Agilent Measurement Solutions for Balanced Components

Product Overview

Discontinued Product Information
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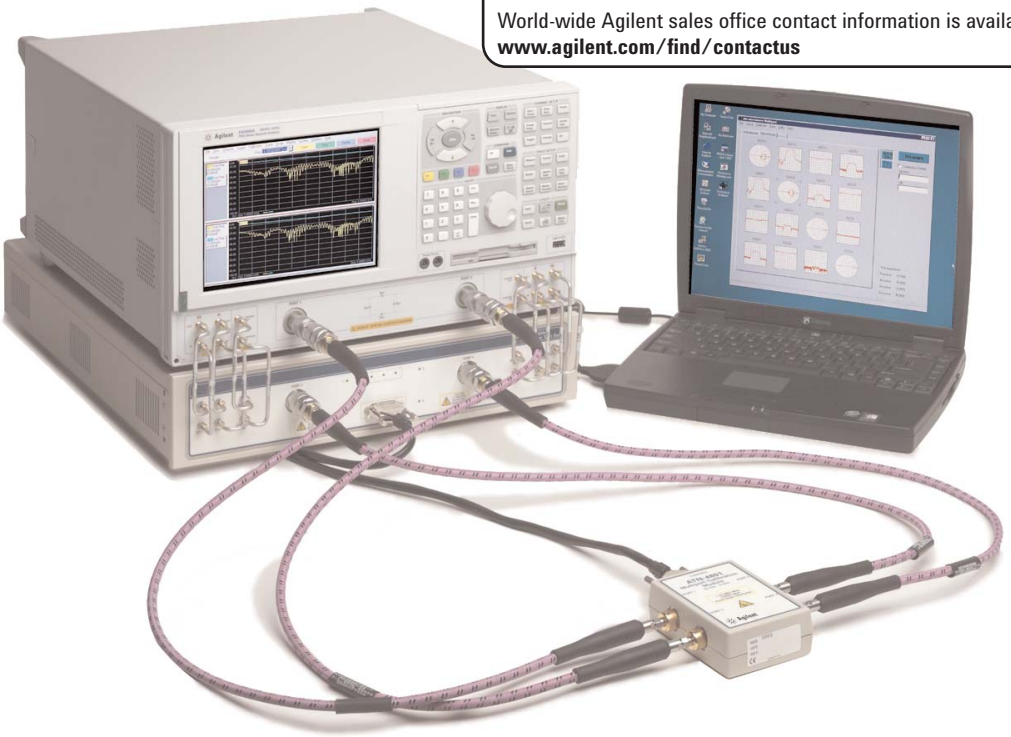
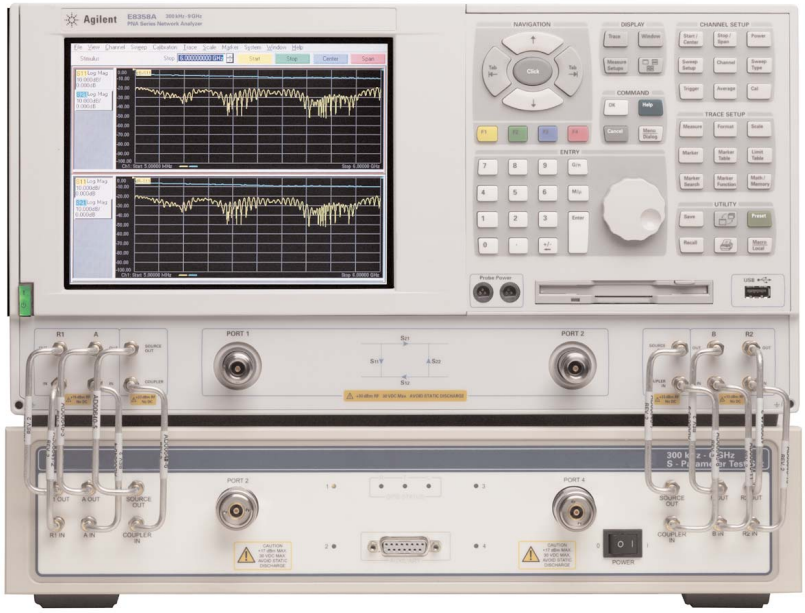


Mixed mode S-parameter and time domain characterization for fully balanced or balanced-to-single-ended devices

Agilent Technologies

Tools you need for the easiest, most accurate characterization of fully balanced or balanced-to-single-ended components



- **Display conventional (single-ended) and mixed mode S-parameters**
- **Re-normalize test data for non-50-ohm devices**
- **Achieve high measurement accuracy with full four-port vector error correction**
- **Perform fast, accurate, automatic calibrations with easy to use four-port electronic calibration (ECal) module**
- **Calculate important parameters with powerful user defined displays**
- **Gain additional insight with time domain analysis option**

Complete vector network analyzer-based multiport measurement solutions

Complex characterization of fully balanced or balanced-to-single-ended RF components is now a whole lot easier. Devices such as differential filters or amplifiers, baluns, and balanced transmission lines that were once difficult to measure using conventional two-port measuring systems, can now be completely and accurately tested with Agilent's balanced measurement solutions. These test solutions combine a vector network analyzer (VNA) with an S-parameter test set and Windows®-based software for differential measurements covering 30 kHz to 20 GHz.[1]

Speed and simplify differential measurements

With one set of connections you can test both single-ended or balanced topologies across the full RF and microwave frequency range. Whether your application is for an engineering or manufacturing environment, this family of products can save you valuable time and money, and help you achieve higher levels of productivity and accuracy than other test methods.

1. An external PC equipped with an IEEE-488 GPIB card is also required.

Mixed mode S-parameters provide key insights into device performance

While ideal balanced components only respond to or produce differential (out-of-phase) signals, real-world devices also respond to or produce common-mode (in-phase) signals. Mode conversion measurements are key to understanding a device's susceptibility to or generation of electro-magnetic interference (EMI). Additional insights into EMI issues early in the design process gives engineers more alternatives to solving potential problems before devices reach manufacturing. Agilent's balanced-measurement test systems perform a series of single-ended stimulus/response measurements on all measurement paths of the device under test (DUT), and then calculate and display differential mode, common-mode, and mixed mode S-parameters.

Re-normalize data for non-50-ohm devices

Testing non-50-ohm devices, like balanced SAW filters, with a tradition 50-ohm network analyzer is challenging. Now, with Agilent's balanced measurement software you can enter different reference impedances for each test port. The software uses this information to display the data the way you would like to see it, eliminating the guesswork normally associated with these measurements.

Time domain option adds further insight

A time domain analysis option provides differential time domain reflectometry (TDR) and time domain transmission (TDT) characterization of devices, using step or impulse stimulus. Unwanted time domain responses can be gated out, such as reflections from fixture launches, giving you a clearer picture of the balanced device's actual performance.

Eliminate test baluns for complete, accurate characterization

One way to test narrowband RF devices is to use test baluns to convert between single-ended and differential signals. This approach has two common drawbacks: it prevents full characterization of the device, and the calibration procedure yields measurements that are far less accurate than those using single-ended short-open-load-through (SOLT) calibration techniques. When test baluns are used, only one of the four modes of operation can be measured (differential to differential). Mode conversions cannot be measured, thereby eliminating the insight into a device's EMI characteristics.

Calibration is usually accomplished by calibrating without the test baluns in place, and then extending the calibration plane to the ports of the DUT during the measurement, using the port-extension feature of the network analyzer. While you can normalize the measurement to remove the frequency response error introduced by the test baluns, you cannot remove the mismatch or amplitude and phase imbalance errors that they introduce. Baluns are inadequate for data communication applications because of their limited bandwidth. Agilent's approach eliminates physical baluns, thereby maintaining exceptional measurement accuracy and permitting full differential and common-mode performance measurements.

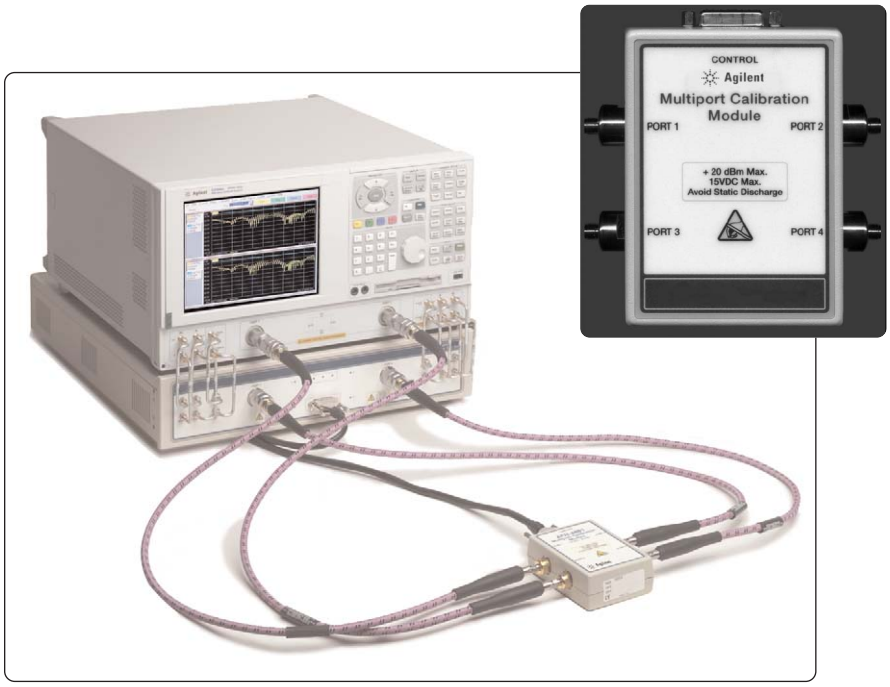
Example showing mixed-mode S-parameters of a SAW filter.

Full four-port error correction gives highest accuracy

Agilent's balanced measurement solutions use SOLT calibration techniques and four-port vector error correction to provide the same level of accuracy for three- and four-port devices as two-port calibration brings to two-port devices. For every measurement, the imperfect aspects of all four test ports are mathematically removed, which gives you excellent measurement accuracy. You can either use Agilent mechanical SOLT calibration kits or the four-port ECal module.

Electronic calibration module eliminates lengthy cal procedure

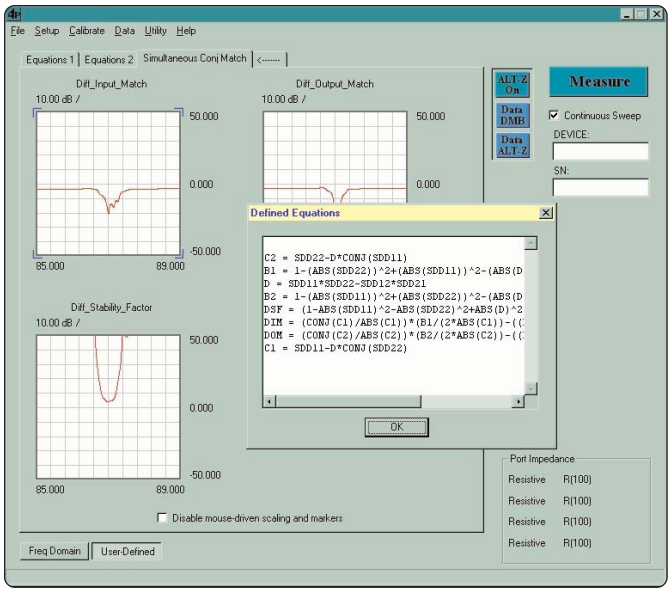
Using the optional four-port ECal module, you can quickly and easily calibrate the entire test system. Simply connect the module and all of the measurements required for a full four-port calibration are done with a simple click of the mouse. With a single set of connections, ECal cycles through the impedance states required for a full, four-port calibration in under a minute. Comparable calibrations using the operator-intensive mechanical-standard technique could easily take five times longer.



Adapters needed to convert from female 3.5mm connectors to the DUT's connector type can be de-embedded from the calibration. The software provides an adapter-characterization tool to easily measure the electrical length and loss of the adapters, which is then used in the de-embedding calculations. The system also supports S-parameter files for fixture de-embedding.

Measure hard-to-characterize single-ended devices like couplers

Making accurate isolation measurements of three- and four-port directional couplers is difficult using a two-port network analyzer, and inaccurate when using a three- or four-port analyzer and two-port error correction. Four-port error correction removes the imperfections of all the test ports simultaneously for every S-parameter measurement, giving you the throughput advantages of a multiport test set along with the best possible measurement accuracy.



Example showing user defined display of differential-mode simultaneous conjugate match.

User defined display lets you customize your measurements

Often, characteristics other than simple S-parameters are important for a particular application, such as phase and amplitude balance, common mode rejection ratio (CMRR), K-factor, or differential-mode simultaneous conjugate match. With the user defined display feature, these alternate parameters can be easily defined and viewed. Simply write an equation involving the device's S-parameters, and let the PC perform the mathematical calculations and display the results automatically. Mathematical operators include addition, subtraction, multiplication, division, and exponentiation. Functions available include absolute, conjugate, real, imaginary, and arc tangent. These choices give you the flexibility needed to easily define and perform complex calculations.

Analyze balanced transmission line and interconnect performance

Today's high-speed interconnect and backplane clock and data signals often have frequency components well into the microwave region. Thorough high speed system design requires characterizing these structures as transmission lines over a wide-enough frequency range to understand how they will affect a signal. Agilent's VNA-based approach to differential measurements yields unparalleled accuracy, dynamic range and measurement flexibility. Unbalanced, balanced, or multiple coupled lines can all be evaluated. Among the parameters that can be easily and accurately determined are characteristic impedance and various types of crosstalk.

Near-end and far-end crosstalk are important considerations when analyzing multiple transmission lines. Balanced transmission lines require special care for complete characterization since each mode of propagation that the lines support must be considered. Conversion of signals from one mode to another is an often overlooked, but very important consideration in determining balanced-transmission-line performance. You may be concerned, for example, about how much common-mode noise from one balanced transmission line is coupling onto an adjacent balanced transmission line, resulting in a differential-mode noise signal. With Agilent's balanced measurement solutions, you can thoroughly characterize all types of crosstalk on balanced transmission lines.

N4413A Test set (ATN-4111A)

System performance summary

The following specifications are applicable for a system consisting of the following configuration:

Network analyzer	8753ES, Options 006 and 011
Test set	N4413A
Calibration kit	85052C, precision 3.5 mm
Test port cables	N4413A, Option B20

Dynamic range

Transmission measurements at 10 Hz IF bandwidth with full error correction and +15 dBm maximum output power.

0.050 to 0.3 GHz	85 dB
0.3 to 4 GHz	90 dB
4 to 5 GHz	85 dB
5 to 6 GHz	75 dB

Measurement port characteristics

Residual uncertainties for corrected data using four-port error correction. These apply for 25 ˚C with less than 1˚C variation from the calibration temperature.

Frequency range	.05-2 GHz	2-4 GHz	4-6 GHz
Directivity	48 dB	46 dB	44 dB
Source match	42 dB	38 dB	35 dB
Load match	48 dB	46 dB	44 dB
Refl. tracking (±)	.012 dB	.012dB	.020 dB
Trans. tracking (±) .	.006 dB	.006 dB	.013 dB

Test set typical performance

Frequency range	50 MHz - 6.0 GHz
Impedance	50 ohms
Insertion loss, any test port to A/B	24 dB max
Insertion loss, RF to any test port	10 dB max.
Insertion loss, RF to R	20 dB max.
Isolation, port to port	≥85 dB.
Maximum operating level	+20 dBm
Damage level	+30 dBm
DC bias range (Option UNL)	40 VDC, 500 mA
RF attenuator (Option UNL)	0-70 dB in 10 dB steps
Test-port connectors	3.5 mm (m)
VNA connectors	50 ohm Type-N (f)
Weight	9 kg

Supported peripheral equipment

Network analyzer	8753C (3 GHz), Rev. .04.13 8753D/E/ES, Options 006 and 011
Calibration kit	N4430A (ATN-4801) electronic calibration module[2], or 85033D, 85052D (3.5 mm), 85050B (7 mm), 85032 (Type-N)
Computer	Pentium II with ≥64 MB RAM Windows 95/98/NT
Monitor	1024 x 768 minimum resolution
IEEE-488 card	Agilent 82340, 82341, or National Instruments (any model)

Ordering information

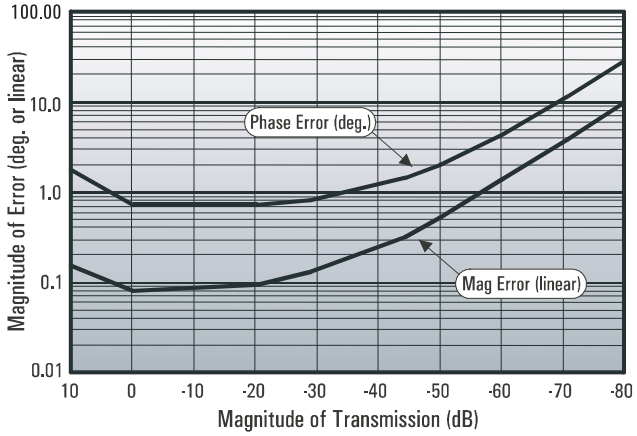
N4413A	50 MHz to 6 GHz S-parameter test set
Option 105[3]	Balanced measurement software
Option 110[3]	Balanced measurement software with time domain analysis
Option UNL	Bias networks and source step attenuator
N4430A	4-port electronic calibration module
N4441A	Balanced measurement system, 50 MHz to 6 GHz. Includes 8753ES Options 006 and 011 and N4413A Options UNL and 105
Option 060	4-port electronic calibration module
Option 110	Time domain analysis

The following options are available for the N4413A and N4441A:

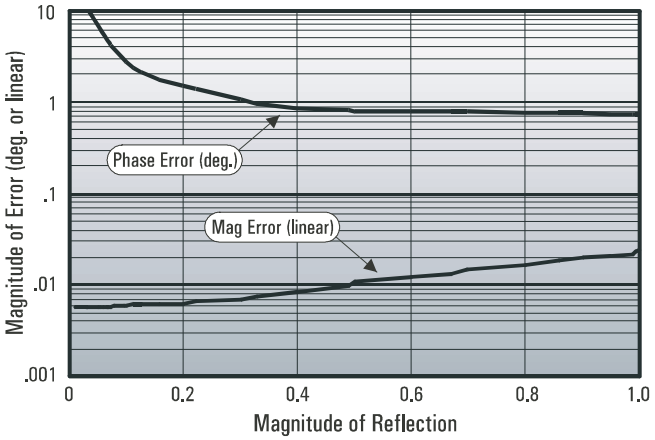
Option 301	DC-bias cable and adapter kit
Option 1CP	Rack-mount and handle kit
Option B20	Test port cables, 3 ft. 3.5mm (m-f) (quantity 4)

Measurement uncertainties

Worst Case 3.5 mm Transmission Magnitude and Phase Uncertainty



Worst Case 3.5 mm Reflection Magnitude and Phase Uncertainty



2. The N4430A (ATN-4801) is compatible with ATN-4111A/B serial numbers A433904 and above. Contact the factory to determine compatibility with earlier models.
3. Either Option 105 or 110 must be ordered at time of initial purchase.

N4414A Test set (ATN-4111B)

System performance summary

The following specifications are applicable for a system in the following configuration:

Network analyzer	8753ES, Options 006 and 011
Test set	N4414A
Calibration kit	85052C, precision 3.5 mm
Test port cables	N4414A, Option B20

Dynamic range

Transmission measurements at 10 Hz IF bandwidth with full error correction and +15 dBm maximum output power.

300 kHz to 4 GHz	90 dB
4 to 6 GHz	75 dB

Measurement port characteristics

Residual uncertainties for corrected data using four-port error correction. These apply for 25 ˚C with less than 1˚C variation from calibration.

Frequency range	0.3-1 MHz	.001-2 GHz	2-4 GHz	4-6 GHz
Directivity	48 dB	48 dB	46 dB	44 dB
Source match	42 dB	42 dB	38 dB	35 dB
Load match	48 dB	48 dB	46 dB	44 dB
Refl. tracking (±)	.012 dB	.012 dB	.012 dB	.020 dB
Trans. tracking (±)	.006 dB	.006 dB	.006 dB	.013 dB

Test set typical performance

Frequency range	300 kHz - 6.0 GHz
Impedance	50 ohms
Insertion loss, any test port to A/B	
0.3 to 300 MHz:	22.4 dB max.
.003 to 6 GHz:	27.5 dB max.
Insertion loss, RF to any test port	
0.3 to 300 MHz:	7.7 dB max.
.003 to 6 GHz:	13.2 dB max.
Insertion loss, RF to R	
0.3 to 300 MHz:	29.0 dB max.
.003 to 6 GHz:	32.5 dB max.
Isolation, port to port and A to B	≥85 dB
Maximum operating level	+20 dBm
Damage level	+30 dBm
RF attenuator (Option 1E1)	0-70 dB in 10 dB steps
Test port connectors	3.5 mm (m)
VNA connectors	50 ohm Type-N (f)
Weight	9 kg

Supported peripheral equipment

Network analyzer	8753C (3 GHz), Rev. .04.13 8753D/E/ES, Options 006 and 011
Calibration kit	N4430A (ATN-4801) electronic calibration module[4], or 85033D, 85052D (3.5 mm), 85050B (7 mm), 85032 (Type-N)
Computer	Pentium II with ≥64 MB RAM, Windows 95/98/NT
Monitor	1024 x 768 minimum resolution
IEEE-488 card	Agilent 82340, 82341, or National Instruments (any model)

Ordering information

N4414A	300 kHz to 6 GHz S-parameter test set
Option 105[5]	Balanced measurement software
Option 110[5]	Balanced measurement software with time domain analysis
Option 1E1	Source step attenuator

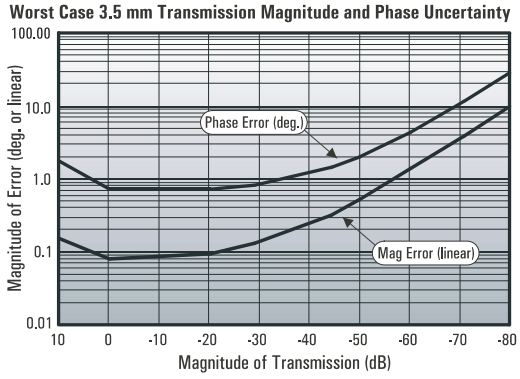
Note: bias networks are not available.

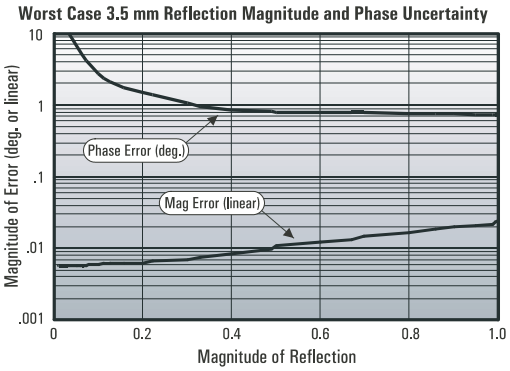
N4430A	4-port electronic calibration module
N4442A	Balanced measurement system, 300 kHz to 6 GHz. Includes 8753ES Options 006 and 011 and N4414A Options 1E1 and 105
Option 060	4-port electronic calibration module
Option 110	Time domain analysis

The following options are available for the N4414A and N4442A:

Option 301	DC-bias cable and adapter kit
Option 1CP	Rack-mount and handle kit
Option B20	Test port cables, 3 ft. 3.5mm (m-f) (quantity 4)

Measurement uncertainties





4. The N4430A (ATN-4801) is compatible with ATN-4111A/B serial number A433904 and above. Contact the factory to determine compatibility with earlier models.
5. Either Option 105 or 110 must be ordered at time of initial purchase.

N4415A Test set (ATN-4111C)

System performance summary

The following specifications are applicable for a system in the following configuration:

Network analyzer	8753ES, Options 006 and 014
Test set	N4415A
Calibration kit	85052C, precision 3.5 mm
Test port cables	N4415A, Option B20

Dynamic range

Transmission measurements at 10 Hz IF bandwidth with full error correction and +15 dBm maximum output power.

30 kHz to 6 GHz	90 dB

Measurement port characteristics

Residual uncertainties for corrected data using four-port error correction. These apply for 25 ˚C with less than 1˚C variation from calibration.

Frequency range	.03-1 MHz	.001-2 GHz	2-4 GHz	4-6 GHz
Directivity	48 dB	48 dB	46 dB	44 dB
Source match	42 dB	42 dB	38 dB	35 dB
Load match	48 dB	48 dB	46 dB	44 dB
Refl. tracking (±)	.012 dB	.012 dB	.012 dB	.020 dB
Trans. tracking (±)	.006 dB	.006 dB	.006 dB	.013 dB

Test set typical performance

Frequency range	30 kHz - 6.0 GHz
Impedance	50 ohms
Insertion loss, source out to coupler in	
300 kHz to 6 GHz	4.5 dB max.
Insertion loss, port 2 or 4 to source out	
300 kHz to 6 GHz	7.5 dB max.
Insertion loss, ports 2 or 4 to A or B in	
300 kHz to 6 GHz	24 dB max.
Insertion loss, A and B in to A and B out	
300 kHz to 6 GHz	7.5 dB max.
Isolation, port to port and A to B	≥85 dB
Maximum operating level	+20 dBm
Damage level	+30 dBm
Test port connectors	7 mm
VNA connectors	50 ohm Type-N (f)
Weight9 kg	

Supported peripheral equipment

Network analyzer	8753E/ES, Options 006, and 014
Calibration kit	N4430A electronic calibration module, or 85033D, 85052D (3.5 mm), 85050B (7 mm), 85032 (Type-N)
Computer	Pentium II with ≥64 MB RAM, Windows 95/98/NT
Monitor	1024 x 768 minimum resolution
IEEE-488 card	Agilent 82340, 82341, or National Instruments (any model)

Ordering information

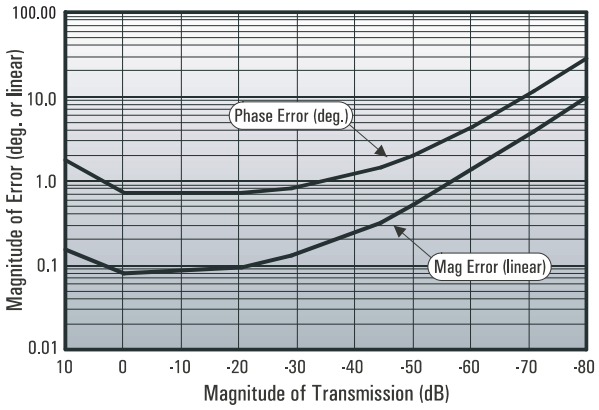
N4415A	30 kHz to 6 GHz S-parameter test set
Option 105[6]	Balanced measurement software
Option 110[6]	Balanced measurement software with time domain analysis
N4430A	4-port electronic calibration module
N4443A	Balanced measurement system, 30 kHz to 6 GHz. Includes 8753ES Options 006 and 014 and N4415A Option 105 (Source attenuator and bias networks included).
Option 060	4-port electronic calibration module
Option 110	Time domain analysis

The following options are available for the N4415A and N4443A:

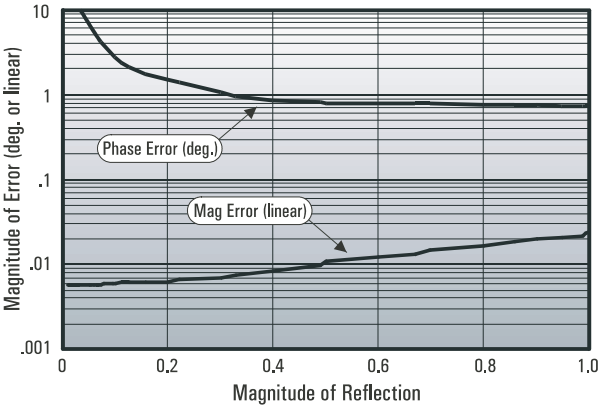
Option 301	DC-bias cable and adapter kit
Option 1CP	Rack-mount and handle kit
Option B20	Test port cables, 3 ft. 7mm to 3.5mm (m) (quantity 4)

Measurement uncertainties

Worst Case 3.5 mm Transmission Magnitude and Phase Uncertainty



Worst Case 3.5 mm Reflection Magnitude and Phase Uncertainty



6. Either Option 105 or 110 must be ordered at time of initial purchase.

N4416A Test set (ATN-4111D)

System performance summary

The following specifications are applicable for a system in the following configuration:

Network analyzer	PNA series E8357A, Option 015
Test set	N4416A
Calibration kit	85052C, precision 3.5 mm
Test port cables	N4416A, Option B20

System dynamic range

Transmission measurements at 10 Hz IF bandwidth with full error correction and 10 dBm maximum output power. The dynamic range is the difference between the RMS noise floor and maximum output power.

300 kHz to 6 GHz	115 dB

Measurement port characteristics

Residual uncertainties for corrected data using four-port error correction. These apply for 25 ˚C with less than 1˚C variation from calibration.

Frequency range	0.3-1 MHz	.001-2 GHz	2-4 GHz	4-6 GHz
Directivity	48 dB	48 dB	46 dB	44 dB
Source match	42 dB	42 dB	38 dB	35 dB
Load match	48 dB	48 dB	46 dB	44 dB
Refl. tracking (±)	.012 dB	.012 dB	.012 dB	.020 dB
Trans. tracking (±)	.006 dB	.006 dB	.006 dB	.013 dB

Test set typical performance

Frequency range	300 kHz - 6.0 GHz
Impedance	50 ohms
Insertion loss, source out to coupler in	
300 kHz to 6 GHz	4.5 dB max.
Insertion loss, port 2 or 4 to source out	
300 kHz to 6 GHz	7.5 dB max.
Insertion loss, ports 2 or 4 to A or B in	
300 kHz to 6 GHz	24 dB max.
Insertion loss, A and B in to A and B out	
300 kHz to 6 GHz	7.5 dB max.
Isolation, port to port and A to B	≥105 dB
Maximum operating level	+20 dBm
Damage level	+30 dBm
Test port connectors	7 mm
VNA connectors	50 ohm SMA (f)
Weight	9 kg

Supported peripheral equipment

Network analyzer	PNA series E8357A, Option 015
Calibration kit	N4430A (ATN-4801) electronic calibration module, or 85033D, 85052D (3.5 mm), 85050B (7 mm), 85032 (Type-N)
Computer	Pentium II with ≥64 MB RAM, Windows 95/98/NT
Monitor	1024 x 768 minimum resolution
IEEE-488 card	Agilent 82340, 82341, or National Instruments (any model)

Ordering information

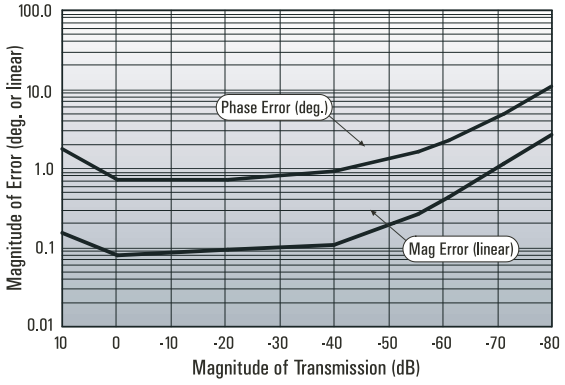
N4416A	300 kHz to 6 GHz S-parameter test set
Option 105[7]	Balanced measurement software
Option 110[7]	Balanced measurement software with time domain analysis
N4430A	4-port electronic calibration module
N4444A	Balanced measurement system, 300 kHz to 6 GHz. Includes E8357A Option 015 and N4416A Option 105 (Source attenuators and bias networks included).
Option 060	4-port electronic calibration module
Option 110	Time domain analysis

The following options are available for the N4416A and N4444A:

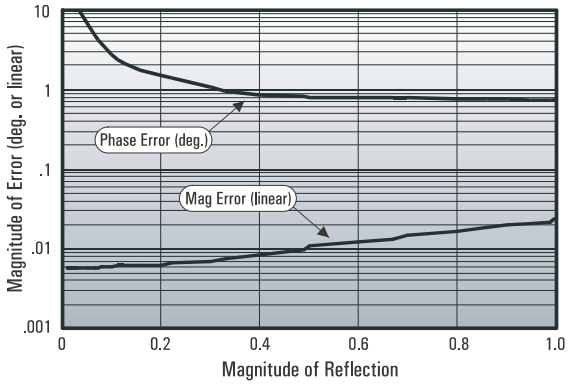
Option 301	DC-bias cable and adapter kit
Option 1CP	Rack-mount and handle kit
Option B20	Test port cables, 3 ft. 7mm to 3.5mm (m) (quantity 4)

Measurement uncertainties

Worst Case 3.5 mm Transmission Magnitude and Phase Uncertainty



Worst Case 3.5 mm Reflection Magnitude and Phase Uncertainty



7. Either Option 105 or 110 must be ordered at time of initial purchase.

N4418A Test set (ATN-4112A)

System performance summary

The following specifications are applicable for a system in the following configuration:

Network analyzer	8720ES, Option H32
Test set	N4418A
Calibration kit	85052C precision 3.5 mm
Test port cables	N4418A Option B20

Dynamic range

Transmission measurements at 10 Hz IF bandwidth with full error correction and +5 dBm maximum output power.

.050 to 0.84 GHz	77 dB
0.84 to 20 GHz	90 dB

Measurement port characteristics

Residual uncertainties for corrected data using 4-port error correction. These apply for 25 ˚C with less than 1˚C variation from calibration.

Frequency range	0.05-2 GHz	2-8 GHz	8-20 GHz
Directivity	48 dB	48 dB	43 dB
Source match	41 dB	41 dB	33 dB
Load match	48 dB	48 dB	43 dB
Refl. tracking (±)	.005 dB	.005 dB	.008 dB
Trans. tracking (±)	.014 dB	.014 dB	.035 dB

Test set typical performance

Frequency range	0.05-20.0 GHz
Impedance	50 ohms
Insertion loss, nominal	8 -10 dB
Isolation, port to port	85 dB
Maximum operating level	+20 dBm
Damage level	+30 dBm
DC bias range (Option UNK)	40 VDC, 500 mA
Test port connectors	3.5 mm (m)
VNA connectors	50 ohm SMA (f)
Weight	9 kg

Supported peripheral equipment

Network analyzer	8720D/ES, Option H32, H42
Calibration kit	SOLT-type with calibration coefficients of open and short standards
Computer	Pentium II with ≥64 MB RAM, Windows 95/98/NT
Monitor	1024 x 768 minimum resolution
IEEE-488 card	Agilent 82340, 82341, or National Instruments (any model)

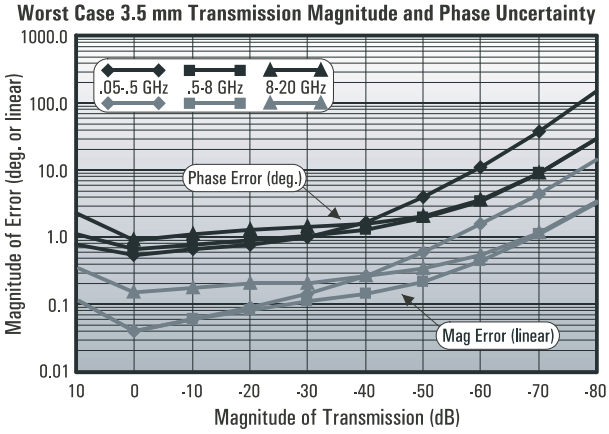
Ordering information

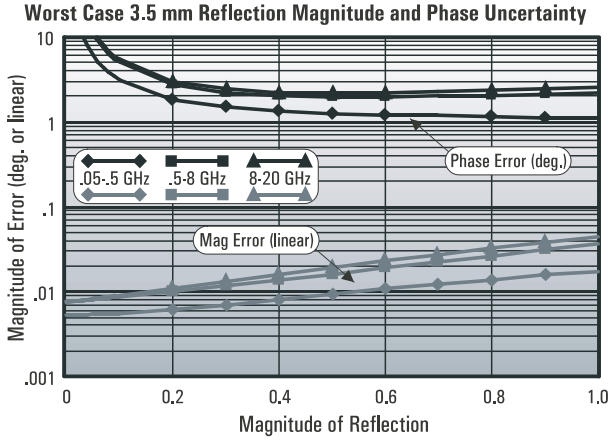
N4418A	50 MHz to 20 GHz S-parameter test set
Option 105[8]	Balanced measurement software
Option 110[8]	Balanced measurement software with time domain analysis
Option UNK	Bias networks
N4446A	Balanced measurement system, 50 MHz to 20 GHz. Includes 8720ES Option H32 and N4418A Options UNK and 105 (Source attenuator included).
Option 110	Time domain analysis

The following options are available for the N4418A and N4446A:

Option 301	DC-bias cable and adapter kit
Option 1CP	Rack-mount and handle kit
Option B20	Test port cables, 3 ft. 3.5mm (m-f) (quantity 4)

Measurement uncertainties

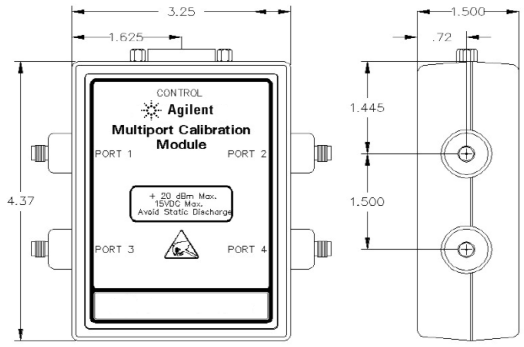




8. Either Option 105 or 110 must be ordered at time of initial purchase.

N4430A ECal module (ATN-4801A)

- Fast, single-connection electronic calibration
- Easy to use
- Accurate transfer standard with excellent repeatability



The N4430A 4-port ECal module is the perfect companion for Agilent's balanced measurement solutions. Fast, and easy-to-use, this ECal module replaces the standard SOLT-based mechanical calibration kit with a solid-state transfer standard.

With a single set of connections, the ECal module cycles through all of the impedance states required for a full, four-port, vector error-corrected calibration in under a minute. A comparable calibration, using the operator-intensive mechanical-standard technique, could easily take five times longer. Not only is ECal fast, it is also extremely repeatable and accurate. Control of the ECal module is built into the balanced-measurement application software — the same software that controls the measurement and provides the differential analysis. Ease of use is provided through an intuitive graphical user interface.

Product configuration

A complete system includes an Agilent vector network analyzer, an Agilent N441xA S-parameter test set, Agilent balanced-measurement application software, a Windows®-based PC with IEEE-488 control, and the N4430A electronic calibration module.

Performance summary

These specifications show the residual uncertainties for corrected data using four-port error correction. They apply for 25 ˚C with less than 1˚C variation from calibration, and are applicable for a system in the following configuration:

Network analyzer:	8753ES Options 006, 014
Test set:	N4415A S-parameter test set
Test port cables:	N4415A Option B20

Measurement port specifications

Frequency range	30-300 kHz	0.3-300 MHz	0.3-3 GHz	3-6 GHz
Directivity	50 dB	52 dB	50 dB	45 dB
Source match	48 dB	48 dB	45 dB	43 dB
Load match	50 dB	50 dB	46 dB	42 dB
Refl. tracking (±)	.04 dB	.02 dB	.02 dB	.04 dB
Trans. tracking (±)	.06 dB	.02 dB	.022 dB	.022 dB

Typical performance

Frequency range	30 kHz - 6.0 GHz
Impedance	50 ohms
Maximum operating level	+20 dBm
Damage level	+30 dBm
RF port connectors	3.5 mm (f)
Control connector	DB-15
Weight	12 oz.

Supported peripheral equipment

S-parameter test sets	N4413/14/15/16A
Balanced measurement systems	N4441/42/43/44A
Computer	Pentium II with ≥64 MB RAM, Windows 95/98/NT
Monitor	1024 x 768 minimum resolution
IEEE-488 card	Agilent 82340, 82341, or National Instruments (any model)

Ordering information

N4430A	Four-port electronic calibration module, 30 kHz to 6 GHz

Web References

For additional information about products in this overview, please visit:
www.agilent.com/find/balanced

For information about network analyzers, please visit:
www.agilent.com/find/na

Component manufacturing information is available at:
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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 receive your new Agilent equipment, we can help verify that it works properly and help with initial product operation.

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 onsite 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.

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China:
(tel) 800 810 0189
(fax) 800 820 2816
Europe:
(tel) 31 20 547 2111
Japan:
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840
Korea:
(tel) (080) 769 0800
(fax) (080) 769 0900
Latin America:
(tel) (305) 269 7500
Taiwan:
(tel) 0800 047 866
(fax) 0800 286 331
Other Asia Pacific Countries:
(tel) (65) 6375 8100
(fax) (65) 6755 0042
Email: tm_ap@agilent.com
Contacts revised: 09/26/05

The complete list is available at:
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Product specifications and descriptions in this document subject to change without notice.

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