

**Agilent**  
**PNA Series**  
**RF and Microwave**  
**Network Analyzers**



exceptional performance  
advanced automation  
expanding the possibilities

Ch1: Start 840.000 MHz

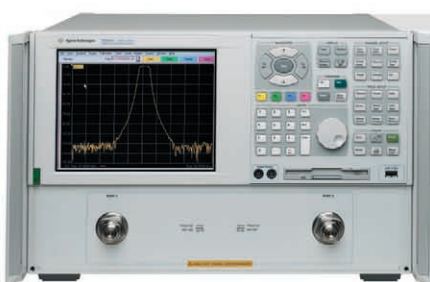


**Agilent Technologies**

Stop 1300.000 MHz

# PNA Series provides...

Rapid evolution of technology presents a growing challenge to component manufacturers in many industries including telecommunications, broadband, and aerospace and defense.



**E8364A**

**50 GHz, 2-port, 4 receiver**

TRL calibration for the most accurate on-wafer, in-fixture, and waveguide measurements

Optional features allow you to add only the capabilities you need

**Applications**

Filters, amplifiers, on wafer and in-fixture devices



**E8356/7/8A**

**3/6/9 GHz, 2-port, 4 receiver**

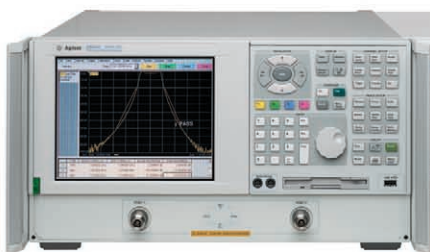
TRL calibration for the most accurate on-wafer and in-fixture measurements

Standard front panel jumpers for highest dynamic range

Standard source attenuators and bias-tees for your active measurement needs

**Applications**

Filters, amplifiers, on wafer and in-fixture devices



**E8801/2/3A**

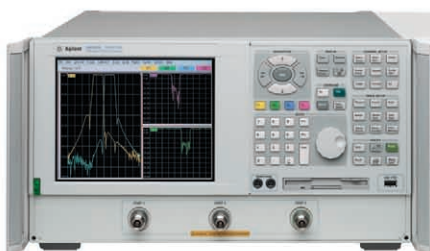
**3/6/9 GHz, 2-port, 3 receiver**

3 measurement receivers give you high performance at a great value

Optional features allow you to add only the capabilities you need

**Applications**

Filters, cables



**N3381/2/3A**

**3/6/9 GHz, 3-port, 4 receiver**

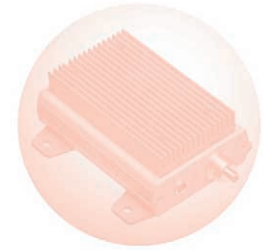
Full 3-port calibration provides the most accurate characterization of your low-isolation 3-port devices

Optional features allow you to add only the capabilities you need

**Applications**

Duplexers, couplers, circulators

# ...the Performance you Demand



## Exceptional measurement capabilities for both today and tomorrow

- <math>35 \mu\text{s}</math>/point measurement speed
- 143 dB dynamic range with direct receiver access for RF models
- 134 dB dynamic range with direct receiver access for the microwave model
- <math>0.002 \text{ dB}</math> trace noise for RF models
- 300 kHz to 50 GHz frequency coverage

You design and test leading edge RF and microwave devices that can push the limit of your test equipment. Agilent PNA Series analyzers meet your challenges with the right combination of fast sweep speeds, wide dynamic range, low trace noise, and flexible connectivity. Test your high-performance components with a network analyzer that meets your measurement needs now and well into the future.

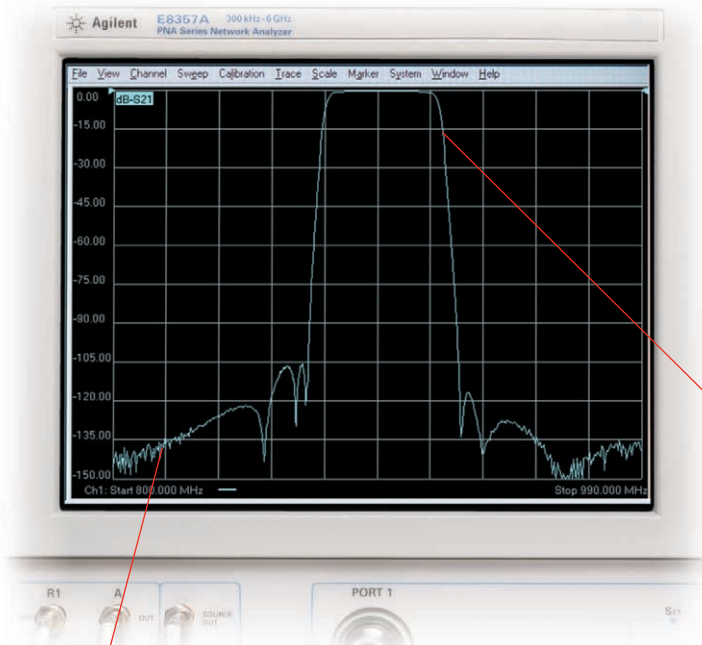
## Precise calibrations that ensure the quality and reliability of your products

- 4 mixer-based receivers enable TRL/LRM calibration (see page 11 for specific models)
- Full 3-port calibration provides the most accurate characterization of your low-isolation 3-port devices
- Adapter-removal calibration removes the effects of adapters when calibrating your mixed connector device
- Power meter calibration for your amplifier measurements



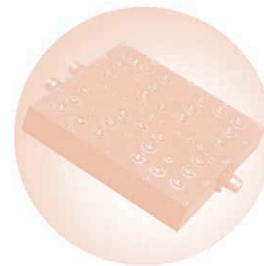
Use TRL calibration for accurate in-fixture or on-wafer measurements.

Accurately measure passband ripple of low insertion loss filters, such as DRF or LC filters, with low trace noise.



Measure base station filters or LAN/receiver filter combinations with up to 143 dB dynamic range.

## ...the Throughput you Strive for



Reduce test time with a network analyzer optimized to increase throughput.



### **Built for Speed**

Decreasing test time is critical for your success in the marketplace. The PNA Series analyzers are designed with maximum throughput in mind. Use a variety of powerful tools to optimize your measurement processes.

### **Reduce test time with fewer connections**

Connect your 3-port device once for full characterization in just 3 sweeps with the new 3-port PNAs. (see specific models on page 11)

### **Decrease calibration time with easy-to-use electronic calibration (ECal)**

Perform fast, accurate, automatic calibrations with Agilent's ECal products. Control ECal directly from the analyzer without an external PC.

### **Dramatically increase throughput with segment sweep mode**

Optimize each sweep by collecting data at frequency segments you define. Specify each segment with the optimum number of points, IF bandwidth and power level for increased speed and dynamic range.

### **Reduce test time with pass/fail testing**

Let the network analyzer determine if measurement results are within limits that you define. Specify limits easily using the limit table.



## Gain a competitive advantage with powerful automation tools

Automated test is yet another method you can use to eliminate valuable seconds from your test process. Use the flexible automation environment to lower your cost of test.

- Control the analyzer using SCPI commands, or gain the speed and connectivity advantage of COM/DCOM.
- Execute code directly from the analyzer, or from an external PC through LAN or GPIB.
- Develop code in the programming language you want. Languages like Visual Basic, Visual C++, Agilent-VEE, or LabView™.

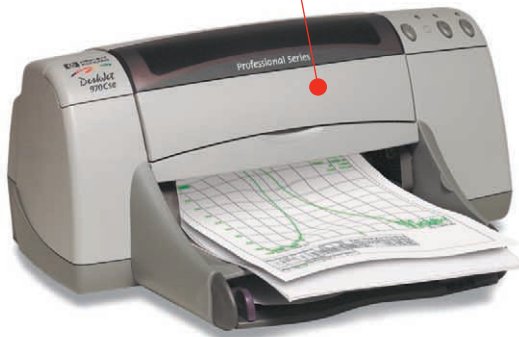
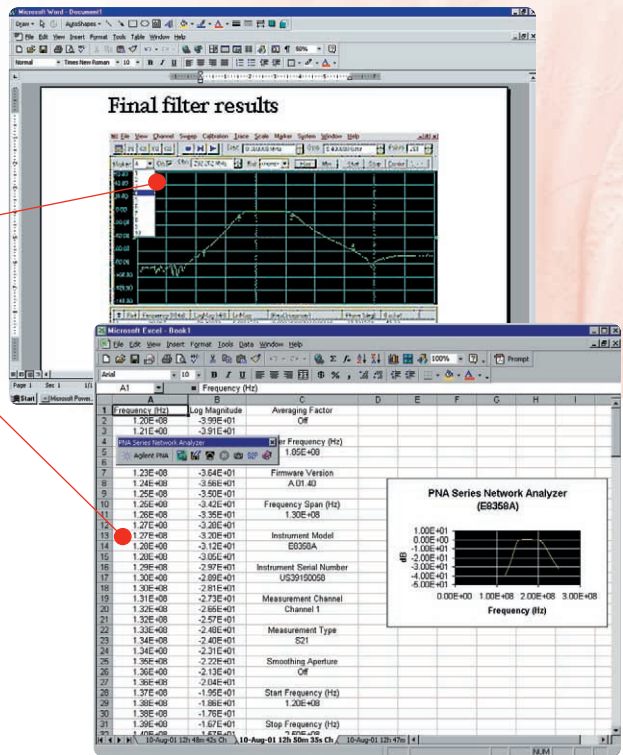
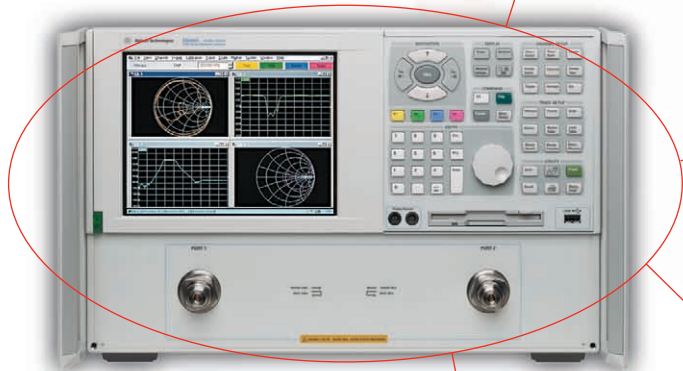
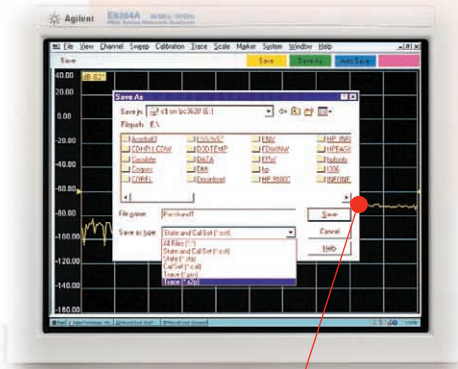


## The COM/DCOM advantage

- Quick data transfer rate (<1 ms COM, 50 ms SCPI over GPIB)
- Swift command execution
- Fewer lines of code
- Re-use rather than re-write objects

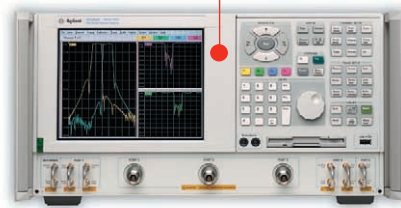
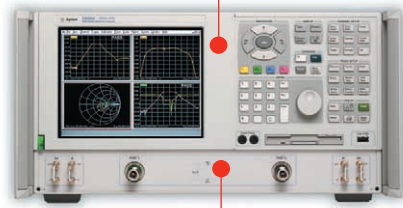
# ...the Connectivity you Dream of

Save data easily to floppy disk, internal hard drive, or your external CD-RW drive, PC or server using the familiar Windows® interface.



Send results to printers over LAN, parallel, serial or USB interfaces.

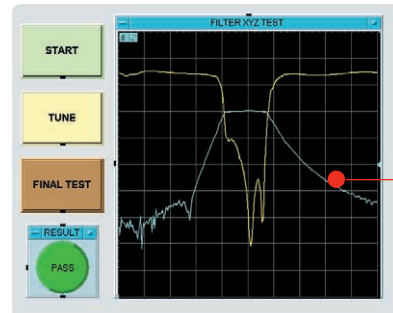
Import trace data and screen images directly into your Microsoft® Excel or Word applications using Agilent IntuiLink® for post-processing on the analyzer. Download IntuiLink free at: [www.agilent.com/find/intuilink](http://www.agilent.com/find/intuilink)



Control additional test equipment directly from the analyzer. Use a variety of I/O interfaces including GPIB, USB, LAN and parallel connections.

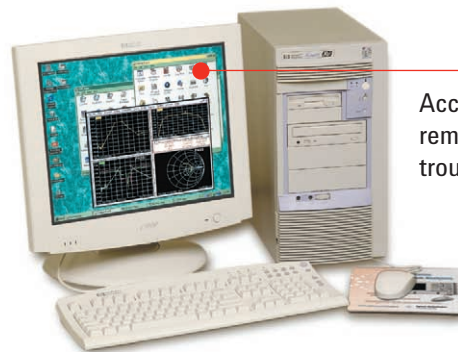


Integrate the analyzer into your automated test using SCPI or COM/DCOM.

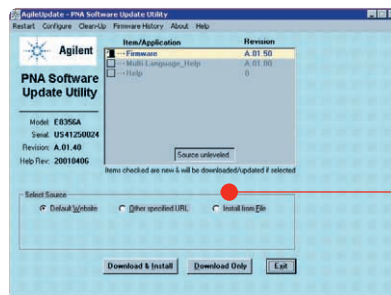


## Achieve a new level of integration

Standard features and an integrated Windows® 2000 operating system give you maximum connectivity choices.



Access the analyzer remotely for additional troubleshooting capability.

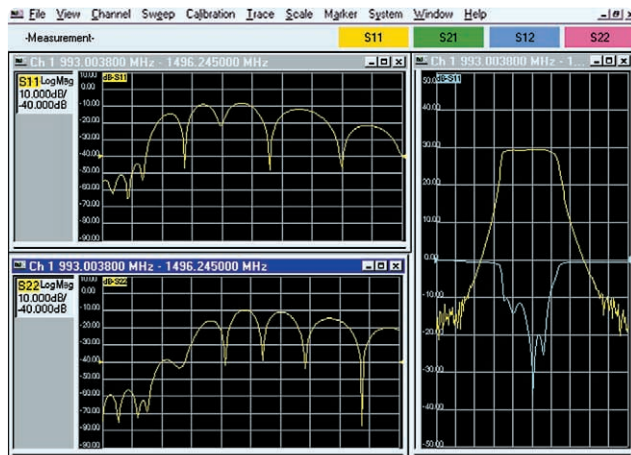


Use the analyzer's AgileUpdate to alert you to new features or new functionality available for free download to any PNA Series analyzer.



Send test data to a central file server.

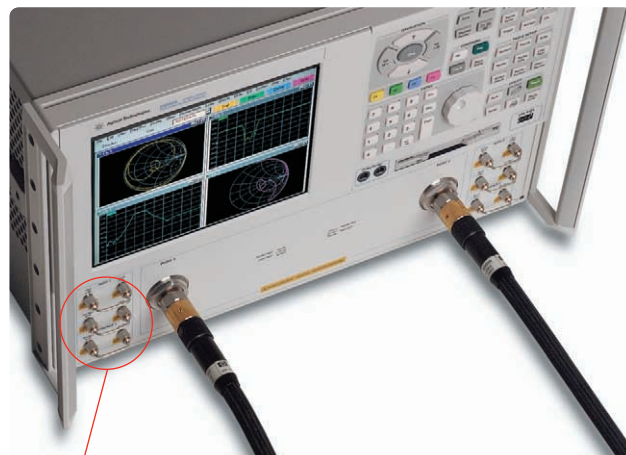
## ...the Flexibility you Desire



Arrange windows for custom viewing or select standard viewing configurations.

**The PNA Series family combines powerful features with the benefit of Windows to provide maximum measurement flexibility and versatility.**

- Configure up to 16 independent stimulus settings in a single instrument state.
- Display up to 4 active traces in each window.
- Select 10 coupled or fully-independent markers per trace.



Configurable test set: access signal paths for flexible configurations.

### High power measurements

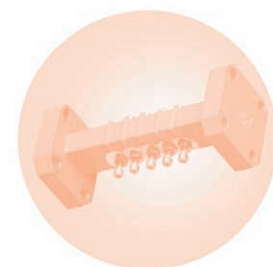
- Use the configurable test set option to add your own external components in the measurement path.
- Internally controlled step attenuators in the source and/or receiver path give you a greater power range.
- Bias-tees supply DC power to your active components.

### High-rejection measurements

- Obtain maximum dynamic range at the test port with full 12-term error correction using the configurable test set option.

### Time-domain analysis

- Locate and resolve discontinuities in your device, fixture or cable. Once located, use gating to remove unwanted responses.
- Tune cavity-resonator bandpass filters quickly with a simple, deterministic method.





...the Ease of Use you Seek

### Answers when and where you need them with embedded help

Accelerate learning with context-sensitive help and robust tutorials. Use on-line help to quickly reference programming and user documentation in French, German, Japanese, Spanish or English languages. Now you can use Favorites to bookmark important topics.

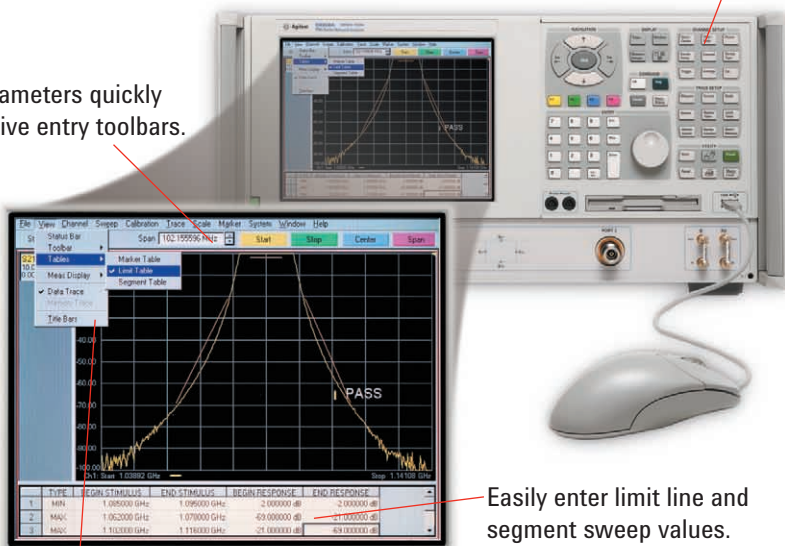


Set up fundamental measurements quickly using front panel keys.

Input parameters quickly using active entry toolbars.

### Configure measurements easily with intuitive user interface

Navigate the analyzer efficiently using familiar front panel keys or with a mouse. Use a mouse or hard keys independently, or in combination to best suit your needs. Both methods are optimized in the Windows® environment for fast, intuitive operation.



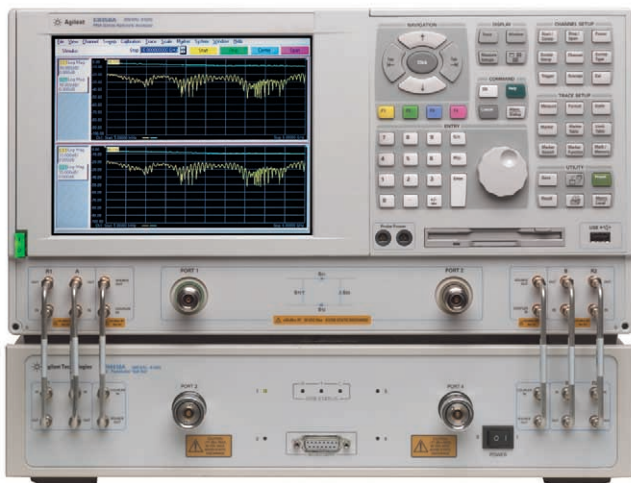
Easily enter limit line and segment sweep values.

View choices easily with drop down menus.

# ...the Total Solutions you Deserve

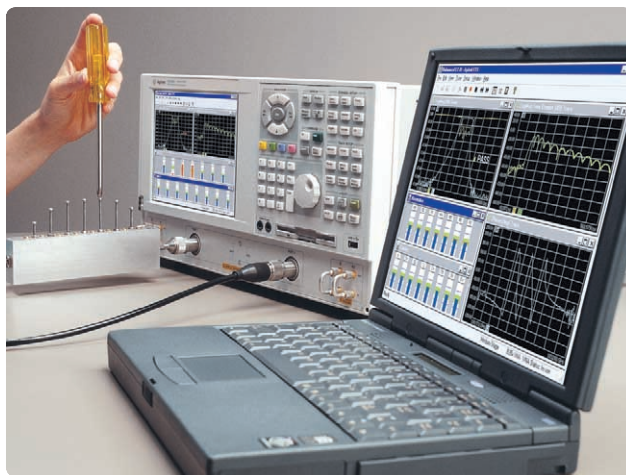


## Characterize your balanced devices



Agilent's balanced-measurement systems make complex characterization of fully balanced or balanced-to-single-ended RF components a lot easier. Devices such as differential filters and amplifiers, baluns, and balanced transmission lines that were once difficult to measure using a conventional two-port measuring system, can now be completely and accurately tested with Agilent's solutions. For more information visit [www.agilent.com/find/balanced](http://www.agilent.com/find/balanced)

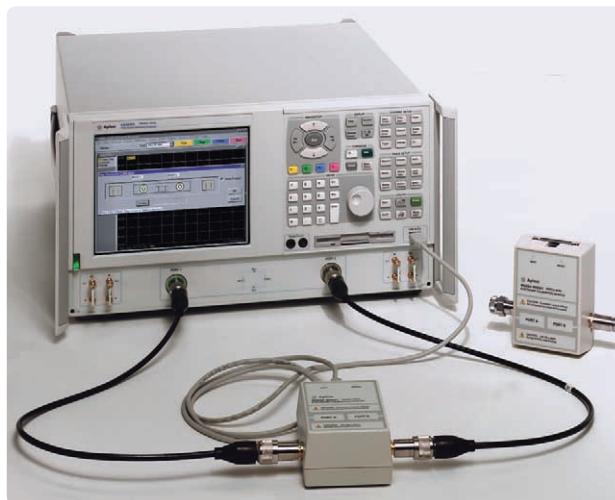
## Reduce training and test time for filters



For manufacturers of high-performance bandpass filters, Agilent's new N4261A filter tuning software is the only solution that allows inexperienced filter tuners to rapidly tune multiple-pole filters after only brief instruction. Agilent's filter tuning software is the industry's first complete solution that helps manufacturers reduce average filter alignment times and significantly reduces personnel training times. For more information visit [www.agilent.com/find/fts](http://www.agilent.com/find/fts)

## Calibrate effortlessly with ECal

Electronic calibration (ECal) is a precision, single connection, one or two-port calibration technique for Agilent vector network analyzers. ECal offers a full two-port calibration with a single connection to the ECal module with minimal operator interaction. You get faster results, more repeatable calibrations, and less wear on the connectors. PNA Series compatible modules are available to 9 GHz. For more information visit [www.agilent.com/find/ecal](http://www.agilent.com/find/ecal)



# ...the Information you Can Rely on

## Key Specifications

Model	RF			Microwave
	E8356/7/8A	E8801/2/3A	N3381/2/3A	E8364A
Frequency range	300kHz - 3/6/9 GHz			45MHz - 50 GHz
Number of ports	2	2	3	2
Measurement receivers	4	3	4	4
<b>Configurable test set<sup>1</sup></b>				
Receiver access	Standard	Option 014	Option 014	Option 014
Source access	Option 015	Option 014	Option 014	Option 014
Extended power range	Standard	Option 1E1	Option 1E1	Option UNL
High stability timebase	Standard	Option 1E5	Option 1E5	Standard
Bias tees	Standard	–	–	Option UNL
Time domain	Option 010	Option 010	Option 010	Option 010
ECal support	Yes	Yes	Yes	No

Dynamic range (at test port)					
			Port 1/Port 2, 3 <sup>2</sup>		
300 kHz - 1 MHz	125 dB	125 dB	125 dB/123 dB	45 MHz - 2 GHz	82 - 115 dB
1 MHz - 3 GHz	128 dB	128 dB	128 dB/126 dB	2 GHz - 20 GHz	120 dB
3 GHz - 6 GHz	118 dB	118 dB	118 dB/116 dB	20 GHz - 40 GHz	107 dB
6 GHz - 9 GHz	113 dB	113 dB	113 dB/113 dB	40 GHz - 50 GHz	>100 dB

Dynamic range (receiver access)					
			Port 1/Port 2, 3 <sup>2</sup>		
300 kHz - 1 MHz	140 dB	140 dB	140 dB/138 dB	45 MHz - 2 GHz	120 dB
1 MHz - 3 GHz	143 dB	143 dB	143 dB/141 dB	2 GHz - 20 GHz	134 dB
3 GHz - 6 GHz	133 dB	133 dB	133 dB/131 dB	20 GHz - 40 GHz	115 dB
6 GHz - 9 GHz	128 dB	128 dB	128 dB/128 dB	40 GHz - 50 GHz	>100 dB

Trace noise (1kHz IF BW)					
300 kHz - 9 GHz	<0.002 dB	<0.002 dB	<0.002 dB	45 MHz - 50 GHz	<0.06 dB
	<0.010 deg rms	<0.010 deg rms	<0.010 deg rms		<0.4 deg rms

Maximum output power					
			Port 1/Port 2, 3 <sup>2</sup>		
300 kHz - 6 GHz	+10 dBm	+10 dBm	+10 dBm/+8 dBm	45 MHz - 500 MHz	0 dBm
6 GHz - 9 GHz	+5 dBm	+5 dBm	+5 dBm/+5 dBm	500 MHz - 10 GHz	+5 dBm
				10 GHz - 20 GHz	+3 dBm
				20 GHz - 40 GHz	-3 dBm
				40 GHz - 45 GHz	-5 dBm
				45 GHz - 50 GHz	-10 dBm

### Measurement speed (35 kHz IF bandwidth)

Model	Frequency	Points	Cycle time (ms) <sup>3</sup>	µs/point	Updates/second
All	1.8 GHz - 2 GHz	101	9	89	111
All	1.8 GHz - 2 GHz	1601	56	35	18
All	300 kHz - 9 GHz	201	57	284	18
E8364A	45 MHz - 50 GHz	201	200	995	5
E8364A	45 MHz - 50 GHz	1601	247	154	4

### Data transfer speed, 32-bit binary (ms)<sup>4</sup>

	201 points	1601 points
COM <sup>5</sup>	2	3
SCPI <sup>5</sup>	3	9
DCOM <sup>6</sup>	3	14
SCPI over GPIB <sup>6</sup>	9	57
SCPI over LAN <sup>6</sup>	12	28

1. To achieve the highest dynamic range requires receiver access. The combination of source and receiver access allows for the highest dynamic range with full 12-term error correction.
2. Port 1 = Power source from Port 1;  
Port 2, 3 = Typical performance power source from Port 2 or 3
3. Typical performance; includes retrace and band switching times with response calibration; full two-port calibration approximately doubles cycle time
4. Typical performance
5. Program executed in the network analyzer
6. Program executed on an external PC

# Imagine What you can Achieve Using Agilent's New Approach to Network Analysis...

## Key web resources

Visit our component manufacturer industry area at:

[www.agilent.com/find/component\\_test](http://www.agilent.com/find/component_test)

Visit the PNA Series home page at:

[www.agilent.com/find/pna](http://www.agilent.com/find/pna)

For further information about Agilent's service and support products, please visit:

[www.agilent.com/find/tm\\_services](http://www.agilent.com/find/tm_services)

## Additional literature

*PNA Series, RF Technical Specifications*, publication #5980-1236E

*PNA Series, RF Configuration Guide*, publication #5980-1235E

*PNA Series, Microwave Technical Specifications*, publication #5988-3992EN

*PNA Series, Microwave Configuration Guide*, publication #5988-3993EN

## Expand your measurement capabilities with Agilent-qualified Channel Partners.

Our Channel Partners offer accessories and measurement solutions that extend your network analysis capabilities.

For information about test fixtures and part handlers, contact:

### Inter-Continental Microwave

1515 Wyatt Drive

Santa Clara, CA 95054 USA

Telephone: (408) 727-1596

Fax: (408) 727-0105

Web site: [www.icmicrowave.com](http://www.icmicrowave.com)

E-mail: [icmfixture@aol.com](mailto:icmfixture@aol.com)

For information about probing equipment and accessories, contact:

### Cascade Microtech, Inc

2430 NW 206th Avenue

Beaverton, OR 97006 USA

Telephone: (503) 601-1000

Fax: (503) 601-1002

Web site: [www.cascademicrotech.com](http://www.cascademicrotech.com)

E-mail: [sales@cmicro.com](mailto:sales@cmicro.com)

## Agilent Technologies Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

### Our Promise

Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

### Your Advantage

Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

By internet, phone, or fax, get assistance with all your test and measurement needs

## Online assistance:

[www.agilent.com/find/assist](http://www.agilent.com/find/assist)

Phone or Fax

### United States:

(tel) 1 800-452-4844

### Canada:

(tel) 1 877-894-4414

(fax) (905)-282-6495

### China:

(tel) 800-810-0189

(fax) 1-0800-650-0121

### Europe:

(tel) (31 20)-547-2323

(fax) (31 20)-547-2390

### Japan:

(tel) (81)-426 56 7832

(fax) (81)-426 56 7840

### Korea:

(tel) (82-2)-2004-5004

(fax) (82-2)-2004-5115

### Latin America:

(tel) (305)-269 7500

(fax) (305)-269 7599

### Taiwan:

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(fax) (65)-836-0252

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Part handler (page 4) courtesy of Inter-Continental Microwave

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