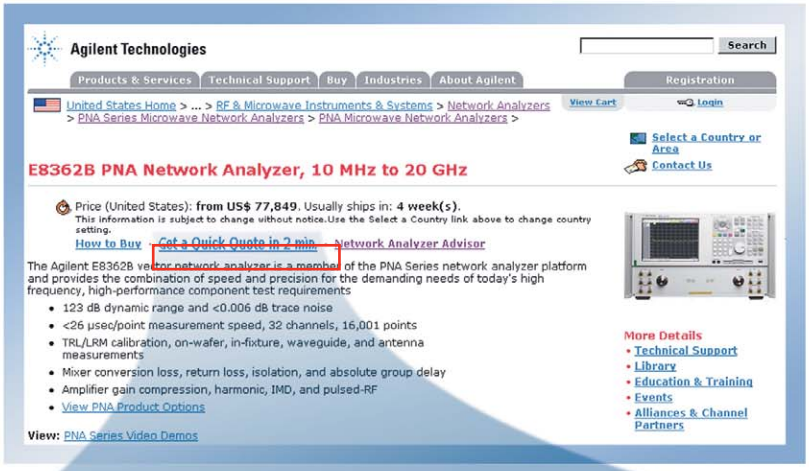

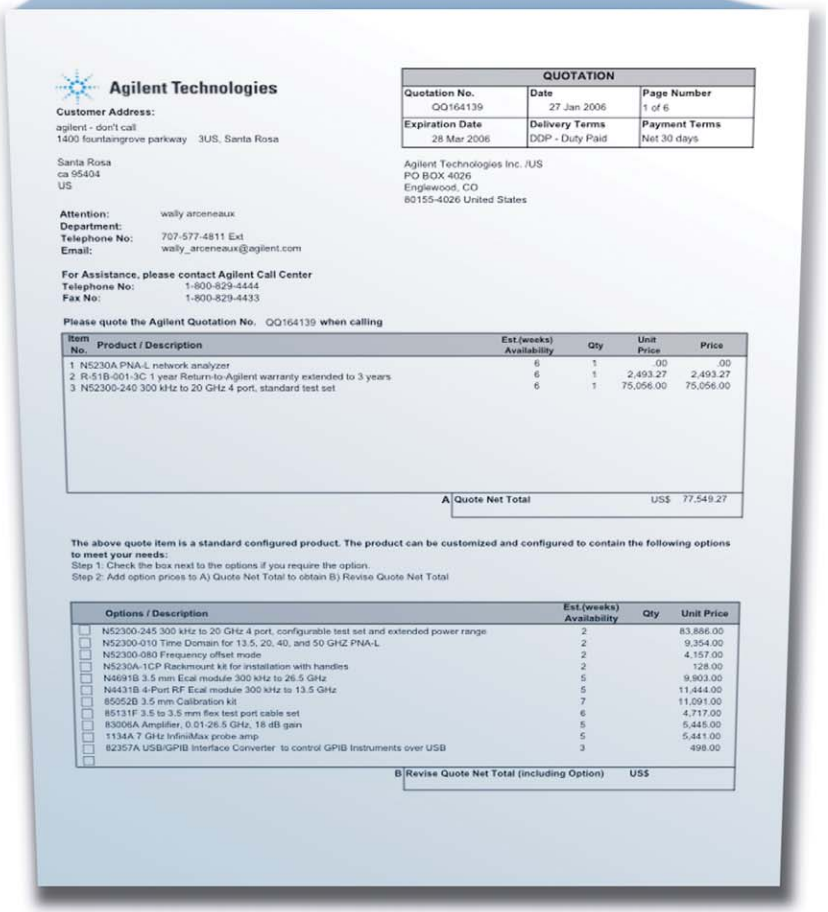

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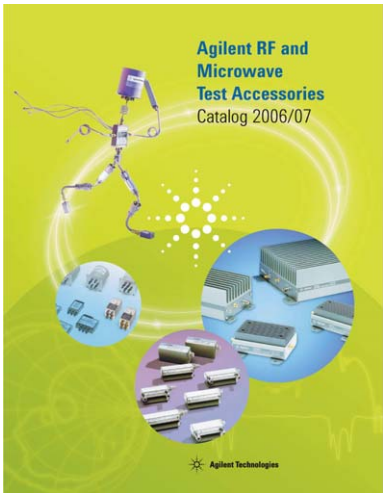

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Revised: October 1, 2008

Printed in USA, October 2, 2008
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