Technical Specifications

(Printed Version of Help)

Agilent Technologies PNA Series Network Analyzers



Part Number: E8356-90028 Printed in USA January 2003

Supersedes December 2002

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This is a complete list of the E8356A, E8357A, and E8358A network analyzer technical specifications.

- To optimize viewing of uncertainty curves, click the Maximize button.
- To view or print the PNA Series Data Sheet (a condensed version of the specifications), visit our web site at http://www.agilent.com/find/pna, select your analyzer model, and click on the link for the data sheet.
- The uncertainty curves contained in this document apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

Definitions

All specifications and characteristics apply over a 25 °C ±5 °C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable) errors.

Corrected (residual): Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Corrected System Performance

The specifications in this section apply for measurements made with the E8356A, E8357A, and E8358A analyzer with the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data
- Environmental temperature of 25 °C ±5 °C, with <1 °C deviation from calibration temperature
- Isolation calibration not omitted •

Note: The uncertainty curves contained in these specifications apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

Table 1. System Dynamic Range					
Description Specification (dB) Characteristic (dB)					
Dynamic range ^a					
(at test port)					
300 kHz to 25 MHz ^b	125				
25 MHz to 3 GHz ^b	128				
3 GHz to 6 GHz	118				
6 GHz to 9 GHz	113				
Dynamic range ^c					
(at receiver input)					
300 kHz to 25 MHz ^d		140			
25 MHz to 3 GHz ^d		143			
3 GHz to 6 GHz		133			
6 GHz to 9 GHz		128			

^a The test port dynamic range is calculated as the difference between the test port rms noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.

^c The receiver input dynamic range is calculated as the difference between the receiver rms noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its damage level. When the analyzer is in segment sweep mode, frequency segments can be defined with a higher power level when the extended dynamic range is required (i.e. the portion of the device's response with high insertion loss), and reduced power when receiver damage may occur (i.e. the portion of the devices's response with low insertion loss). ^d May be limited to 115 dB at particular frequencies below 750 MHz due to spurious receiver residuals.

May be limited to 100 dB at particular frequencies below 750 MHz due to spurious receiver residuals.

Corrected System Performance with Type-N Connectors

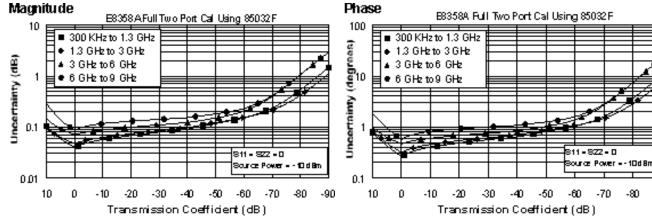
Table 2. Corrected System Performance With Type-N Device Connectors, 85032F Calibration Kit

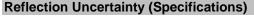
Applies to the E8356A, E8357A, and E8358A analyzer, 85032F (Type-N, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

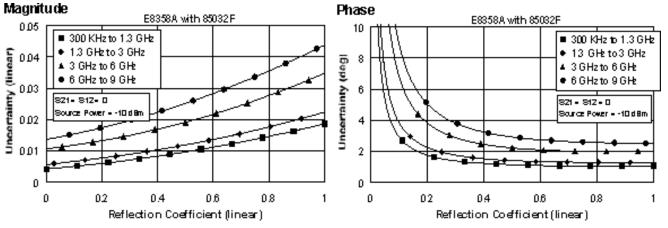
- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to	1.3 GHz to	3 to	6 to
	1.3 GHz	3 GHz	6 GHz	9 GHz
Directivity	49	46	40	38
Source Match	41	40	36	35
Load Match	49	45	39	37
Reflection Tracking	±0.011	±0.021	±0.032	±0.054
Transmission	±0.011	±0.019	±0.041	±0.051
Tracking				

Transmission Uncertainty (Specifications)







-80

-90

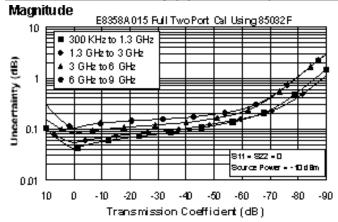
Table 3. Corrected System Performance With Type-N Device Connectors, Option 015 With 85032F Calibration Kit

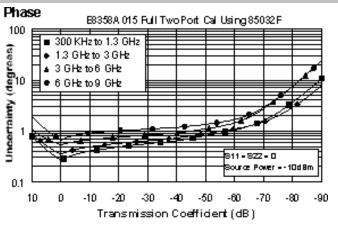
Applies to the E8356A, E8357A, and E8358A analyzer with Option 015, 85032F (Type-N, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to	1.3 GHz to	3 to	6 to
	1.3 GHz	3 GHz	6 GHz	9 GHz
Directivity	49	46	40	38
Source Match	41	40	36	35
Load Match	49	45	39	37
Reflection Tracking	±0.011	±0.021	±0.032	±0.054
Transmission Tracking	±0.011	±0.024	±0.052	±0.065

Transmission Uncertainty (Specifications)





Reflection Uncertainty (Specifications)

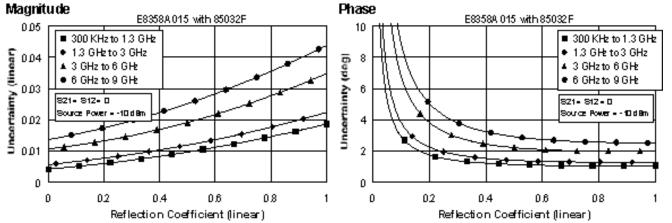


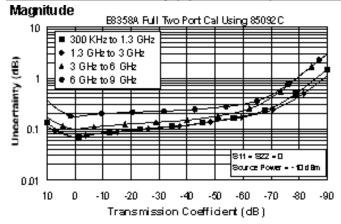
Table 4. Corrected System Performance With Type-N Device Connectors, 85092C Electronic Calibration Module

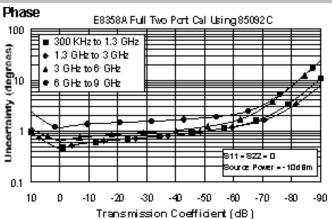
Applies to the E8356A, E8357A, and E8358A analyzer, 85092C (Type-N, 50Ω) electronic calibration (ECal) module, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to	1.3 GHz to	3 to	6 to
	1.3 GHz	3 GHz	6 Hz	9 GHz ^a
Directivity	52	54	52	47
Source Match	45	44	41	36
Load Match	47	47	44	39
Reflection Tracking	±0.040	±0.040	±0.060	±0.070
Transmission Tracking	±0.039	±0.039	±0.068	±0.135

Transmission Uncertainty (Specifications)





Reflection Uncertainty (Specifications)

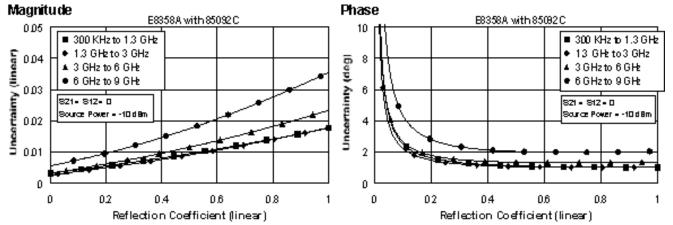


Table 5. Corrected System Performance With Type-N Device Connectors, Option 015 With 85092C Electronic Calibration Module

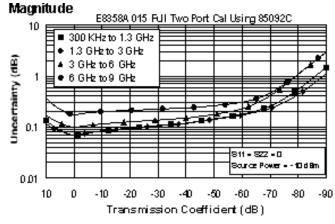
Applies to the E8356A, E8357A, and E8358A analyzer with Option 015, 85092C (Type-N, 50Ω) electronic calibration (ECal) module, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

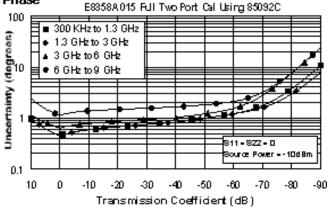
Phase

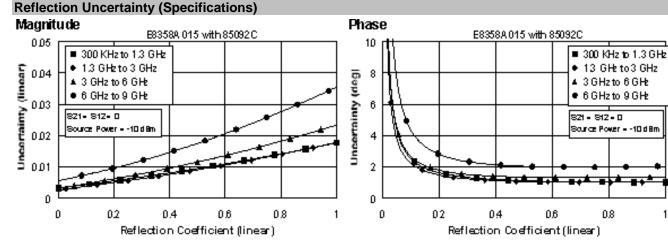
- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature •
- Isolation calibration not omitted .

Description	Specification (dB)			
	300 kHz to	1.3 GHz to	3 to	6 to
	1.3 GHz	3 GHz	6 GHz	9 GHz ^a
Directivity	52	54	52	47
Source Match	45	44	41	36
Load Match	47	47	44	39
Reflection Tracking	±0.040	±0.040	±0.060	±0.070
Transmission Tracking	±0.039	±0.039	±0.068	±0.135

Transmission Uncertainty (Specifications)







Corrected System Performance with 3.5 mm Connectors

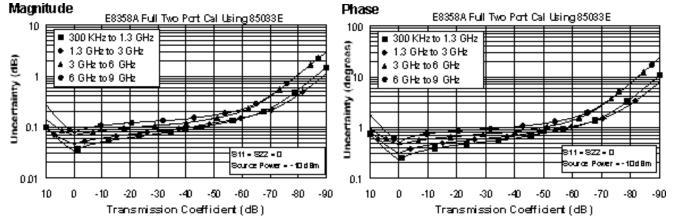
Table 6. Corrected System Performance With 3.5 mm Device Connector Type, 85033E Calibration Kit

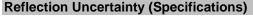
Applies to the E8356A, E8357A, and E8358A analyzer, 85033E (3.5 mm, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to	1.3 GHz to 3	3 to 6	6 to
	1.3 GHz	GHz	GHz	9 GHz
Directivity	46	44	38	38
Source Match	43	40	37	36
Load Match	46	44	38	38
Reflection Tracking	±0.006	±0.007	±0.009	±0.010
Transmission	±0.011	±0.020	±0.041	±0.047
Tracking				

Transmission Uncertainty (Specifications)





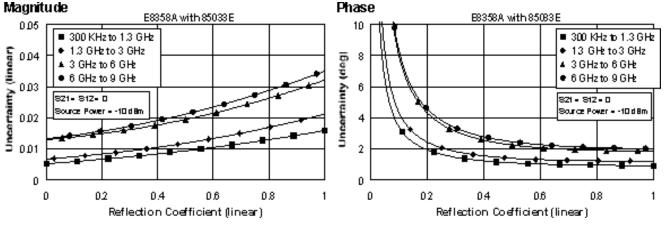


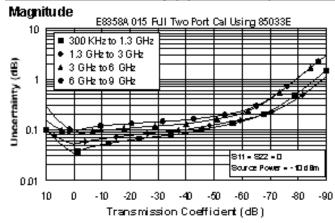
Table 7. Corrected System Performance With 3.5 mm Device Connector Type, Option 015 With 85033E Calibration Kit

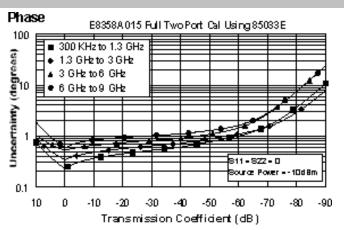
Applies to the E8356A, E8357A, and E8358A analyzer with Option 015, 85033E (3.5 mm, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to	1.3 GHz to	3 to	6 to
	1.3 GHz	3 GHz	6 GHz	9 GHz
Directivity	46	44	38	38
Source Match	43	40	37	36
Load Match	46	44	38	38
Reflection Tracking	±0.006	±0.007	±0.009	±0.010
Transmission Tracking	±0.011	±0.025	±0.052	±0.059

Transmission Uncertainty (Specifications)





Reflection Uncertainty (Specifications)

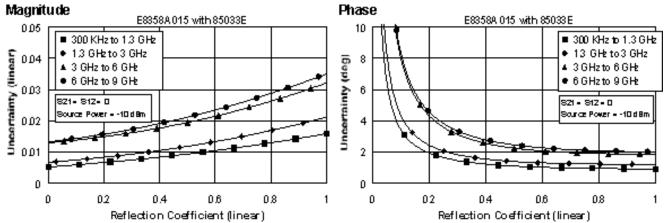


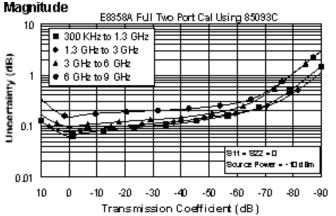
Table 8. Corrected System Performance With 3.5 mm Device Connector Type, 85093C Electronic Calibration Module

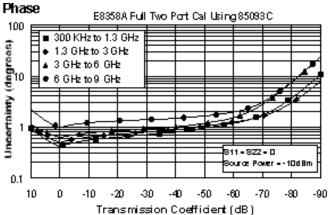
Applies to the E8356A, E8357A, and E8358A analyzer, 85093C (3.5 mm, 50Ω) electronic calibration (ECal) module, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to	1.3 GHz to	3 to	6 to
	1.3 GHz	3 GHz	6 GHz	9 GHz ^a
Directivity	52	52	51	47
Source Match	44	44	39	34
Load Match	47	47	44	40
Reflection Tracking	±0.030	±0.040	±0.050	±0.070
Transmission Tracking	±0.039	±0.049	±0.068	±0.116

Transmission Uncertainty (Specifications)





Reflection Uncertainty (Specifications)

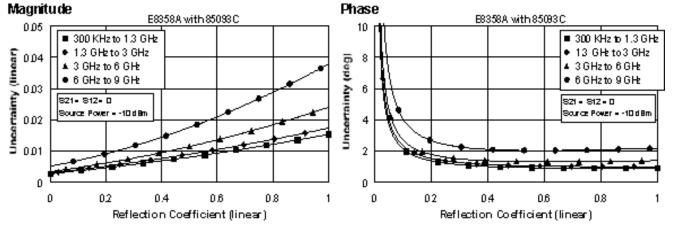


Table 9. Corrected System Performance With 3.5 mm Device Connector Type, Option 015 With 85093C Electronic Calibration Module

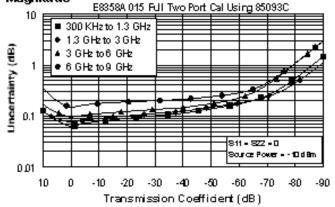
Applies to the E8356A, E8357A, and E8358A analyzer with Option 015, 85093C (3.5 mm, 50Ω) electronic calibration (ECal) module, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

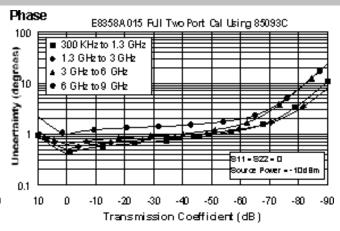
- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

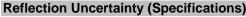
Description	escription Specification (dB)				
	300 kHz to	1.3 GHz to	3 to	6 to	
	1.3 GHz	3 GHz	6 GHz	9 GHz ^a	
Directivity	52	52	51	47	
Source Match	44	44	39	34	
Load Match	47	47	44	40	
Reflection Tracking	±0.030	±0.040	±0.050	±0.070	
Transmission Tracking	±0.039	±0.049	±0.068	±0.116	

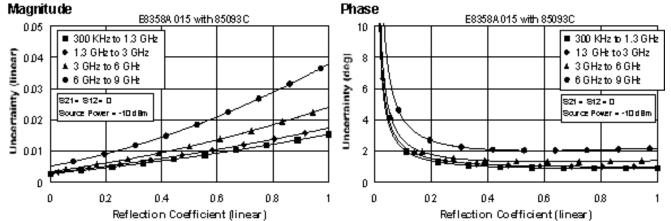
Transmission Uncertainty (Specifications)











Corrected System Performance with 7-16 Connectors

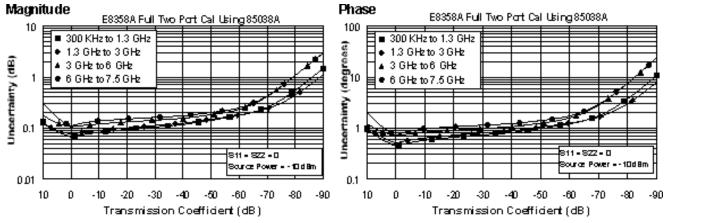
Table 10. Corrected System Performance With 7-16 Device Connector Type, 85038A Calibration Kit

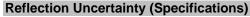
Applies to the E8356A, E8357A, and E8358A analyzer, 85038A (7-16, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to	1.3 GHz to	3 to	6 to
	1.3 GHz	3 GHz	6 GHz	9 GHza
Directivity	40	40	36	36
Source Match	37	37	34	34
Load Match	39	39	35	35
Reflection Tracking	±0.089	±0.089	±0.115	±0.115
Transmission Tracking	±0.022	±0.031	±0.059	±0.062

Transmission Uncertainty (Specifications)





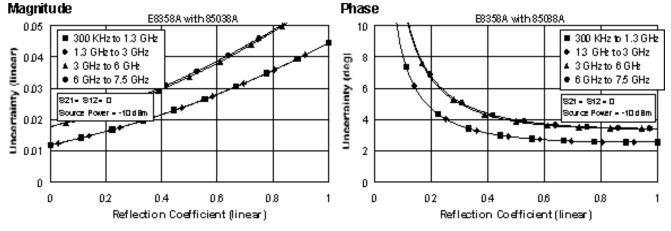


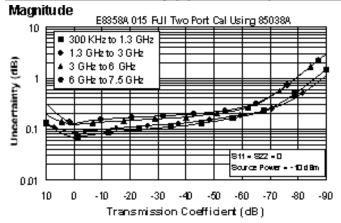
Table 11. Corrected System Performance With 7-16 Device Connector Type, Option 015 With 85038A Calibration Kit

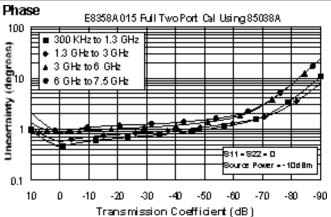
Applies to the E8356A, E8357A, and E8358A analyzer with Option 015, 85038A (7-16, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

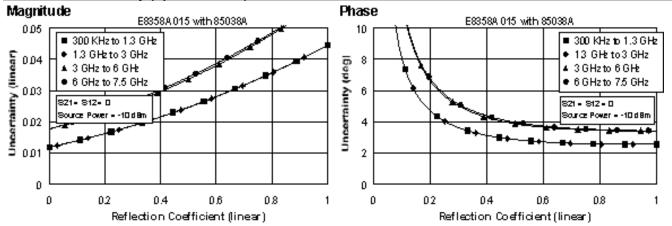
Description	Specification (dB)				
	300 kHz to	1.3 GHz to	3 to	6 to	
	1.3 GHz	3 GHz	6 GHz	9 GHz ^a	
Directivity	40	40	36	36	
Source Match	37	37	34	34	
Load Match	39	39	35	35	
Reflection Tracking	±0.089	±0.089	±0.115	±0.115	
Transmission Tracking	±0.022	±0.040	±0.075	±0.080	

Transmission Uncertainty (Specifications)





Reflection Uncertainty (Specifications)



Uncorrected Instrument Performance

Description	Specification (dB)				
	300 kHz to	1MHz to	1.3 GHz to	3 GHz to	6 GHz to
	1 MHz	1.3 GHz	3 GHz	6 GHz	9 GHz
Directivity	30	33	27	20	13
Source Match	20	20	17	15	14
Source Match (Opt. 015)	20	20	15	13	12
Load Match	20	20	17	15	15
Load Match (Opt. 015)	20	20	15	13	13
Reflection Tracking	±1.5	±1.5	±1.5	±2.5	±3.0
Transmission Tracking	±1.5	±1.5	±1.5	±2.5	±3.0

Table 12. Uncorrected Instrument Performance

Test Port Output Characteristics (Source)

Fable 13. Test Port Output Frequency			
Description	Speci	fication	Supplemental Information
Range			
E8356A	300 kH	Hz to 3.0 GHz	
E8357A	300 kl	Hz to 6.0 GHz	
E8358A	300 kH	Hz to 9.0 GHz	
Resolution	1 Hz		
Source Stability			±0.05 ppm, -0° to 40 °C, typical
			±0.1 ppm/year, typical
CW Accuracy	±1 ppr	n	
Table 14. Test Port O	utput P	ower ^a	
Description	:	Specification	Supplemental Information
Level Accuracy			
			Variation from 0 dBm in power range 0
			(step attenuator at 0 dB) ±1.5dB below
			10 MHz
300 kHz to 10 MHz		±1.5 dB	
10 MHz to 6 GHz		±1.0 dB	
6 GHz to 9 GHz	:	±2.0 dB	
Level Linearity			
			Variation from 0 dBm in power range 0
300 kHz to 9 GHz		±0.3 dB	-15 to +5 dBm
300 kHz to 1 MHz		±1.0 dB	+5 to +10 dBm
1 MHz to 6 GHz	:	±0.5 dB	+5 to +10 dBm
Range⁵	<u> </u>		
300 kHz to 6 GHz		-85 to +10 dBm	
6 GHz to 9 GHz		-85 to +5 dBm	
Sweep Range			
300 kHz to 6 GHz		25 dB	
6 GHz to 9 GHz		20 dB	
Level Resolution		0.01 dB	

^a Source output performance on port 1 only. Port 2 output performance is typical.

^b Power to which the source can be set and phase lock is assured.

Table 15. Test Port Output Signal Purity

Description	Specification	Supplemental Information
Harmonics (2nd or 3rd)		
at max output power (< 25 MHz)		< -25 dBc, typical
at max output power (25 MHz to		< -25 dBc, characteristic ^a
9 GHz)		
at 0 dBm output		< -35 dBc, typical
at -10 dBm output		< -38 dBc, typical, in power range 0
		(step attenuator at 0 dB)
Non-harmonic Spurious		
at max output		-30 dBc, typical for offset freq >1kHz
at -10 dBm output		-50 dBc, typical for offset
		freq >1kHz

^a Typical below 25 MHz.

Test Port and Receiver Input Characteristics Table 16. Test Port and Receiver Input Levels

Description	Specification	Supplemental Information
Maximum Test Port Inpu		
Test Ports 1 and 2:		
300 kHz to 25 MHz	+10 dBm	< 0.6 dB compression
25 MHz to 3 GHz	+10 dBm	< 0.4 dB compression
3 GHz to 6 GHz	+10 dBm	< 0.7 dB compression
6 GHz to 9 GHz	+5 dBm	< 0.7 dB compression
Damage Level		
Test Port 1, 2		+30 dBm or ±30 VDC, typ.
R1, R2 IN		+15 dBm or ±5 VDC, typ.
A, B IN (standard)		+15 dBm or ±5 VDC, typ.
A, B IN (Opt. 015)		+15 dBm or ±0 VDC, typ.
Coupler IN (Opt. 015)		+33 dBm or ±0 VDC, typ.
Test Port Noise Floor ^a		
300 kHz to 25 MHz ^b		
10 Hz IF Bandwidth	-115 dBm	
1 kHz IF Bandwidth	-95 dBm	
25 MHz to 3 GHz ^₅		
10 Hz IF Bandwidth	-118 dBm	
1 kHz IF Bandwidth	-98 dBm	
3 GHz to 9 GHz		
10 Hz IF Bandwidth	≤ -108 dBm	
1 kHz IF Bandwidth	≤ -88 dBm	
Receiver Noise Floor ^a		
300 kHz to 25 MHz ^c		
10 Hz IF Bandwidth	≤ -130 dBm	
1 kHz IF Bandwidth	≤ -110 dBm	
25 MHz to 3 GHz ^c		
10 Hz IF Bandwidth	≤ -133 dBm	
1 kHz IF Bandwidth	≤ -113 dBm	
6 GHz to 9 GHz		
10 Hz IF Bandwidth	≤ -123 dBm	
1 kHz IF Bandwidth	≤ -103 dBm	

Crosstalk				
		Between test ports 1 and 2, with		
		short circuits at both ports		
300 kHz to 1 MHz	<-120 dB			
1 MHz to 25 MHz	<-125 dB			
25 MHz to 3 GHz	<-128 dB			
3 GHz to 6 GHz	<-118 dB			
6 GHz to 9 GHz	<-113 dB			
Maximum Receiver Input Level (A, B, R1, R2)				
300 kHz to 6 GHz		-6 dBm, typical		
6 GHz to 9 GHz		-11 dBm, typical		
Reference Input Level (R1, R2) ^d				
300 kHz to 9 GHz		-10 to -35 dBm, typical		
Maximum Coupler Input L	Maximum Coupler Input Level (Opt 015)			
300 kHz to 9 GHz		+33 dBm, typical		

^a Total average (RMS) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.

^b May be limited to -90 dBm at particular frequencies below 750 MHz due to spurious receiver residuals.

^c May be limited to -105 dBm at particular frequencies below 750 MHz due to spurious receiver residuals.

^d Input level to maintain phase lock.

Table 17. Test Port Input (Trace Noise)

Description	Specification	Supplemental Information	
Trace Noise ^a Magnitude			
1 kHz IF Bandwidth	< 0.002 dB rms		
10 kHz IF Bandwidth	< 0.005 dB rms		
Trace Noise ^ª Phase			
1 kHz IF Bandwidth	< 0.010° rms		
10 kHz IF Bandwidth	< 0.035° rms		

^a Trace noise is defined as a ratio measurement of a through or a full reflection, with the source set to 0 dBm.

Table 18. Test Port Input (Reference Level and Stability)

Description	Specification	Supplemental Information		
Reference Level Magni	Reference Level Magnitude			
Range	±200 dB			
Resolution	0.001 dB			
Reference Level Phase	•			
Range	±500°			
Resolution	0.01°			
Stability Magnitude ^a	Stability Magnitude ^a			
300 kHz to 3 GHz		0.02 dB/°C, typical		
3 GHz to 6 GHz		0.04 dB/°C, typical		
6 GHz to 9 GHz		0.06 dB/°C, typical		
Stability Phase ^a				
300 kHz to 3 GHz		0.2°/°C, typical		
3 GHz to 6 GHz		0.3°/°C, typical		
6 GHz to 9 GHz		0.6°/°C, typical		

^a Stability is defined as a ratio measurement at the test port.

Table 19. Test Port Input (Dynamic Accuracy specification^a)

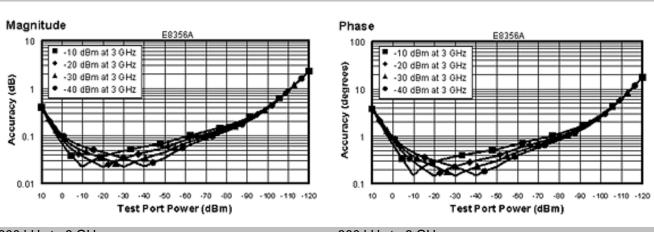
Accuracy of the test port input power reading is relative to the reference input power level. Applies to input ports 1 and 2 with the following conditions:

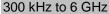
300 kHz to 3 GHz

• IF bandwidth = 10 Hz

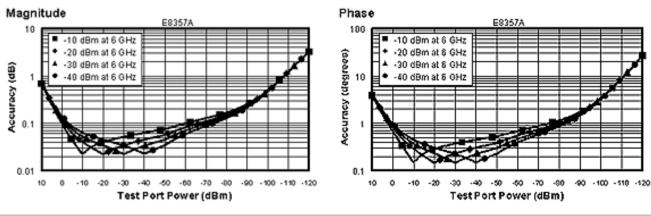
300 kHz to 3 GHz

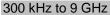
Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature



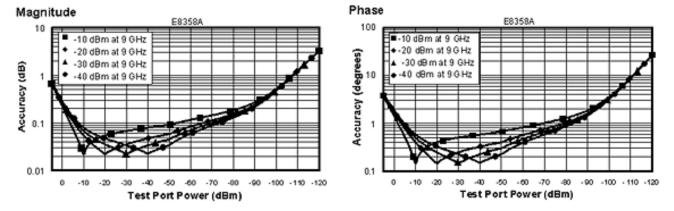


300 kHz to 6 GHz



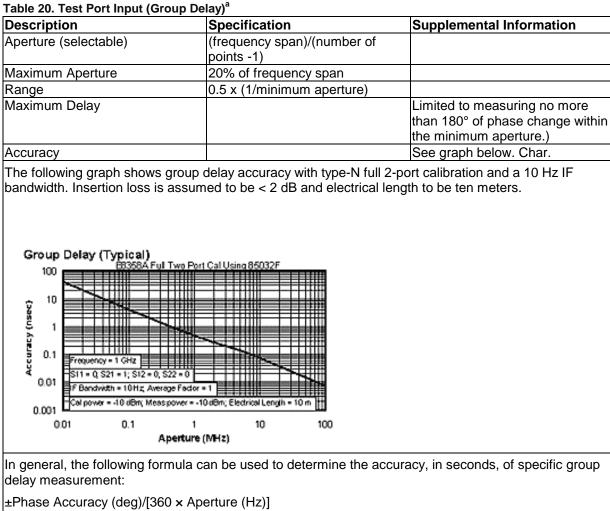


300 kHz to 9 GHz



^a Dynamic accuracy is verified with the following measurements:

- compression over frequency
- IF linearity at a single frequency of 1.195 GHz and a reference level of -20 dBm



Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst case phase accuracy.

^a Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and the number of points per sweep).

General Information

Table 21. System Bandwidths

Description	Specification	Supplemental Information
IF Bandwidth Settings		
Range		1 Hz to 40 kHz
		in a 1, 2, 3, 5, 7,10 sequence up to 30
		kHz, 35 kHz, 40kHz, nominal

Table 22. Front Panel Information			
Supplemental Information			
Type-N, female; 50 Ω , nominal			
0.204 to 0.207 in., characteristic			
3-pin connector, male			
+15 VDC ±2%, 400 mA, max, characteristic			
-12.6 VDC ±5%, 300 mA, max, characteristic			
21.3 cm (8.4 in) diagonal color active matrix LCD; 640 (horizontal) X 480 (vertical) resolution			
Vertical 59.83 Hz; Horizontal 31.41 Hz			
±200 dB (at 20 dB/div), max			
±180°, max			
10 pUnits, min 1000 Units, max			
0.001 dB/div, min			
0.01°/div, min			
0.001 dB, min			
0.01°, min			
0.01 mUnit, min; 0.01°, min			

Table 22. Front Panel Information

Description	Supplemental Information
Test Port Bias Input	
Connector	BNC, female
Maximum Voltage	±30 VDC, typical
Maximum Current (no degradation in RF	±200 mA, typical
specifications)	
Maximum Current	A A turnical
	±1 A, typical
10 MHz Reference In	DNC female
Connector	BNC, female
Input Frequency	10 MHz ± 1 ppm, typical
Input Level	-15 dBm to +20 dBm, typical
Input Impedance	200 Ω, nom.
10 MHz Reference Out	
Connector	BNC, female
Output Frequency	10 MHz ± 1 ppm, typical
Signal Type	Sine Wave, typical
Output Level	+10 dBm \pm 4 dB into 50 Ω , typical
Output Impedance	50 Ω, nominal
Harmonics	<-40 dBc, typical
VGA Video Output	
Connector	15-pin mini D-Sub; Drives VGA compatible monitors
Devices Supported:	Resolutions:
Flat Panel (TFT)	1024 X 768, 800 X 600, 640 X 480
Flat Panel (DSTN)	800 X 600, 640 X 480
CRT Monitor	1280 X 1024, 1024 X 768, 800 X 600, 640 X 480
	Simultaneous operation of the internal and external displays is allowed,
	but with 640 X 480 resolution only. If you change resolution, you can only
	view the external display (internal display will "white out").
Test Set IO	25-pin D-Sub connector, available for external test set control
Aux IO	25-pin D-Sub connector, male, analog and digital IO
Handler IO	36-pin IDC D-ribbon socket connector; all input/output signals are default
	set to negative logic; can be reset to positive logic via GPIB command
GPIB	24-pin D-sub (Type D-24), female; compatible with IEEE-488.
Parallel Port (LPT1)	25-pin D-Sub connector, female; provides connection to printers or any
	other parallel port peripheral
Serial Port (COM 1)	9-pin D-Sub, male; compatible with RS-232
USB Port	
	Universal Serial Bus jack, Type A configuration (4 contacts inline, contact
	1 on left); female
Contact 1	Vcc: 4.75 to 5.25 VDC, 500 mA, maximum
Contact 2	-Data
Contact 3	+Data
Contact 4	Ground
LAN	10/100BaseT Ethernet; 8-pin configuration; auto selects between the two
	data rates
Line Power ^{a, b}	
Frequency at 110/115 V	50/60/400 Hz
Frequency at 230/240 V	50/60 Hz
Maximum Watts	350 W
^a A third-wire ground is required.	

^a A third-wire ground is required.

^b Power supply has a voltage autoswitching feature.

Table 24. Real Panel Information (continued)			
Description	Supplemental Information		
External AM Input			
Description	Input provides low-frequency AM modulation to test port output signal, or shifts the test port output. Zero volts input gives the power level set by the instrument, a positive voltage gives a higher level, and a negative voltage gives a lower level.		
Connector	BNC, female		
Input Sensitivity	8 dB/V, typical		
Bandwidth	1 kHz, typical		
Input Impedance	1 kΩ, typical		
External Detector Input			
Description	Input from an external, negative polarity diode detector provides ALC for a test port remote from instrument's front panel		
Connector	BNC, female		
Input Sensitivity	-500 mV yields approximately -3 dBm at detector's input, typical		
Bandwidth	50 kHz, typical		
Input Impedance	1 k Ω , nominal		

Table 24. Rear Panel Information (continued)

Defined by CISPR Pub. 11, Group 1,				
Class A, a	Class A, and IEC 50082-1			
Minimize using static-safe work				
			mat	
Minimize f	or optimum	reliability		
-1				
0 °C to +4	0 °C			
Instrumen	t powers up	phase locks	, and	
		U		
with less t	than 1°C de	viation from		
calibration temp.				
5% to 95%	5% to 95% at +40 °C			
0 to 4500 m (14,760 ft.)				
-40 °C to +70 °C				
0% to 90% at +65 °C (non-condensing)				
0 to 15,240 m (50,000 ft.)				
	-			
Height	Width			
222 mm	425 mm			
	-	-		
9.5 in	16.75 in	18.5 in		
242 mm	458 mm	502 mm		
	-			
9.5 in				
	483 mm	502 mm		
9.5 in	19 in	19.75 in		
		•	1	
24 kg (54	lb), nominal			
	Defined by Class A, a Minimize u procedure Minimize f 0 °C to +4 Instrumen displays n temperatu 25°C ± 5°C with less calibration 5% to 95% 0 to 4500 ent -40 °C to - 0% to 90% 0 to 15,24 Height 222 mm 8.75 in 242 mm 9.5 in 242 mm 9.5 in 242 mm	Supplemental InformDefined by CISPR Put Class A, and IEC 5008Minimize using static-s procedures and an an Minimize for optimum0 °C to +40 °CInstrument powers up displays no error mess temperature range.25°C \pm 5°C with less than 1°C dec calibration temp.5% to 95% at +40 °C0 to 4500 m (14,760 ftent-40 °C to +70 °C0% to 90% at +65 °C (0 0 to 15,240 m (50,000)HeightWidth222 mm425 mm 8.75 in 16.75 in242 mm425 mm 16.75 in242 mm 9.5 in18 in 19 in 242 mm 483 mm 9.5 in242 mm 9.5 in19 in 19 in 242 mm	Supplemental InformationDefined by CISPR Pub. 11, Group Class A, and IEC 50082-1Minimize using static-safe work procedures and an antistatic benchMinimize for optimum reliability0 °C to +40 °CInstrument powers up, phase locks displays no error messages within the temperature range.25°C ± 5°Cwith less than 1°C deviation from calibration temp.5% to 95% at +40 °C0 to 4500 m (14,760 ft.)ent-40 °C to +70 °C0% to 90% at +65 °C (non-condens 0 to 15,240 m (50,000 ft.)Height Width Depth222 mm 425 mm 426 mm 16.75 in 16.8 in242 mm 425 mm 425 mm 470 mm 19.5 in 18 in 19.75 in242 mm 483 mm 470 mm 9.5 in 18 in 19.75 in242 mm 483 mm 502 mm9.5 in 19 in 18.5 in242 mm 483 mm 502 mm	

Measurement Throughput Summary

Table 26. Typical	-	. ,			
	Numb	Number of Points			
	101	201	401	1601	
Start 1.8 GHz, S	Start 1.8 GHz, Stop 2 GHz, 35 kHz IF bandwidth				
Uncorrected,	9	12	18	54	
1-port cal					
2-Port cal	22	29	42	117	
Start 300 kHz, Stop 3 GHz, 35 kHz IF bandwidth					
Uncorrected,	39	47	56	96	
1-port cal					
2-Port cal	80	101	121	204	
Start 300 kHz, Stop 9 GHz, 35 kHz IF bandwidth					
Uncorrected,	51	57	64	103	
1-port cal					
2-Port cal	112	124	138	220	

^a Typical performance.
 ^b Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S11) measurement.

Table 27. Cycle Time vs. IF Bandwidth^a

Applies to the Preset condition (201 points, correction off) except for the following changes:

- CF = 1 GHz .
- Span = 100 MHz
- Display off (add 21 ms for display on)

IF Bandwidth	Cycle Time (ms) ^b		
(Hz)			
40,000	8		
35,000	9		
30,000	11		
20,000	13		
10,000	28		
7000	36		
5000	48		
3000	72		
1000	196		
300	620		
100	1875		
30	8062		
10	17877		

^a Typical performance. ^b Cycle time includes sweep and retrace time.

Table 28. Cycle Time vs. Number of Points^a

Applies to the Preset condition (35 kHz IF bandwidth, correction off) except for the following changes:

- CF = 1 GHz ٠
- Span = 100 MHz ٠
- Display off (add 21 ms for display on) ٠

Number of Points	Cycle Time (ms) ^b
3	4
11	4
51	5
101	6
201	9
401	16
801	29
1601	52

 1601
 52

 ^a Typical performance.
 ^b Cycle time includes sweep and retrace time.

Table 29. Data Transfer Time^a (ms)

	Number of Points				
	51	201	401	1601	
SCPI over GPIB					
(program executed on	externa	I PC) ^b			
32-bit floating point	3	7	12	43	
64-bit floating point	4	12	22	84	
ASCII	7	64	124	489	
SCPI over 100 Mbit/s L	.AN				
(program executed on	externa	I PC) ^b			
32-bit floating point	1	1	1	1	
64-bit floating point	1	1	1	2	
ASCII	5	15	26	96	
SCPI (program execute	ed in the	e analyz	er) ^d		
32-bit floating point	1	1	2	3	
64-bit floating point	1	2	2	4	
ASCII	8	29	56	222	
COM (program execut	COM (program executed in the analyzer) ^e				
32-bit floating point	1	1	1	1	
Variant type	1	1	2	6	
DCOM over 100 Mbit/s LAN					
(program executed on external PC) ^f					
32-bit floating point ^g	1	1	1	2	
Variant type ^h	1	3	6	19	

^a Typical performance of unit with new 500 MHz Pentium III Processor.

^b Measured using a VEE 5.0 program running on a 600 MHz HP Kayak, National InstrumentsTM GPIB card.

Transferred complex S11 data, using "CALC:DATA?SDATA".
 ⁶ Measured using a VEE 5.0 program running on a 600 MHz HP Kayak. Transferred complex S11 data, using "CALC:DATA?SDATA". Speed dependent on LAN traffic, if connected to network.
 ^d Measured using a VEE 5.0 program running inside PNA Series Analyzer. Transferred complex S11 data,

using "CALC:DATA?SDATA". ^e Measured using a Visual Basic 6.0 program running inside PNA Series Analyzer. Transferred complex S11 data.

^f Measured using a Visual Basic 6.0 program running on a 600 MHz HP Kayak. Transferred complex S11 data. Speed dependent on LAN traffic, if connected to network.

^g Used IArray Transfer.getComplex method for 32-bit floating point.

^h Used meas.getData method for Variant data type.

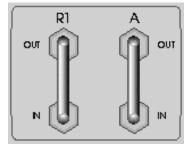
Table 30. Recall and Sweep Speed^a

Operations	Number	Number	Recall
	of Window(s)	of Trace(s)	Time (ms)
Recall	1	1	49
Recall and Sweep	1	1	59
Recall	1	2	82
Recall and Sweep	1	2	96
Recall	1	4	159
Recall and Sweep	1	4	203
Recall	2	2	93
Recall and Sweep	2	2	115
Recall	3	4	158
Recall and Sweep	3	4	218
Recall	4	4	187
Recall and Sweep	4	4	247
Recall	4	8	340
Recall and Sweep	4	8	507

^a CF= 177 MHz, Span = 200 MHz, 201 points, 35 kHz IF BW

Specifications: Front-Panel Jumpers

E8356A, 57A, 58A, Standard - Port 1



Use these SMA (female) connectors to develop custom measurements.

Receiver A Direct-Access Jumper

- The upper "A" connector comes from the coupled arm of the Port 1 coupler.
- The lower connector goes directly to the input of receiver "A." If Option 015 is installed, the path goes directly to a switchable attenuator and then to the receiver input.

Want to upgrade your analyzer? See information on Front-Panel Jumpers with Option 015.

For the A Receiver Input:

Maximum Input Level:

- -6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)
- -6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)
- -11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Noise Floor; rms (10 Hz Bandwidth):

<-130 dBm (300 kHz to 25 MHz) <-123 dBm (3 GHz to 6 GHz) <-123 dBm (6 GHz to 9 GHz)

Damage Level: +15 dBm

Maximum DC Level: +/-5 V

Return Loss:

>17 dB (300 kHz to 3 GHz) >12 dB (3 GHz to 6 GHz) >7 dB (6 GHz to 9 GHz)

Reference Channel R1 Jumper

- The upper connector comes from the transfer switch Reference 1 output.
- The lower connector goes directly to the R1 receiver input.

For the R1 Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)
-6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)
-11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Damage Level: >+15 dBm

Minimum Level to Maintain Phase-Lock:

-35 dBm (300 kHz to 3 GHz) -25 dBm (3 GHz to 9 GHz)

For the Reference Output: (with an External Input to Lock the Source)

Output Level:

-5 to -30 dBm (300 kHz to 6 GHz) -10 to -35 dBm (6 GHz to 9 GHz)

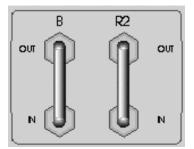
Source Match Return Loss:

16 dB (300 kHz to 3 GHz) 14 dB (3 GHz to 9 GHz)

Damage Level: >+15 dBm

Maximum DC Level: 40V

E8356A, 57A, 58A, Standard - Port 2



Use these SMA (female) connectors to develop custom measurements.

Receiver B Direct-Access Jumper

- The upper "B" connector comes from the coupled arm of the Port 2 coupler.
- The lower connector goes directly to the input of receiver "B." If Option 015 is installed, the path goes directly to a switchable attenuator and then to the receiver input.

Want to upgrade your analyzer? See information on Front-Panel Jumpers with Option 015.

For the B Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)
-6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)
-11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Noise Floor; rms (10 Hz Bandwidth):

<-130 dBm (300 kHz to 25 MHz) <-123 dBm (3 GHz to 6 GHz) <-123 dBm (6 GHz to 9 GHz)

Damage Level: +15 dBm

Maximum DC Level: +/-5 V

Return Loss:

```
>17 dB (300 kHz to 3 GHz)
>12 dB (3 GHz to 6 GHz)
>7 dB (6 GHz to 9 GHz)
```

Reference Channel R2 Jumper

- The upper connector comes from the transfer switch Reference 2 output.
- The lower connector goes directly to the R2 receiver input.

For the R2 Receiver Input:

Maximum Input Level:

- -6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)
- -6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)
- -11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Damage Level: >+15 dBm

Minimum Level to Maintain Phase-Lock:

-35 dBm (300 kHz to 3 GHz) -25 dBm (3 GHz to 9 GHz)

For the Reference Output: (with an External Input to Lock the Source)

Output Level:

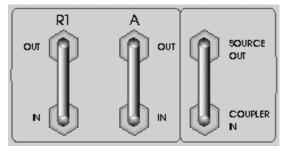
-5 to -30 dBm (300 kHz to 6 GHz) -10 to -35 dBm (6 GHz to 9 GHz) Source Match Return Loss:

16 dB (300 kHz to 3 GHz) 14 dB (3 GHz to 9 GHz)

Damage Level: >+15 dBm

Maximum DC Level: 40V

E8356A, 57A, 58A, Option 015 - Port 1



Use these SMA (female) connectors to develop custom measurements.

Receiver A Direct-Access Jumper

- The upper "A" connector comes from the coupled arm of the Port 1 coupler.
- The lower connector goes directly to the input of receiver "A." With Option 015, the path goes directly to a switchable attenuator and then to the receiver input.

For the A Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)

-6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)

-11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Noise Floor; rms (10 Hz Bandwidth):

<-130 dBm (300 kHz to 25 MHz) <-123 dBm (3 GHz to 6 GHz) <-123 dBm (6 GHz to 9 GHz)

Damage Level: +15 dBm

```
Maximum DC Level: +/-5 V
```

Return Loss:

>17 dB (300 kHz to 3 GHz) >12 dB (3 GHz to 6 GHz) >7 dB (6 GHz to 9 GHz)

Reference Channel R1 Jumper

- The upper connector comes from the transfer switch Reference 1 output.
- The lower connector goes directly to the R1 receiver input.

For the R1 Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)
-6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)
-11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Damage Level: >+15 dBm

Minimum Level to Maintain Phase-Lock:

-35 dBm (300 kHz to 3 GHz) -25 dBm (3 GHz to 9 GHz)

For the Reference Output: (with an External Input to Lock the Source)

Output Level:

-5 to -30 dBm (300 kHz to 6 GHz) -10 to -35 dBm (6 GHz to 9 GHz)

Source Match Return Loss:

16 dB (300 kHz to 3 GHz) 14 dB (3 GHz to 9 GHz)

Damage Level: >+15 dBm

Maximum DC Level: 40V

Port 1 Test-Port Jumper

- The upper "source out" connector comes from the transfer switch Port 1 output.
- The lower "coupler in" connector goes directly to the main input of Port 1 coupler. This is where a power amplifier can be inserted to boost the test port power.

For the Source Output:

Output Level:

+12 to -83 dBm (300 kHz to 6 GHz) +7 to -88 dBm (6 GHz to 9 GHz)

Source Match: 15 dB at 9 GHz

For the Input to the Coupler:

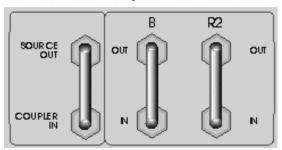
Insertion Loss to Test Port 1:

<3.5 dB at 3 GHz <5 dB at 9 GHz

Maximum Input Power: 2 Watts, CW

Damage Level: 4 Watts, CW

E8356A, 57A, 58A, Option 015 - Port 2



Use these SMA (female) connectors to develop custom measurements.

Receiver B Direct-Access Jumper

- The upper "B" connector comes from the coupled arm of the Port 2 coupler.
- The lower connector goes directly to the input of receiver "B." With Option 015, the path goes directly to a switchable attenuator and then to the receiver input.

For the B Receiver Input:

Maximum Input Level:

- -6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)
- -6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)
- -11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Noise Floor; rms (10 Hz Bandwidth):

<-130 dBm (300 kHz to 25 MHz) <-123 dBm (3 GHz to 6 GHz) <-123 dBm (6 GHz to 9 GHz)

Damage Level: +15 dBm

Maximum DC Level: +/-5 V

Return Loss:

>17 dB (300 kHz to 3 GHz) >12 dB (3 GHz to 6 GHz) >7 dB (6 GHz to 9 GHz)

Reference Channel R2 Jumper

- The upper connector comes from the transfer switch Reference 2 output.
- The lower connector goes directly to the R2 receiver input.

For the R2 Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)
-6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)
-11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Damage Level: >+15 dBm

Minimum Level to Maintain Phase-Lock:

-35 dBm (300 kHz to 3 GHz) -25 dBm (3 GHz to 9 GHz)

For the Reference Output: (with an External Input to Lock the Source)

Output Level:

-5 to -30 dBm (300 kHz to 6 GHz) -10 to -35 dBm (6 GHz to 9 GHz)

Source Match Return Loss:

16 dB (300 kHz to 3 GHz) 14 dB (3 GHz to 9 GHz)

Damage Level: >+15 dBm

Maximum DC Level: 40V

Port 2 Test-Port Jumper

- The upper "source out" connector comes from the transfer switch Port 2 output.
- The lower "coupler in" connector goes directly to the main input of Port 2 coupler. This is where a power amplifier can be inserted to boost the test port power.

For the Source Output:

Output Level:

+12 to -83 dBm (300 kHz to 6 GHz) +7 to -88 dBm (6 GHz to 9 GHz)

Source Match: 15 dB at 9 GHz

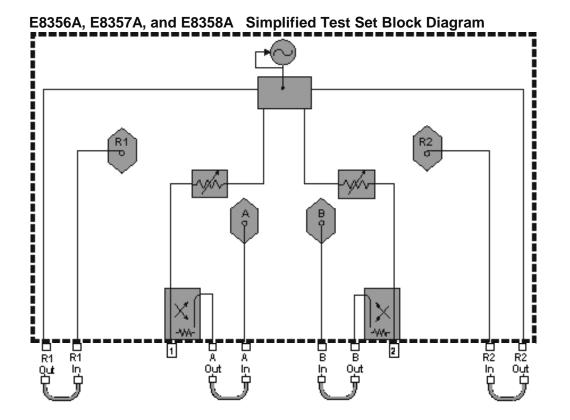
For the Input to the Coupler:

Insertion Loss to Test Port 2:

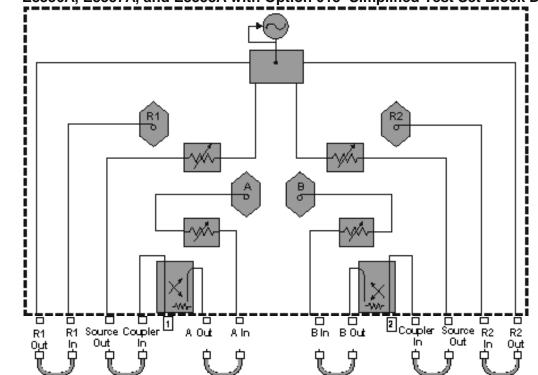
<3.5 dB at 3 GHz <5 dB at 9 GHz

Maximum Input Power: 2 Watts, CW

Damage Level: 4 Watts, CW



1-33



E8356A, E8357A, and E8358A with Option 015 Simplified Test Set Block Diagram

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This is a complete list of the E8801A, E8802A, and E8803A network analyzer technical specifications.

- To optimize viewing of uncertainty curves, click the Maximize button.
- To view or print the PNA Series Data Sheet (a condensed version of the specifications), visit our web site at http://www.agilent.com/find/pna, select your analyzer model, and click on the link for the data sheet.
- The uncertainty curves contained in this document apply only to the setup conditions listed. Please
 download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator
 to generate the
 curves for your PNA setup. View the equations
 used to generate the uncertainty curves.

Definitions

All specifications and characteristics apply over a 25 °C \pm 5 °C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable) errors.

Corrected (residual): Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Corrected System Performance

The specifications in this section apply for measurements made with the E8801A, E8802A, and E8803A analyzer with the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data
- Environmental temperature of 25 °C ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Note: The uncertainty curves contained in these specifications apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

Table 1. System Dynamic Range						
Description	Specification (dB)	Characteristic (dB)				
Dynamic range ^a (at test port)	Dynamic range ^a (at test port)					
300 kHz to 25 MHz ^b	125					
25 MHz to 3 GHz ^b	128					
3 GHz to 6 GHz	118					
6 GHz to 9 GHz	115					
Dynamic range ^c (at receiver in	out)					
300 kHz to 25 MHz ^d		140				
25 MHz to 3 GHz ^d		143				
3 GHz to 6 GHz		133				
6 GHz to 9 GHz		130				

^a The test port dynamic range is calculated as the difference between the test port rms noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.

^b May be limited to 100 dB at particular frequencies below 750 MHz due to spurious receiver residuals.

^c The receiver input dynamic range is calculated as the difference between the receiver rms noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its damage level. When the analyzer is in segment sweep mode, frequency segments can be defined with a higher power level when the extended dynamic range is required (i.e. the portion of the device's response with high insertion loss), and reduced power when receiver damage may occur (i.e. the portion of the devices's response with low insertion loss).

^d May be limited to 115 dB at particular frequencies below 750 MHz due to spurious receiver residuals.

Corrected System Performance with Type-N Connectors

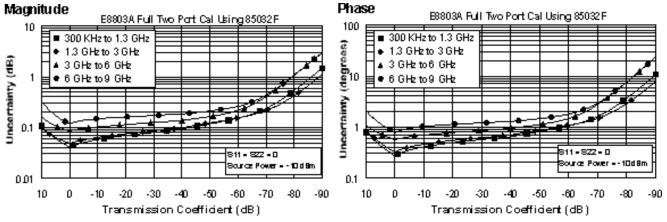
Table 2. Corrected System Performance With Type-N Device Connectors, 85032F Calibration Kit

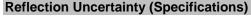
Applies to the E8801A, E8802A, and E8803A analyzer, 85032F (Type-N, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature •
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to	1.3 GHz to	3 GHz to	6GHz to
	1.3 GHz	3 GHz	6 GHz	9 GHz
Directivity	49	46	40	38
Source Match	41	40	36	35
Load Match	49	45	39	37
Reflection Tracking	±0.011	±0.021	±0.032	±0.054
Transmission Tracking	±0.012	±0.020	±0.055	±0.083







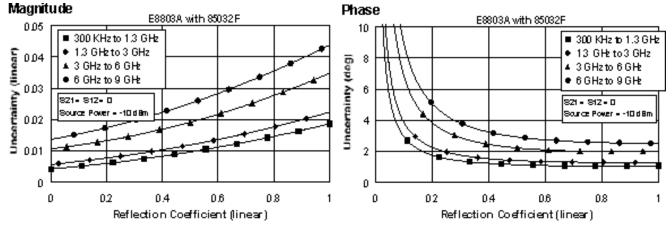
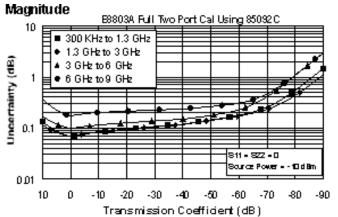


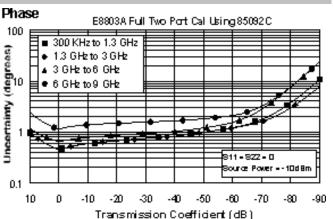
Table 3. Corrected System Performance With Type-N Device Connectors, 85092C Electronic Calibration Module

Applies to the E8801A, E8802A, and E8803A analyzer, 85092C (Type-N, 50Ω) electronic calibration (ECal) module, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

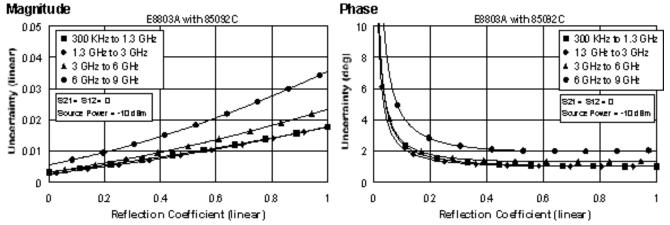
- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to	300 kHz to 1.3 GHz to 3 GHz to 6 to		6 to
	1.3 GHz	3 GHz	6 GHz	9 GHz ^a
Directivity	52	54	52	47
Source Match	45	44	41	36
Load Match	47	47	44	39
Reflection Tracking	±0.040	±0.040	±0.060	±0.070
Transmission Tracking	±0.039	±0.039	±0.068	±0.136









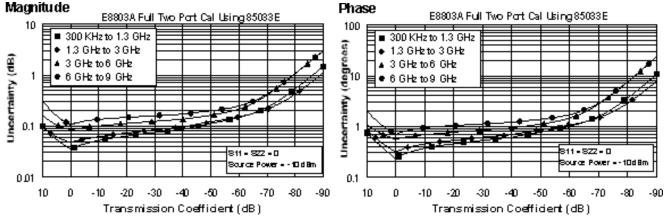
Corrected System Performance with 3.5 mm Connectors

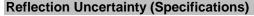
Table 4. Corrected System Performance With 3.5 mm Device Connector Type, 85033E Calibration Kit

Applies to the E8801A, E8802A, and E8803A analyzer, 85033E (3.5 mm, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to 1.3 GHz to 3 GHz to 6 GH		6 GHz to	
	1.3 GHz	3 GHz	6 GHz	9 GHz
Directivity	46	44	38	38
Source Match	43	40	37	36
Load Match	46	44	38	38
Reflection Tracking	±0.006	±0.007	±0.009	±0.010
Transmission	±0.012	±0.021	±0.057	±0.075
Tracking				





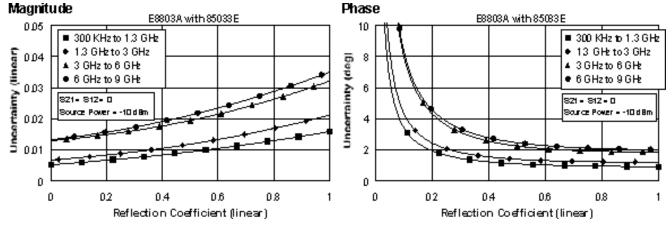


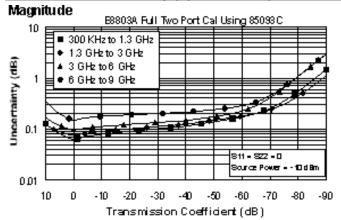
Table 5. Corrected System Performance With 3.5 mm Device Connector Type, 85093C Electronic Calibration Module

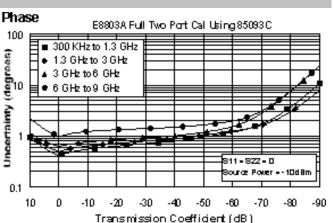
Applies to the E8801A, E8802A, and E8803A analyzer, 85093C (3.5 mm, 50Ω) electronic calibration (ECal) module, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to 1.3 GHz to 3 GHz to		6 GHz to	
	1.3 GHz	3 GHz	6 GHz	9 GHz ^a
Directivity	52	52	51	47
Source Match	44	44	39	34
Load Match	47	47	44	40
Reflection Tracking	±0.030	±0.040	±0.050	±0.070
Transmission Tracking	±0.039	±0.049	±0.068	±0.117

Transmission Uncertainty (Specifications)





Reflection Uncertainty (Specifications)

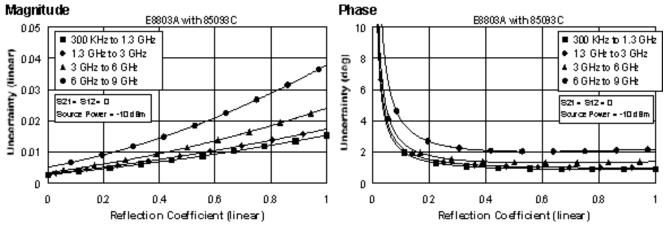


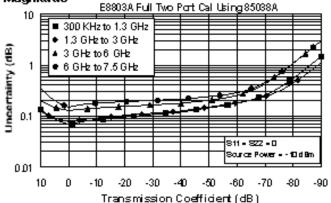
Table 6. Corrected System Performance With 7-16 Device Connector Type, 85038A Calibration Kit

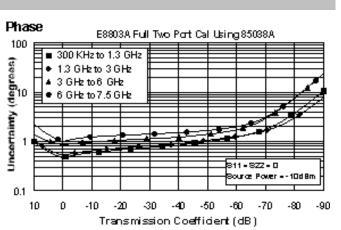
Applies to the E8801A, E8802A, and E8803A analyzer, 85038A (7-16, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

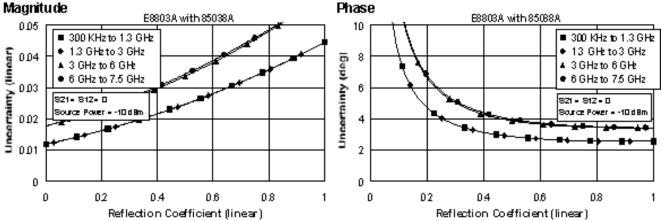
Description	Specification (dB)			
	300 kHz to 1.3 GHz to		3 to	6 to
	1.3 GHz	3 GHz	6 GHz	9 GHz ^a
Directivity	40	40	36	36
Source Match	37	37	34	34
Load Match	39	39	35	35
Reflection Tracking	±0.089	±0.089	±0.115	±0.115
Transmission Tracking	±0.024	±0.033	±0.082	±0.103











Description	Specification (dB)				
	300 kHz to	1MHz to	1.3 GHz to	3 GHz to	6 GHz to
	1 MHz	1.3 GHz	3 GHz	6 GHz	9 GHz
Directivity	30	33	27	20	13
Source Match	18	18	16	11	8
Load Match	20	20	17	13.5	13
Reflection Tracking	±1.5	±1.5	±1.5	±2.5	±3.0
Transmission Tracking	±1.5	±1.5	±1.5	±2.5	±3.0

Table 7. Uncorrected Instrument Performance

Test Port Output Characteristics (Source) Table 8. Test Port Output Frequency

Description	Specification	Supplemental Information
Range:		
E8801A	300 kHz to 3.0 GHz	
E8802A	300 kHz to 6.0 GHz	
E8803A	300 kHz to 9.0 GHz	
Resolution:	1 Hz	
Source Stability		±1 ppm, 0°C to 40 °C, typical ±1ppm/year maximum
Source Stability (Option 1E5)		±0.05 ppm, 0° to 70 °C, typical ±0.1 ppm/year maximum
CW Accuracy	±3 ppm	
CW Accuracy	±1 ppm	
(Option 1E5)		

Table 9. Test Port Output	Fower	
Description	Specification	Supplemental Information
Level Accuracy:		
300 kHz to 6 GHz	±1.0 dB	Variation from 0 dBm in power range 0
6 GHz to 9 GHz	±2.0 dB	±1.5dB below 10 MHz
Level Linearity:		
		Variation from 0 dBm in power range 0
300 kHz to 9 GHz	±0.3 dB	-15 to +5 dBm
300 kHz to 1 MHz	±1.0 dB	+5 to +10 dBm
1 MHz to 6 GHz	±0.5 dB	+5 to +10 dBm
6 GHz to 9 GHz	±0.5 dB	+5 to +7 dBm
Range ^{b:}		
300 kHz to 6 GHz	-15 to +10 dBm	
6 GHz to 9 GHz	-15 to +7 dBm	
Range ^{b:}		
(Option 1E1):		
300 kHz to 6 GHz	-85 to +10 dBm	
6 GHz to 9 GHz	-85 to +7 dBm	
Sweep Range		
300 kHz to 6 GHz	25 dB	
6 GHz to 9 GHz	22 dB	
Level Resolution	0.01 dB	

Table 9. Test Port Output Power^a

^a Source output performance on port 1 only. Port 2 output performance is typical.

^b Power to which the source can be set and phase lock is assured.

Table 10. Test Port Output Signal Purity

Description	Specification	Supplemental Information
Harmonics (2nd or 3rd)		
at max output power (< 25 MHz)		< -25 dBc, typical
at max output power (25 MHz to 9 GHz)		< -25 dBc, characteristic ^a
at 0 dBm output		< -35 dBc, typical
at -10 dBm output		< -38 dBc, typical, in power
		range 0
Non-harmonic Spurious		
at max output		-30 dBc, typical for offset freq>1kHz
at -10 dBm output		-50 dBc, typical for offset freq >1kHz

^a Typical below 25 MHz.

Test Port and Receiver In	put Characteristics
----------------------------------	---------------------

Table 11. Test Port and Receiver Input Levels			
Description	Specification	Supplemental Information	
Maximum Test Port Input			
Test Ports 1 and 2:			
300 kHz to 25 MHz	+10 dBm	< 0.6 dB compression	
25 MHz to 3 GHz	+10 dBm	< 0.4 dB compression	
3 GHz to 6 GHz	+10 dBm	< 0.7 dB compression	
6 GHz to 9 GHz	+5 dBm	< 0.7 dB compression	
Damage Level	1		
Test Port 1, 2		+30 dBm or ±30 VDC, typ.	
R, A, B (Opt. 014)		+15 dBm or ±5 VDC, typ.	
Coupler Thru (Opt. 014)		+33 dBm or ±0 VDC, typ.	
Test Port Noise Floor ^a			
300 kHz to 25 MHz ^b			
10 Hz IF Bandwidth	-115 dBm		
1 kHz IF Bandwidth	-95 dBm		
25 MHz to 3 GHz ^b			
10 Hz IF Bandwidth	-118 dBm		
1 kHz IF Bandwidth	-98 dBm		
3 GHz to 9 GHz			
10 Hz IF Bandwidth	≤ -108 dBm		
1 kHz IF Bandwidth	≤ -88 dBm		
Receiver Noise Floor ^a	-		
300 kHz to 25 MHz ^c			
10 Hz IF Bandwidth	≤ -130 dBm		
1 kHz IF Bandwidth	≤ -110 dBm		
25 MHz to 3 GHz ^c			
10 Hz IF Bandwidth	≤ -133 dBm		
1 kHz IF Bandwidth	≤ -113 dBm		
6 GHz to 9 GHz			
10 Hz IF Bandwidth	≤ -123 dBm		
1 kHz IF Bandwidth	≤ -103 dBm		
Crosstalk			
		Between test ports 1 and 2, with	
		short circuits at both ports	
300 kHz to 1 MHz	<-120 dB		
1 MHz to 25 MHz	<-125 dB		
25 MHz to 3 GHz	<-126 dB		
3 GHz to 6 GHz	<-117 dB		
6 GHz to 9 GHz	<-106 dB		
Maximum Receiver Input	Level (A, B, R)		
300 kHz to 6 GHz		-6 dBm, typical	
6 GHz to 9 GHz		-9 dBm, typical	
Reference Input Level (R)	u		
300 kHz to 9 GHz		-10 to -35 dBm, typical	
Maximum Coupler Input L	evel (Opt 014)		
300 kHz to 9 GHz		+33 dBm, typical	
^a Total average (PMS) paige powe	a selected at a state of the second second	a value of a linear magnitude trace everges	

^a Total average (RMS) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.

^b May be limited to -90 dBm at particular frequencies below 750 MHz due to spurious receiver residuals.

^c May be limited to -105 dBm at particular frequencies below 750 MHz due to spurious receiver residuals.

^d Input level to maintain phase lock.

Table 12. Test Port Input (Trace Noise)

Description	Specification	Supplemental Information			
Trace Noise ^a Magnitue	Trace Noise ^a Magnitude				
1 kHz IF Bandwidth	< 0.002 dB rms				
10 kHz IF Bandwidth	< 0.005 dB rms				
Trace Noise ^a Phase					
1 kHz IF Bandwidth	< 0.010° rms				
10 kHz IF Bandwidth	< 0.035° rms				

^a Trace noise is defined as a ratio measurement of a through or a full reflection, with the source set to 0 dBm.

Table 13. Test Port Input (Reference Level and Stability)

Description	Specification	Supplemental Information
Reference Level Ma	gnitude	
Range	±200 dB	
Resolution	0.001 dB	
Reference Level Pha	ase	
Range	±500°	
Resolution	0.01°	
Stability Magnitude	1	
300 kHz to 3 GHz		0.02 dB/°C, typical
3 GHz to 6 GHz		0.04 dB/°C, typical
6 GHz to 9 GHz		0.06 dB/°C, typical
Stability Phase ^a		
300 kHz to 3 GHz		0.2°/°C, typical
3 GHz to 6 GHz		0.3°/°C, typical
6 GHz to 9 GHz		0.6°/°C, typical
^a Stability is defined as a r	tio managerement at the	a toot port

^a Stability is defined as a ratio measurement at the test port.

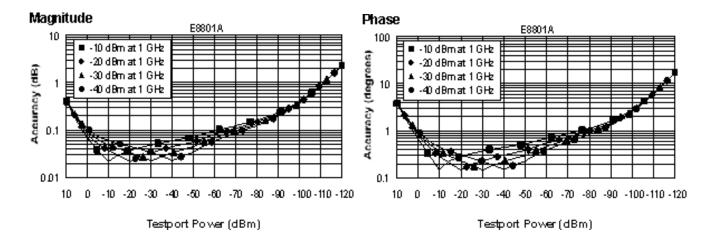
Table 14. Test Port Input (Dynamic Accuracy specification^a)

Accuracy of the test port input power reading is relative to the reference input power level. Applies to input ports 1 and 2 with the following conditions:

- IF bandwidth = 10 Hz
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature

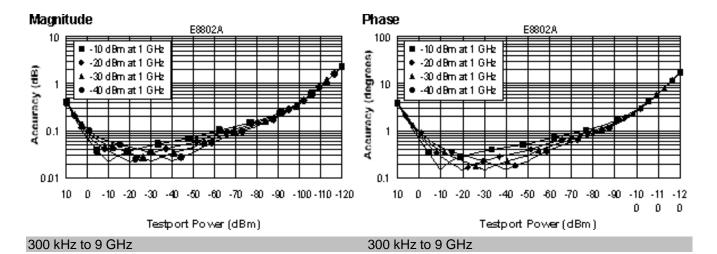
300 kHz to 3 GHz

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300 kHz to 3 GHz
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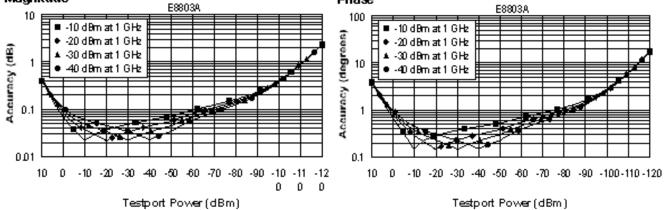
300 kHz to 6 GHz

300 kHz to 6 GHz





Phase



^a Dynamic accuracy is verified with the following measurements:

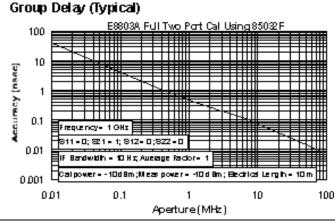
• compression over frequency

[•] IF linearity at a single frequency of 1.195 GHz and a reference level of -20 dBm

Description	Specification	Supplemental Information
Aperture (selectable)	(frequency span)/(number of points -1)	
Maximum Aperture	20% of frequency span	
Range	0.5 x (1/minimum aperture)	
Maximum Delay		Limited to measuring no more than 180° of phase change within the minimum aperture.)
Accuracy		See graph below. Char.

Table 15. Test Port Input (Group Delay)^a

The following graph shows group delay accuracy with type-N full 2-port calibration and a 10 Hz IF bandwidth. Insertion loss is assumed to be < 2 dB and electrical length to be ten meters.



In general, the following formula can be used to determine the accuracy, in seconds, of specific group delay measurement:

±Phase Accuracy (deg)/[360 × Aperture (Hz)]

Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst case phase accuracy.

^a Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and the number of points per sweep).

General Information

Table 16. System Bandwidths

Description	Specification	Supplemental Information
IF Bandwidth Se	ettings	
Range		1 Hz to 40 kHz
		in a 1, 2, 3, 5, 7,10 sequence up to 30 kHz, 35 kHz, 40kHz,
		nominal

Supplemental Information
Type-N, female; 50 Ω , nominal
0.204 to 0.207 in., characteristic
3-pin connector, male
+15 VDC ±2%, 400 mA, max, characteristic
-12.6 VDC ±5%, 300 mA, max, characteristic
21.3 cm (8.4 in) diagonal color active matrix LCD; 640 (horizontal) X 480 (vertical) resolution
Vertical 59.83 Hz; Horizontal 31.41 Hz
±200 dB (at 20 dB/div), max
±180°, max
10 pUnits, min 1000 Units, max
0.001 dB/div, min
0.01°/div, min
0.001 dB, min
0.01°, min
0.01 mUnit, min; 0.01°,min

Table 17. Front Panel Information

Table 18. Rear Panel Informa	
Description	Supplemental Information
10 MHz Reference In	
Connector	BNC, female
Input Frequency	10 MHz ± 1 ppm, typical
Input Level	-15 dBm to +20 dBm, typical
Input Impedance	200 Ω, nom.
10 MHz Reference Out	
Connector	BNC, female
Output Frequency	10 MHz ± 10 ppm, typical
Signal Type	Sine Wave, typical
Output Level	+10 dBm \pm 4 dB into 50 Ω , typical
Output Impedance	50 Ω , nominal
Harmonics	<-40 dBc, typical
VGA Video Output	
Connector	15-pin mini D-Sub; Drives VGA compatible monitors
Devices Supported	Resolutions
Flat Panel (TFT	1024 X 768, 800 X 600, 640 X 480
Flat Panel (DSTN)	800 X 600, 640 X 480
CRT Monitor	1280 X 1024, 1024 X 768, 800 X 600, 640 X 480
	Simultaneous operation of the internal and external displays is allowed,
	but with 640 X 480 resolution only. If you change resolution, you can only
	view the external display (internal display will "white out").
Test Set IO	25-pin D-Sub connector, available for external test set control
Aux IO	25-pin D-Sub connector, male, analog and digital IO
Handler IO	36-pin IDC D-ribbon socket connector; all input/output signals are default
	set to negative logic; can be reset to positive logic via GPIB command
GPIB	24-pin D-sub (Type D-24), female; compatible with IEEE-488.
Parallel Port (LPT1)	25-pin D-Sub connector, female; provides connection to printers or any other parallel port peripherals
Serial Port (COM 1)	9-pin D-Sub, male; compatible with RS-232
USB Port	
	Universal Serial Bus jack, Type A configuration (4 contacts inline, contact
	1 on left); female
Contact 1	Vcc: 4.75 to 5.25 VDC, 500 mA, maximum
Contact 2	-Data
Contact 3	+Data
Contact 4	Ground
LAN	10/100BaseT Ethernet, 8-pin configuration; auto selects between the two
Line Dewer ^{a, b}	data rates
Line Power ^{a, b}	
Frequency at 110/115 V	50/60/400 Hz
Frequency at 230/240 V	50/60 Hz
Maximum Watts	350 W
^a A third-wire around is required	

Table 18. Rear Panel Information

^a A third-wire ground is required.

^b Power supply has a voltage autoswitching feature.

 Table 19. Rear Panel Information (continued)

Description	Supplem	ental Information		
External AM Input	Cappion			
Description	signal, or level set b and a neg	shifts the test port output. by the instrument, a positiv pative voltage gives a lowe	odulation to test port output Zero volts input gives the power e voltage gives a higher level, r level.	
Connector	BNC, fem	ale		
Input Sensitivity	8 dB/V, ty	pical		
Bandwidth	1 kHz, typ	vical		
Input Impedance	1 kΩ, typio	cal		
External Detector Input	· · ·			
Description		n an external, negative pola test port remote from instr	arity diode detector provides rument's front panel	
Connector	BNC, fem			
Input Sensitivity	-500 mV y	/ields approximately -3 dBi	m at detector's input, typical	
Bandwidth	50 kHz, ty	pical		
Input Impedance	1 kΩ, nom	ninal		
Table 20. Analyzer Environm	ent and Dimensior			
Description		Supplemental	Information	
General Environmental				
RFI/EMI Susceptibility		Defined by CIS 50082-1	PR Pub. 11, Group 1, Class A, and IEC	
ESD			Minimize using static-safe work procedures and an antistatic bench mat	
Dust		Minimize for op	Minimize for optimum reliability	
Operating Environment			· · · · · · · · · · · · · · · · · · ·	
Temperature		0 °C to +40 °C		
		error message	Instrument powers up, phase locks, and displays no error messages within this temperature range.	
	Error-Corrected Temperature Range		25°C ± 5°C with less than 1°C deviation from calibration temp.	
Humidity			5% to 95% at +40 °C	
Altitude		0 to 4500 m (1-	4,760 ft.)	
Non-Operating Storage E	nvironment	P		
Temperature		-40 °C to +70 °		
Humidity			0% to 90% at +65 °C (non-condensing)	
Altitude		0 to 15,240 m	(50,000 ft.)	
Cabinet Dimensions	1			
	Height	Width	Depth	
Excluding front and rear	222 mm	425 mm	426 mm	
panel hardware and feet	8.75 in	16.75 in	16.8 in	
As shipped - includes front		425 mm	470 mm	
panel connectors, rear panel bumpers, and feet.	9.5 in	16.75 in	18.5 in	
As shipped plus handles	242 mm	458 mm	502 mm	
	9.5 in	18 in	19.75 in	
As shipped plus rack-	242 mm	483 mm	470 mm	
mount flanges	9.5 in	19 in	18.5 in	
As shipped plus handles	242 mm	483 mm 19 in	502 mm	
and flanges	9.5 in		19.75 in	
Weight				
Net	24 kg (54 lb), nor			
Shipping	32 kg (70 lb), nominal			

Measurement Throughput Summary

Table 21. Typical	Cycle Time	e ^{a,b} (ms)		-
	Number	of Points		
	101	201	401	1601
Start 1.8 GHz, S	top 2 GHz	., 35 kHz IF	bandwid	lth
Uncorrected,	7	10	16	52
1-port cal				
2-Port cal	27	36	55	164
Start 300 kHz, S	top 3 GHz	2, 35 kHz IF	bandwid	lth
Uncorrected,	48	54	64	104
1-port cal				
2-Port cal	103	119	145	254
Start 300 kHz, S	top 9 GHz	2, 35 kHz IF	bandwid	lth
Uncorrected,	51	57	64	103
1-port cal				
2-Port cal	112	124	138	220

a Typical performance.

b Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with DISPLAY: ENABLE OFF. Add 21 ms for display on. Data for one trace (S11) measurement..

Table 22. Cycle Time vs. IF Bandwidth^a

Applies to the Preset condition (201 points, correction off) except for the following changes:

- CF = 1 GHz
- Span = 100 MHz •

Display off (add 21 ms for display on) •

IF Bandwidth	Cycle Time (ms) ^b
(Hz)	
40,000	8
35,000	9
30,000	11
20,000	13
10,000	28
7000	36
5000	48
3000	72
1000	196
300	620
100	1875
30	8062
10	17877

^a Typical performance. ^b Cycle time includes sweep and retrace time.

Table 23. Cycle Time vs. Number of Points^a

Applies to the Preset condition (35 kHz IF bandwidth, correction off) except for the following changes:

- CF = 1 GHz ٠
- Span = 100 MHz
- Display off (add 21 ms for display on) •

Number of Points	Cycle Time (ms) [♭]
3	4
11	4
51	5
101	6
201	9
401	16
801	29
1601	52

^a Typical performance. ^b Cycle time includes sweep and retrace time.

Table 24. Data Transfer Time^a (ms)

	Number of Points			
	51	201	401	1601
SCPI over GPIB				
(program executed or	n externa	I PC) ^b		
32-bit floating point	3	7	12	43
64-bit floating point	4	12	22	84
ASCII	7	64	24	489
SCPI over 100 Mbit/s	LAN			
(program executed or	n externa	I PC) ^b		
32-bit floating point	1	1	1	1
64-bit floating point	1	1	1	2
ASCII	5	15	26	96
SCPI (program execut	ted in the	analyzer) ^d	-
32-bit floating point	1	1	2	3
64-bit floating point	1	2	2	4
ASCII	8	29	56	222
COM (program executed in the analyzer) ^e				
32-bit floating point	1	1	1	1
Variant type	1	1	2	6
DCOM over 100 Mbit/s LAN				
(program executed on external PC) ^f				
32-bit floating point ^g	1	1	1	2
Variant type ^h	1	3	6	19

^a Typical performance of unit with 500 MHz Pentium III processor.

^b Measured using a VEE 5.0 program running on a 600 MHz HP Kayak, National InstrumentsTM GPIB card. Transferred complex S11 data , using "CALC:DATA?SDATA". ⁶ Measured using a VEE 5.0 program running on a 600 MHz HP Kayak. Transferred complex S11 data,

using "CALC:DATA?SDATA". Speed dependent on LAN traffic, if connected to network. ^d Measured using a VEE 5.0 program running inside PNA Series Analyzer. Transferred complex S11 data, using "CALC:DATA?SDATA". * Measured using a Visual Basic 6.0 program running inside PNA Series Analyzer. Transferred complex S11

data.

^f Measured using a Visual Basic 6.0 program running on a 600 MHz HP Kayak. Transferred complex S11 data. Speed dependent on LAN traffic, if connected to network.

^g Used IArray Transfer.getComplex method for 32-bit floating point.

^h Used meas.getData method for Variant data type.

Table 25. Recall and Sweep Speed^a

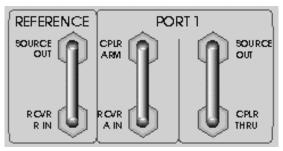
Operations	Number of Number of		Recall	
	Window(s)	Trace(s)	Time (ms)	
Recall	1	1	49	
Recall and Sweep	1	1	59	
Recall	1	2	82	
Recall and Sweep	1	2	96	
Recall	1	4	159	
Recall and Sweep	1	4	203	
Recall	2	2	93	
Recall and Sweep	2	2	115	
Recall	3	4	158	
Recall and Sweep	3	4	218	
Recall	4	4	187	
Recall and Sweep	4	4	247	
Recall	4	8	340	
Recall and Sweep	4	8	507	

^a CF=177 MHz, Span=200 MHz, 201 points, 35 kHz IF BW

Specifications: Front-Panel Jumpers

Models E8801A, E8802A, E8803A Option 014

Specifications: Front-Panel Jumpers, Port 1



Option 014 Analyzer

NOTE: The standard analyzer (E8801A/ E8802A/ E8803A) has no front-panel jumpers.

Use these SMA (female) connectors to develop custom measurements.

Receiver A Direct-Access Jumper

- The "Cplr Arm" connector comes from the coupled arm of the Port 1 coupler.
- The "Rcvr A In"connector goes directly to the input of receiver "A."

For the A Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)

-6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)

-11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Noise Floor; rms (10 Hz Bandwidth):

<-130 dBm (300 kHz to 25 MHz) <-123 dBm (3 GHz to 6 GHz) <-123 dBm (6 GHz to 9 GHz)

Damage Level: +15 dBm

Maximum DC Level: +/-5 V

Return Loss:

>17 dB (300 kHz to 3 GHz) >12 dB (3 GHz to 6 GHz) >7 dB (6 GHz to 9 GHz)

Reference Channel R Jumper

- The "Source Out" connector comes from the source Reference output.
- The "Rcvr R In" connector goes directly to the R receiver input.

For the R Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz) -6 dBm; <0.8 dB Compression (3 GHz to 6 GHz) -11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Damage Level: >+15 dBm

Minimum Level to Maintain Phase-Lock:

-35 dBm (300 kHz to 3 GHz) -25 dBm (3 GHz to 9 GHz)

For the Reference Output: (with an External Input to Lock the Source)

Output Level:

-5 to -30 dBm (300 kHz to 6 GHz) -10 to -35 dBm (6 GHz to 9 GHz)

Source Match Return Loss:

16 dB (300 kHz to 3 GHz) 14 dB (3 GHz to 9 GHz)

Damage Level: >+15 dBm

Maximum DC Level: 40V

Port 1 Test-Port Jumper

- The upper "Source Out" connector comes from the transfer switch Port 1 output.
- The lower "Coupler Thru" connector goes directly to the main input of Port 1 coupler. This is where a power amplifier can be inserted to boost the test port power.

For the Source Output:

Output Level:

+12 to -83 dBm (300 kHz to 6 GHz) +7 to -88 dBm (6 GHz to 9 GHz)

Source Match: 15 dB at 9 GHz

For the Input to the Coupler:

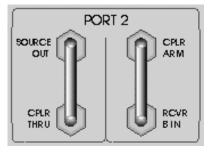
Insertion Loss to Test Port 1:

<3.5 dB at 3 GHz <5 dB at 9 GHz

Maximum Input Power: 2 Watts, CW

Damage Level: 4 Watts, CW

Specifications: Front-Panel Jumpers, Port 2



Option 014 Analyzer

NOTE: The standard analyzer (E8801A/ E8802A/ E8803A) has no front-panel jumpers.

Use these SMA (female) connectors to develop custom measurements.

Receiver B Direct-Access Jumper

- The upper "Cplr Arm" connector comes from the coupled arm of the Port 2 coupler.
- The "Rcvr B In" connector goes directly to the input of receiver "B."

For the B Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)

- -6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)
- -11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Noise Floor; rms (10 Hz Bandwidth):

<-130 dBm (300 kHz to 25 MHz) <-123 dBm (3 GHz to 6 GHz) <-123 dBm (6 GHz to 9 GHz)

Damage Level: +15 dBm

Maximum DC Level: +/-5 V

Return Loss:

>17 dB (300 kHz to 3 GHz) >12 dB (3 GHz to 6 GHz) >7 dB (6 GHz to 9 GHz)

Port 2 Test-Port Jumper

- The upper "Source Out" connector comes from the transfer switch Port 2 output.
- The lower "Coupler Thru" connector goes directly to the main input of Port 2 coupler. This is where a power amplifier can be inserted to boost the test port power.

For the Source Output:

Output Level:

+12 to -83 dBm (300 kHz to 6 GHz) +7 to -88 dBm (6 GHz to 9 GHz)

Source Match: 15 dB at 9 GHz

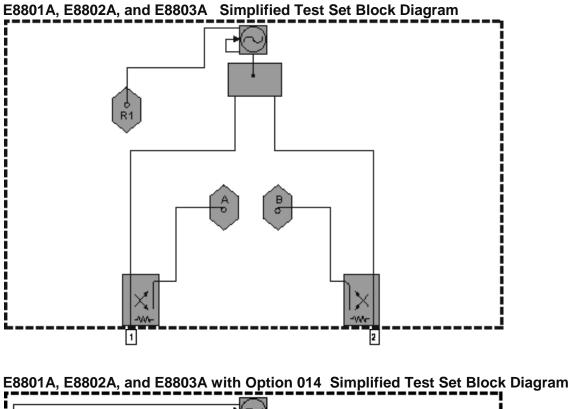
For the Input to the Coupler:

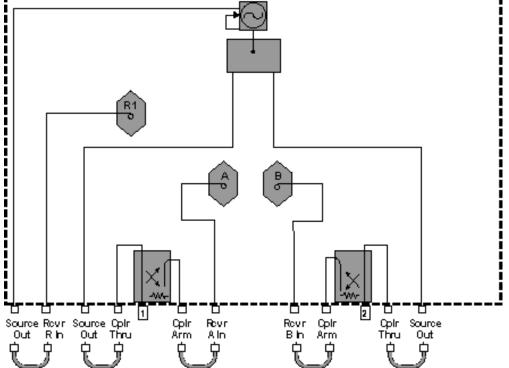
Insertion Loss to Test Port 2:

<3.5 dB at 3 GHz <5 dB at 9 GHz

Maximum Input Power: 2 Watts, CW

Damage Level: 4 Watts, CW





3 Technical Specifications for the N3381A, N3382A, N3383A

Definitions	
Corrected System Performance	
Table 1. System Dynamic Range	
Corrected System Performance with Type-N Connectors	
Table 2. Corrected System Performance With Type-N Device Connectors, 85032F Calibration Kit	
Table 3. Corrected System Performance With Type-N Device Connectors, 85092C Electronic Calibration Module	
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Specifications: Front-Panel Jumpers	
Specifications: Front-Panel Jumpers, Port 1	
Receiver A Direct-Access Jumper	
Reference Channel R Jumper	
Port 1 Test-Port Jumper	3_27
-	
Specifications: Front-Panel Jumpers, Port 2 and Port 3 Receiver B Direct-Access Jumper	

Port 2 Test-Port Jumper	
Receiver C Direct-Access Jumper	
N3381A, N3382A, and N3383A Simplified Test Set Block Diagram	
N3381A, N3382A, and N3383A with Option 014 Simplified Test Set Block Dia	gram3-30

This is a complete list of the N3381A, N3382A, and N3383A network analyzer technical specifications.

- To optimize viewing of uncertainty curves, click the Maximize button.
- To view or print the PNA Series Data Sheet (a condensed version of the specifications), visit our web site at http://www.agilent.com/find/pna, select your analyzer model, and click on the link for the data sheet.
- The uncertainty curves contained in this document apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

Definitions

All specifications and characteristics apply over a 25 °C \pm 5 °C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable) errors.

Corrected (residual): Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Corrected System Performance

The specifications in this section apply for measurements made with the N3381A, N3382A, and N3383A analyzer with the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data
- Environmental temperature of 25 °C ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Note: The uncertainty curves contained in these specifications apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

Table 1. System Dynamic Range						
Description	Specification (dB)	Characteristic (dB)				
	Dynamic range ^a (at test port)					
300 kHz to 25 MHz ^b	125					
25 MHz to 3 GHz ^b	128					
3 GHz to 6 GHz	118					
6 GHz to 9 GHz	115					
Dynamic range ^c (at rec	Dynamic range ^c (at receiver input)					
300 kHz to 25 MHz ^d		140				
25 MHz to 3 GHz ^d		143				
3 GHz to 6 GHz		133				
6 GHz to 9 GHz		130				

^a The test port dynamic range is calculated as the difference between the test port rms noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.

^b May be limited to 100 dB at particular frequencies below 750 MHz due to spurious receiver residuals.

^c The receiver input dynamic range is calculated as the difference between the receiver rms noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its damage level. When the analyzer is in segment sweep mode, frequency segments can be defined with a higher power level when the extended dynamic range is required (i.e. the portion of the device's response with high insertion loss), and reduced power when receiver damage may occur (i.e. the portion of the devices's response with low insertion loss). Specification applies only when power is sourced from Port 1. If power is sourced from either Port 2 or Port 3, dynamic range decreases by 3 dB.

^d May be limited to 115 dB at particular frequencies below 750 MHz due to spurious receiver residuals.

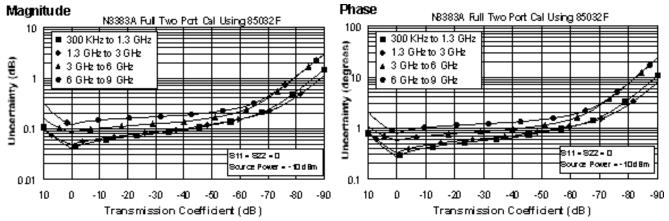
Corrected System Performance with Type-N Connectors

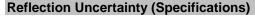
Table 2. Corrected System Performance With Type-N Device Connectors, 85032F Calibration Kit

Applies to the N3381A, N3382A, and N3383A analyzer, 85032F (Type-N, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to 1.3 GHz to 3		3 to	6 to
	1.3 GHz	3 GHz	6 GHz	9 GHz
Directivity	49	46	40	38
Source Match	41	40	36	35
Load Match	49	45	39	37
Reflection Tracking	±0.011	±0.021	±0.032	±0.054
Transmission Tracking	±0.012	±0.020	±0.055	±0.083





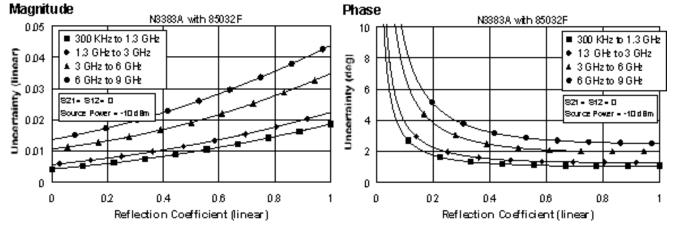


Table 3. Corrected System Performance With Type-N Device Connectors, 85092C Electronic Calibration Module

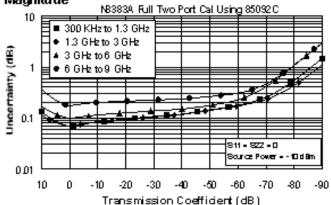
Applies to the N3381A, N3382A, and N3383A analyzer, 85092C (Type-N, 50Ω) electronic calibration (ECal) module, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

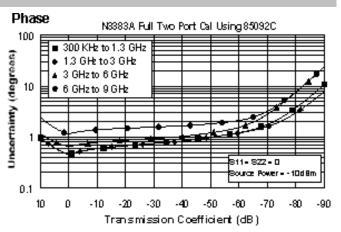
- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

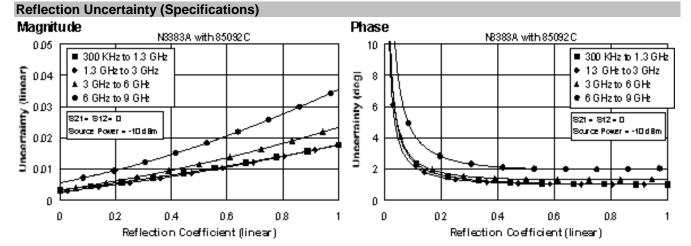
Description	Specification (dB)				
	300 kHz to	1.3 GHz to	3 to	6 to	
	1.3 GHz	3 GHz	6 GHz	9 GHz ^a	
Directivity	52	54	52	47	
Source Match	45	44	41	36	
Load Match	47	47	44	39	
Reflection Tracking	±0.040	±0.040	±0.060	±0.070	
Transmission Tracking	±0.039	±0.039	±0.068	±0.136	

Transmission Uncertainty (Specifications)

Magnitude







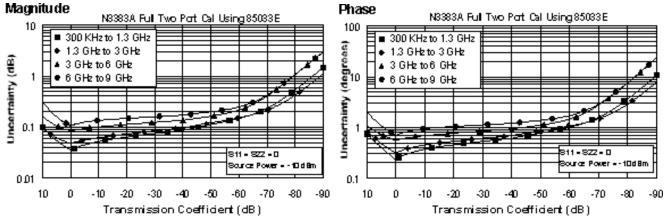
Corrected System Performance with 3.5 mm Connectors

Table 4. Corrected System Performance With 3.5 mm Device Connector Type, 85033E Calibration Kit

Applies to the N3381A, N3382A, and N3383A analyzer, 85033E (3.5 mm, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to	1.3 GHz to	3 to	6 to
	1.3 GHz	3 GHz	6 GHz	9 GHz
Directivity	46	44	38	38
Source Match	43	40	37	36
Load Match	46	44	38	38
Reflection Tracking	±0.006	±0.007	±0.009	±0.010
Transmission Tracking	±0.012	±0.021	±0.057	±0.075





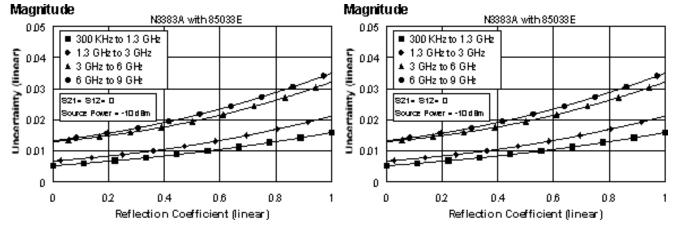
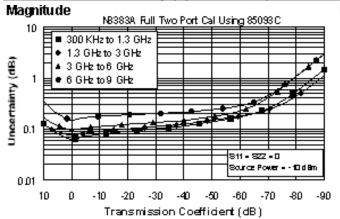


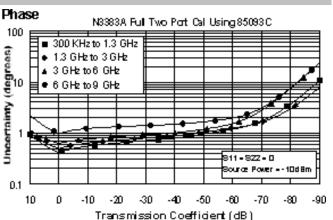
Table 5. Corrected System Performance With 3.5 mm Device Connector Type, 85093C Electronic Calibration Module

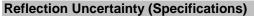
Applies to the N3381A, N3382A, and N3383A analyzer, 85093C (3.5 mm, 50Ω) electronic calibration (ECal) module, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)				
	300 kHz to	1.3 GHz to	3 to	6 to	
	1.3 GHz	3 GHz	6 GHz	9 GHz ^a	
Directivity	52	52	51	47	
Source Match	44	44	39	34	
Load Match	47	47	44	40	
Reflection Tracking	±0.030	±0.040	±0.050	±0.070	
Transmission Tracking	±0.039	±0.049	±0.068	±0.117	







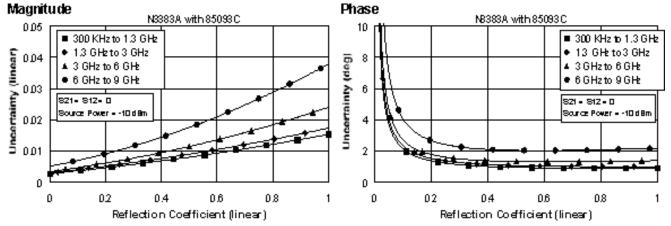


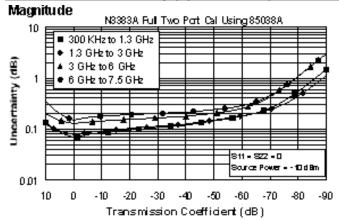
Table 6. Corrected System Performance With 7-16 Device Connector Type, 85038A Calibration Kit

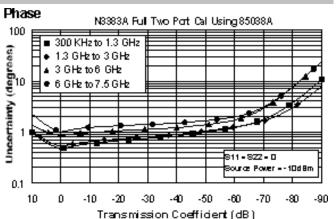
Applies to the N3381A, N3382A, and N3383A analyzer, 85038A (7-16, 50Ω) calibration kit, N6314A test port cable, and a full 2-port calibration. Also applies to the following conditions:

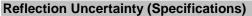
- IF bandwidth = 10 Hz
- No averaging applied to data
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature
- Isolation calibration not omitted

Description	Specification (dB)			
	300 kHz to	1.3 GHz to	3 to	6 to
	1.3 GHz	3 GHz	6 GHz	9 GHz ^a
Directivity	40	40	36	36
Source Match	37	37	34	34
Load Match	39	39	35	35
Reflection Tracking	±0.089	±0.089	±0.115	±0.115
Transmission Tracking	±0.024	±0.033	±0.082	±0.103

Transmission Uncertainty (Specifications)







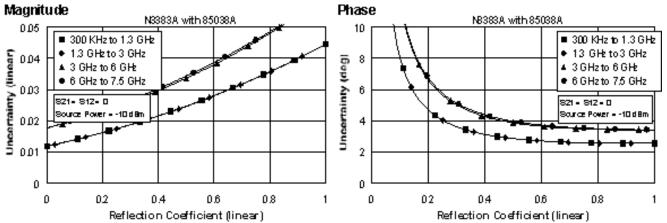


Table 7. Uncorrected Instrument Performance

Description	Specification (dB)				
	300 kHz to	1MHz to	1.3 GHz to	3 GHz to	6 GHz to
	1 MHz	1.3 GHz	3 GHz	6 GHz	9 GHz
Directivity	30	33	27	20	13
Source Match Ports 1 and 2	18	18	17	14	12
Source Match Port 3 only	18	18	17	14	12
Load Match Ports 1 and 2	20	20	17	13.5	11.5
Load Match Port 3 only	20	20	17	13.5	11.5
Reflection Tracking	±1.5	±1.5	±1.5	±2.5	±3.0
Transmission Tracking	±1.5	±1.5	±1.5	±2.5	±3.0

Test Port Output Characteristics (Source)

Table 8. Test Port Output Frequency				
Description	Specification	Supplemental Information		
Range:				
N3381A	300 kHz to 3.0 GHz			
N3382A	300 kHz to 6.0 GHz			
N3383A	300 kHz to 9.0 GHz			
Resolution	1 Hz			
Source Stability		±1 ppm, 0° to 40 °C, typical		
		±1ppm/year maximum		
Source Stability		±0.05 ppm, 0° to 40 °C, typical		
(Option 1E5)		±0.1 ppm/year maximum		
CW Accuracy	±3 ppm			
CW Accuracy				
(Option 1E5)	±1 ppm			

Description	Specification	Supplemental Information
Level Accuracy		
		Variation from 0 dBm in power range
		0
		(step attenuator at 0 dB)
		±1.5dB below 10 MHz
300 kHz to 6 GHz	±1.0 dB	
6 GHz to 9 GHz	±2.0 dB	
Level Linearity		
		Variation from 0 dBm in power range
		0
300 kHz to 9 GHz	±0.3 dB	-15 to +5 dBm
300 kHz to 1 MHz	±1.0 dB	+5 to +10 dBm
1 MHz to 6 GHz	±0.5 dB	+5 to +10 dBm
6 GHz to 9 GHz	±0.5 dB	+5 to +7 dBm
Range ^b		
300 kHz to 6 GHz	-15 to +10 dBm	
6 GHz to 9 GHz	-15 to +7 dBm	
Range⁵		
(Option 1E1)		
300 kHz to 6 GHz	-85 to +10 dBm	
6 GHz to 9 GHz	-85 to +7 dBm	
Sweep Range		
Port 1:		
300 kHz to 6 GHz	25 dB	
6 GHz to 9 GHz	22 dB	
Level Resolution	0.01 dB	

^a Source output performance on port 1 only. Port 2 and port 3 output performance is typically 3 dB less.

^b Power to which the source can be set and phase lock is assured.

Table 10. Test Port Output Signal Purity

Description	Specification	Supplemental Information
Harmonics (2nd or 3rd)		
at max output power (< 25 MHz)		< -25 dBc, typical
at max output power (25 MHz to		< -25 dBc, characteristic ^a
9 GHz)		
at 0 dBm output		< -35 dBc, typical
at -10 dBm output		< -38 dBc, typical, in power
		range 0
Non-harmonic Spurious		
at max output		-30 dBc, typical for offset freq>1kHz
at -10 dBm output		-50 dBc, typical for offset freq >1kHz

^a Typical below 25 MHz.

Test Port and Receiver Input Characteristics

Table 11. Test Port and Receiver Input Levels				
Description	Specification	Supplemental Information		
Maximum Test Port Input Lev	vel			
300 kHz to 25 MHz	+10 dBm	<0.6 dB compression		
25 MHz to 3 GHz	+10 dBm	<0.4 dB compression		
3 GHz to 6 GHz	+10 dBm	<0.7 dB compression		
6 GHz to 9 GHz	+7 dBm	<0.7 dB compression		
Damage Level				
Test Port 1, 2. 3		+30 dBm or ±30 VDC, typ.		
R, A, B, C (Opt. 014)		+15 dBm or ±5 VDC, typ.		
Coupler Thru (Opt. 014)		+33 dBm or ±0 VDC, typ.		
Test Port Noise Floor ^a				
300 kHz to 25 MHz ^b				
10 Hz IF Bandwidth	-115 dBm			
1 kHz IF Bandwidth	-95 dBm			
25 MHz to 3 GHz ^b				
10 Hz IF Bandwidth	-118 dBm			
1 kHz IF Bandwidth	-98 dBm			
3 GHz to 9 GHz				
10 Hz IF Bandwidth	≤ -108 dBm			
1 kHz IF Bandwidth	≤ -88 dBm			
Receiver Noise Floor ^a				
300 kHz to 25 MHz ^c				
10 Hz IF Bandwidth	≤ -130 dBm,			
	characteristic			
1 kHz IF Bandwidth	≤ -110 dBm,			
	characteristic			
25 MHz to 3 GHz ^c				
10 Hz IF Bandwidth	-133 dBm,			
	characteristic			
1 kHz IF Bandwidth	-113 dBm,			
	characteristic			
6 GHz to 9 GHz	1			
10 Hz IF Bandwidth	≤ -123 dBm,			
	characteristic			
1 kHz IF Bandwidth	≤ -103 dBm,			
	characteristic			

Crosstalk		
(S ₂₁ , S ₃₁):		
300 kHz to 1 MHz	<-120 dB	
1 MHz to 25 MHz	<-125 dB	
25 MHz to 3 GHz	<-126 dB	
3 GHz to 6 GHz	<-117 dB	
6 GHz to 9 GHz	<-106 dB	
(S ₁₂ , S ₁₃):		
300 kHz to 1 MHz	<-120 dB	
1 MHz to 25 MHz	<-125 dB	
25 MHz to 3 GHz	<-126 dB	
3 GHz to 6 GHz	<-113 dB	
6 GHz to 9 GHz	<-106 dB	
(S ₂₃ , S ₃₂):		
300 kHz to 1 MHz	<-120 dB	
1 MHz to 3 GHz	<-125 dB	
3 GHz to 6 GHz	<-115 dB	
6 GHz to 9 GHz	<-107 dB	
Maximum Receiver Input Lev	vel (A, B, R, C)	
300 kHz to 6 GHz		6 dBm, typical
6 GHz to 9 GHz		9 dBm, typical
Reference Input Level (R) ^d		
300 kHz to 9 GHz		-10 to -35 dBm, typical
Maximum Coupler Input Lev	el (Opt 014)	
300 kHz to 9 GHz		+33 dBm, typical

^a Total average (RMS) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.

^b May be limited to -90 dBm at particular frequencies below 750 MHz due to spurious receiver residuals.

^c May be limited to -105 dBm at particular frequencies below 750 MHz due to spurious receiver residuals.

^d Input level to maintain phase lock.

Table 12. Test Port Input (Trace Noise)

Specification	Supplemental Information
9	
< 0.002 dB rms	
< 0.005 dB rms	
< 0.010° rms	
< 0.035° rms	
	e < 0.002 dB rms < 0.005 dB rms < 0.010° rms

^a Trace noise is defined as a ratio measurement of a through or a full reflection, with the source set to 0 dBm.

Description	Specification	Supplemental Information		
Reference Level Magni	Reference Level Magnitude			
Range	±200 dB			
Resolution	0.001 dB			
Reference Level Phase	ļ.			
Range	±500°			
Resolution	0.01°			
Stability Magnitude ^a	Stability Magnitude ^a			
300 kHz to 3 GHz		0.02 dB/°C, typical		
3 GHz to 6 GHz		0.04 dB/°C, typical		
6 GHz to 9 GHz		0.06 dB/°C, typical		
Stability Phase ^a				
300 kHz to 3 GHz		0.2°/°C, typical		
3 GHz to 6 GHz		0.3°/°C, typical		
6 GHz to 9 GHz		0.6°/°C, typical		

Table 13. Test Port Input (Reference Level and Stability)

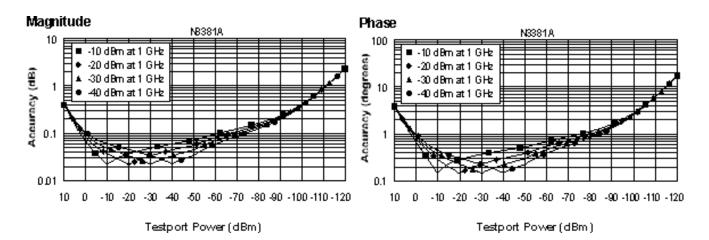
^a Stability is defined as a ratio measurement at the test port.

Table 14. Test Port Input (Dynamic Accuracy specification^a)

Accuracy of the test port input power reading is relative to the reference input power level. Applies to input ports 1 and 2 with the following conditions:

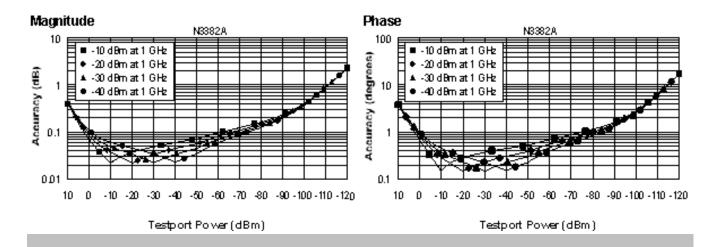
- IF bandwidth = 10 Hz
- Environmental temperature 25° ±5 °C, with < 1 °C deviation from calibration temperature

300 kHz to 3 GHz	300 kHz to 3 GHz



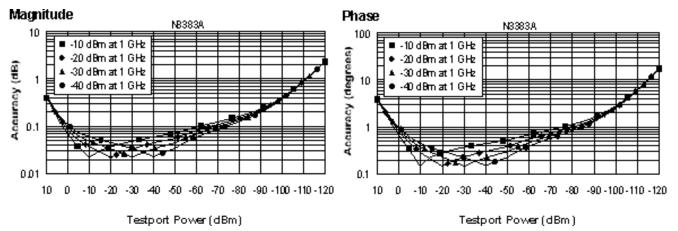
300 kHz to 6 GHz

300 kHz to 6 GHz



300 kHz to 9 GHz

300 kHz to 9 GHz



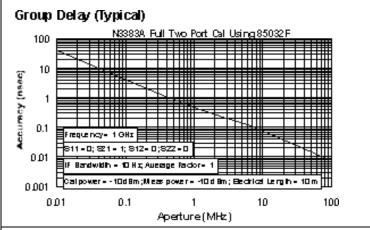
^aDynamic accuracy is verified with the following measurements:

- compression over frequency
- IF linearity at a single frequency of 1.195 GHz and a reference level of -20 dBm

Description	Specification	Supplemental Information
Aperture (selectable)	(frequency span)/(number of points -1)	
Maximum Aperture	20% of frequency span	
Range	0.5 x (1/minimum aperture)	
Maximum Delay		Limited to measuring no more than 180° of phase change within the minimum aperture.)
Accuracy		See graph below. Char.

Table 15. Test Port Input (Group Delay)^a

The following graph shows group delay accuracy with type-N full 2-port calibration and a 10 Hz IF bandwidth. Insertion loss is assumed to be < 2 dB and electrical length to be ten meters.



In general, the following formula can be used to determine the accuracy, in seconds, of specific group delay measurement:

±Phase Accuracy (deg)/[360 × Aperture (Hz)]

Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst case phase accuracy.

^a Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and the number of points per sweep).

General Information

Table 16. System B	andwidths	
Description	Specification	Supplemental Information
IF Bandwidth Set	ttings	
Range		1 Hz to 40 kHz in a 1, 2, 3, 5, 7,10 sequence up to 30 kHz 35 kHz, 40kHz, nominal
Table 17. Front Par	nel Information	
Description	Suppleme	ental Information
RF Connectors		
Туре		male; 50 Ω , nominal
Center Pin Protrus	sion 0.204 to 0.	207 in., characteristic
Probe Power		
Connector		ector, male
Positive Supply		£2%, 400 mA, max, characteristic
Negative Supply	-12.6 VDC	±5%, 300 mA, max, characteristic
Display		
Size		 4 in) diagonal color active matrix LCD; 640) X 480 (vertical) resolution
Refresh Rate Vertical 59.83		.83 Hz; Horizontal 31.41 Hz
Display Range		
Magnitude	±200 dB (a	at 20 dB/div), max
Phase	±180°, ma	X
Polar	10 pUnits,	min
	1000 Units	i, max
Display Resolution	on	
Magnitude	0.001 dB/d	
Phase	0.01°/div, r	nin
Marker Resolution		
Magnitude	0.001 dB, i	min
Phase	0.01°, min	
Polar	0.01 mUnit	t, min; 0.01°,min

Table 18. Rear Panel Informat			
Description	Supplemental Information		
10 MHz Reference In	DNC female		
Connector	BNC, female		
Input Frequency	10 MHz ± 1 ppm, typical		
Input Level	-15 dBm to +20 dBm, typical		
Input Impedance	200 Ω, nom.		
10 MHz Reference Out			
Connector	BNC, female		
Output Frequency	10 MHz ± 10 ppm, typical		
Signal Type	Sine Wave, typical		
Output Level	+10 dBm \pm 4 dB into 50 Ω , typical		
Output Impedance	50 Ω, nominal		
Harmonics	<-40 dBc, typical		
VGA Video Output			
Connector	15-pin mini D-Sub; Drives VGA compatible monitors		
Devices Supported:	Resolutions:		
Flat Panel (TFT)	1024 X 768, 800 X 600, 640 X 480		
Flat Panel (DSTN)	800 X 600, 640 X 480		
CRT Monitor	1280 X 1024, 1024 X 768, 800 X 600, 640 X 480		
	Simultaneous operation of the internal and external		
	displays is allowed, but with 640 X 480 resolution only.		
	If you change resolution, you can only view the external		
	display (internal display will "white out").		
Test Set IO	25-pin D-Sub connector, available for external test set		
	control		
Aux IO	25-pin D-Sub connector, male, analog and digital IO		
Handler IO	36-pin IDC D-ribbon socket connector; all input/output		
signals are default set to negative logic; can be positive logic via GPIB command			
		GPIB 24-pin D-sub (Type D-24), female; compatible wi	
	IEEE-488.		
Parallel Port (LPT1)	25-pin D-Sub connector, female; provides connection to		
	printers or any other parallel port peripherals		
Serial Port (COM 1)	9-pin D-Sub, male; compatible with RS-232		
USB Port	g-pin D-Sub, male, compatible with NS-232		
	Universal Serial Bus jack, Type A configuration (4		
	contacts inline, contact 1 on left); female		
Contact 1	Vcc: 4.75 to 5.25 VDC, 500 mA, maximum		
Contact 2	-Data		
Contact 3	+Data		
Contact 4	Ground		
AN 10/100BaseT Ethernet, 8-pin configuration; auto so			
Line Dewer ^{a, b}	between the two data rates		
Line Power ^{a, b}			
Frequency at 110/115 V	50/60/400 Hz		
Frequency at 230/240 V	50/60Hz		
Maximum Watts	350 W		
A third-wire around is required.			

Table 18. Rear Panel Information

^a A third-wire ground is required.

^b Power supply has a voltage autoswitching feature.

Table 19. Rear Panel Information (continued)

Description	Supplemental Information
External AM Input	
Description	Input provides low-frequency AM modulation to test port output signal, or shifts the test port output. Zero volts input gives the power level set by the instrument, a positive voltage gives a higher level, and a negative voltage gives a lower level.
Connector	BNC, female
Input Sensitivity	8 dB/V, typical
Bandwidth	1 kHz, typical
Input Impedance	1 kΩ, nominal
External Detector In	put
Description	Input from an external, negative polarity diode detector provides ALC for a test port remote from instrument's front panel
Connector	BNC, female
Input Sensitivity	-500 mV yields approximately -3 dBm at detector's input, typical
Bandwidth	50 kHz, typical
Input Impedance	1 kΩ, typical

Description	Suppleme	ental Inform	nation	
General Environmental				
RFI/EMI Susceptibility	Defined by CISPR Pub. 11, Group 1,			
		nd IEC 5008		
ESD		ising static-s		
			tistatic bench	mat
Dust	Minimize f	or optimum	reliability	
Operating Environment	-			
Temperature	0 °C to +4	0°C		
	Instrument	t powers up	, phase locks	, and
			sages within t	
	temperatu		-	
Error-Corrected Temperature Range	25°C ± 5°C			
-		han 1°C de	viation from	
	calibration			
Humidity		5 at +40 °C		
Altitude		m (14,760 ft)	
Non-Operating Storage Environme				
Temperature	-40 °C to +70 °C			
Humidity	0% to 90% at +65 °C (non-condensing)			
Altitude	0 to 15,240 m (50,000 ft.)			
Cabinet Dimensions				
	Height	Width	Depth	
Excluding front and rear panel	222 mm	425 mm	426 mm	
hardware and feet	8.75 in	16.75 in	16.8 in	
As shipped - includes front panel	242 mm	425 mm	470 mm	
connectors, rear panel bumpers, and feet.	9.5 in	16.75 in	18.5 in	
As shipped plus handles	242 mm	458 mm	502 mm	1
	9.5 in	18 in	19.75 in	
As shipped plus rack-mount flanges	242 mm	483 mm	470 mm	1
,, , , , , , , , , , , , , , , , , , , ,	9.5 in	19 in	18.5 in	
As shipped plus handles and flanges	242 mm	483 mm	502 mm	1
	9.5 in	19 in	19.75 in	
Weight				1
Net	24 ka (54	b), nominal]
	J (-			
Shipping		lb), nominal		1

Table 20. Analyzer Environment and Dimensions

Measurement Throughput Summary

Table 21. Typical	Cycle Time [®]	^{i,b} (ms)			
Number of Points					
	101	201	401	1601	
Start 1.8 GHz, S	top 2 GHz	, 35 kHz IF b	andwidth		
Uncorrected,	8	11	17	53	
1-port cal					
2-Port cal	27	36	55	164	
Start 300 kHz, S	top 3 GHz	, 35 kHz IF b	andwidth		
Uncorrected,	48	54	64	104	
1-port cal					
2-Port cal	103	119	145	254	
Start 300 kHz, S	top 9 GHz	, 35 kHz IF b	andwidth		
Uncorrected,	45	55	61	99	
1-port cal					
2-Port cal	99	119	133	212	

a Typical performance.

b Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with

DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S11) measurement. c Option 010 only. Analyzer display turned off with DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S11) measurement.

Table 22. Cycle Time vs. IF Bandwidth^a

Applies to the Preset condition (201 points, correction off) except for the following changes:

- CF = 1 GHz •
- Span = 100 MHz •
- Display off (add 21 ms for display on) ٠

IF	Cycle Time (ms) ^b
Bandwidth	(ms) [♭]
(Hz)	
40,000	8
35,000	9
30,000	11
20,000	13
10,000	28
7000	36
5000	48
3000	72
1000	196
300	620
100	1875
30	8062
10	17877

^a Typical performance. ^b Cycle time includes sweep and retrace time.

Table 23. Cycle Time vs. Number of Points^a

Applies to the Preset condition (35 kHz IF bandwidth, correction off) except for the following changes:

- CF = 1 GHz •
- Span = 100 MHz
- Display off (add 21 ms for display on) •

Number of Points	Cycle Time (ms) ^b
3	4
11	4
51	5
101	6
201	9
401	16
801	29
1601	52

^a Typical performance. ^b Cycle time includes sweep and retrace time.

Table 24. Data Transfer Timea (ms)

	Number of Points			
	51	201	401	1601
SCPI over GPIB				
(program executed on	externa	l PC) ^b		
32-bit floating point	3	7	12	43
64-bit floating point	4	12	22	84
ASCII	7	64	124	489
SCPI over 100 Mbit/s I	AN			
(program executed on	externa	l PC) ^b		
32-bit floating point	1	1	1	1
64-bit floating point	1	1	1	2
ASCII	5	15	26	96
SCPI (program execut	ed in the	e analyzer)	d	
32-bit floating point	1	1	2	3
64-bit floating point	1	2	2	4
ASCII	8	29	56	222
COM (program execut	ed in the	e analyzer)	e	
32-bit floating point	1	1	1	1
Variant type	1	1	2	6
DCOM over 100 Mbit/s LAN				
(program executed on	externa	l PC) ^f		
32-bit floating point ^g	1	1	1	2
Variant type ⁿ	1	3	6	19

^a Typical performance of unit with 500 MHz Pentium III processor.

^b Measured using a VEE 5.0 program running on a 600 MHz HP Kayak, National InstrumentsTM GPIB card. Transferred complex S11 data , using "CALC:DATA?SDATA". ⁶ Measured using a VEE 5.0 program running on a 600 MHz HP Kayak. Transferred complex S11 data,

using "CALC:DATA?SDATA". Speed dependent on LAN traffic, if connected to network. ^d Measured using a VEE 5.0 program running inside PNA Series Analyzer. Transferred complex S11 data, using "CALC:DATA?SDATA".

^e Measured using a Visual Basic 6.0 program running inside PNA Series Analyzer. Transferred complex S11 data.

^f Measured using a Visual Basic 6.0 program running on a 600 MHz HP Kayak. Transferred complex S11 data. Speed dependent on LAN traffic, if connected to network.

^g Used IArray Transfer.getComplex method for 32-bit floating point.

^h Used meas.getData method for Variant data type.

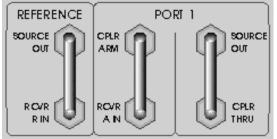
Table 25. Recall and Sweep Speed^a

Operations	Number of	Number of	Recall
	Window(s)	Trace(s)	Time (ms)
Recall	1	1	49
Recall and Sweep	1	1	59
Recall	1	2	82
Recall and Sweep	1	2	96
Recall	1	4	159
Recall and Sweep	1	4	203
Recall	2	2	93
Recall and Sweep	2	2	115
Recall	3	4	158
Recall and Sweep	3	4	218
Recall	4	4	187
Recall and Sweep	4	4	247
Recall	4	8	340
Recall and Sweep	4	8	507

^aCF=177MHz, Span=200 MHz, 201 points, 35 kHz IF BW

Specifications: Front-Panel Jumpers Models N3381A, N3382A, N3383A Option 014

Specifications: Front-Panel Jumpers, Port 1



Option 014 Analyzer

NOTE: The standard analyzer (N3381A/ N3382A/ N3383A) has no front-panel jumpers.

Use these SMA (female) connectors to develop custom measurements.

Receiver A Direct-Access Jumper

- The "Cplr Arm" connector comes from the coupled arm of the Port 1 coupler.
- The "Rcvr A In" connector goes directly to the input of receiver "A."

For the A Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)

-6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)

-11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Noise Floor; rms (10 Hz Bandwidth):

<-130 dBm (300 kHz to 25 MHz) <-123 dBm (3 GHz to 6 GHz) <-123 dBm (6 GHz to 9 GHz)

Damage Level: +15 dBm

Maximum DC Level: +/-5 V

Return Loss:

>17 dB (300 kHz to 3 GHz) >12 dB (3 GHz to 6 GHz) >7 dB (6 GHz to 9 GHz)

Reference Channel R Jumper

- The "Source Out" connector comes from the source Reference output.
- The "Rcvr R In" connector goes directly to the R receiver input.

For the R Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)
-6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)
-11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Damage Level: >+15 dBm

Minimum Level to Maintain Phase-Lock:

-35 dBm (300 kHz to 3 GHz) -25 dBm (3 GHz to 9 GHz)

For the Reference Output: (with an External Input to Lock the Source)

Output Level:

-5 to -30 dBm (300 kHz to 6 GHz) -10 to -35 dBm (6 GHz to 9 GHz)

Source Match Return Loss:

16 dB (300 kHz to 3 GHz) 14 dB (3 GHz to 9 GHz)

Damage Level: >+15 dBm

Maximum DC Level: 40V

Port 1 Test-Port Jumper

- The upper "Source Out" connector comes from the transfer switch Port 1 output.
- The lower "Coupler Thru" connector goes directly to the main input of Port 1 coupler. This is where a power amplifier can be inserted to boost the test port power.

For the Source Output:

Output Level:

+12 to -83 dBm (300 kHz to 6 GHz) +7 to -88 dBm (6 GHz to 9 GHz)

Source Match: 15 dB at 9 GHz

For the Input to the Coupler:

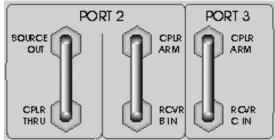
Insertion Loss to Test Port 1:

<3.5 dB at 3 GHz <5 dB at 9 GHz

Maximum Input Power: 2 Watts, CW

Damage Level: 4 Watts, CW

Specifications: Front-Panel Jumpers, Port 2 and Port 3



Option 014 Analyzer

NOTE: The standard analyzer (N3381A/ N3382A/ N3383A) has no front-panel jumpers.

Use these SMA (female) connectors to develop custom measurements.

Receiver B Direct-Access Jumper

- The upper "Cplr Arm" connector comes from the coupled arm of the Port 2 coupler.
- The "Rcvr B In" connector goes directly to the input of receiver "B."

For the B Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz)
-6 dBm; <0.8 dB Compression (3 GHz to 6 GHz)
-11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Noise Floor; rms (10 Hz Bandwidth):

<-130 dBm (300 kHz to 25 MHz) <-123 dBm (3 GHz to 6 GHz) <-123 dBm (6 GHz to 9 GHz)

Damage Level: +15 dBm

Maximum DC Level: +/-5 V

Return Loss:

>17 dB (300 kHz to 3 GHz) >12 dB (3 GHz to 6 GHz) >7 dB (6 GHz to 9 GHz)

Port 2 Test-Port Jumper

- The upper "Source Out" connector comes from the transfer switch Port 2 output.
- The lower "Coupler Thru" connector goes directly to the main input of Port 2 coupler. This is where a power amplifier can be inserted to boost the test port power.

For the Source Output:

Output Level:

+10 to -85 dBm (300 kHz to 6 GHz)

+7 to -88 dBm (6 GHz to 9 GHz)

Source Match: 15 dB at 9 GHz

For the Input to the Coupler:

Insertion Loss to Test Port 2:

<3.5 dB at 3 GHz <5 dB at 9 GHz

Maximum Input Power: 2 Watts, CW

Damage Level: 4 Watts, CW

Receiver C Direct-Access Jumper

- The upper "Cplr Arm" connector comes from the coupled arm of the Port 3 coupler.
- The "Rcvr C In" connector goes directly to the input of receiver "C."

For the C Receiver Input:

Maximum Input Level:

-6 dBm; <0.4 dB Compression (300 kHz to 3 GHz) -6 dBm; <0.8 dB Compression (3 GHz to 6 GHz) -11 dBm; <0.8 dB Compression (6 GHz to 9 GHz)

Noise Floor; rms (10 Hz Bandwidth):

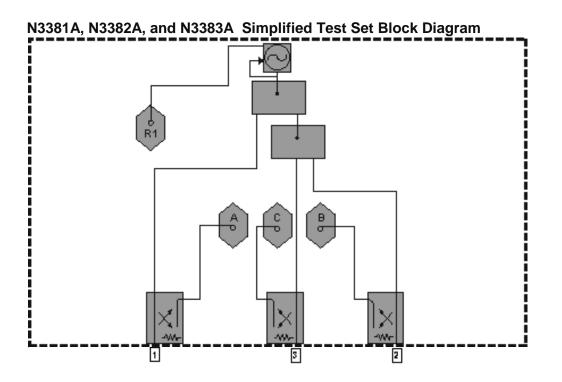
<-130 dBm (300 kHz to 25 MHz) <-123 dBm (6 GHz to 9 GHz)

Damage Level: +15 dBm

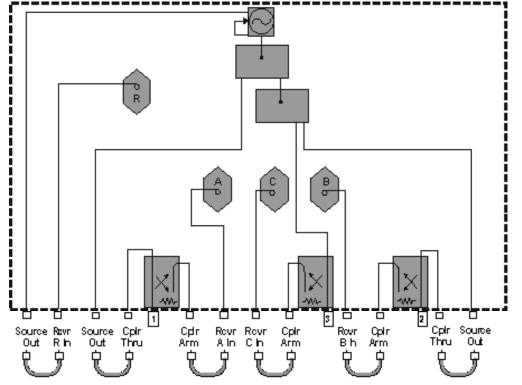
Maximum DC Level: +/-5 V

Return Loss:

>17 dB (300 kHz to 3 GHz) >12 dB (3 GHz to 6 GHz) >7 dB (6 GHz to 9 GHz)



N3381A, N3382A, and N3383A with Option 014 Simplified Test Set Block Diagram



4 Technical Specifications for the E836xA

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This is a complete list of the E8362A, E8363A, and E8364A network analyzer technical specifications.

- To optimize viewing of uncertainty curves, click the Maximize button.
- To view or print the PNA Series Data Sheet (a condensed version of the specifications), visit our web site at http://www.agilent.com/find/pna, select your analyzer model, and click on the link for the data sheet.
- The uncertainty curves contained in this document apply only to the setup conditions listed. Please
 download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator
 to generate the
 curves for your PNA setup. View the equations
 used to generate the uncertainty curves.

See Specs for other PNA models

Definitions

All specifications and characteristics apply over a 25 $^{\circ}$ C ±5 $^{\circ}$ C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable) errors.

Corrected (residual): Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Corrected System Performance

The specifications in this section apply for measurements made with the E836xA analyzer with the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data
- Isolation calibration with an averaging factor of 8

Table 1. System Dynamic Range^a Specification Description Typical (dB) at Direct (dB) at Test Port^b Receiver Access Input^c Dynamic Range (in a 10 Hz BW) Standard Configuration and Standard Power Range (E836xA - Standard) 45 MHz to 500 MHz^d 94 NA 119 500 MHz to 2 GHz NA 122 2 GHz to 10 GHz NA 10 GHz to 20 GHz 123 NA 20 GHz to 30 GHz 114 NA 30 GHz to 40 GHz 110 NA 40 GHz to 45 GHz 109 NA 104 45 GHz to 50 GHz NA Extended Configuration and Standard Power Range (E836xA - Option 014) 45 MHz to 500 MHz^d 94 132 138 500 MHz to 2 GHz 119 122 137 2 GHz to 10 GHz 10 GHz to 20 GHz 122 137 20 GHz to 30 GHz 115 127 30 GHz to 40 GHz 107 119 40 GHz to 45 GHz 105 116 45 GHz to 50 GHz 100 111 Standard Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL) 45 MHz to 500 MHz^d 92 NA 500 MHz to 2 GHz 117 NA 2 GHz to 10 GHz 120 NA 121 10 GHz to 20 GHz NA 20 GHz to 30 GHz 112 NA 30 GHz to 40 GHz NA 108 40 GHz to 45 GHz 105 NA 45 GHz to 50 GHz 99 NA

Standard Configuration and Extended Power Range & Blas-rees					
(E836xA - Option UNL&014)					
45 MHz to 500 MHz ^d	92	130			
500 MHz to 2 GHz	117	136			
2 GHz to 10 GHz	120	135			
10 GHz to 20 GHz	119	134			
20 GHz to 30 GHz	109	121			
30 GHz to 40 GHz	105	117			
40 GHz to 45 GHz	101	112			
45 GHz to 50 GHz	95	108			

Standard Configuration and Extended Power Range & Bias-Tees

^a The system dynamic range is calculated as the difference between the noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.

I

The test port system dynamic range is calculated as the difference between the test port noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.

The direct receiver access input system dynamic range is calculated as the difference between the receiver access input noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its damage level. When the analyzer is in segment sweep mode, the analyzer can have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with high insertion loss), and reduced power when receiver damage may occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

^d May be degraded by 10 dB at particular frequencies (multiples of 5 MHz) below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

Description		Typical (dB) at Direct Receiver
	at Test Port ^b	Access Input ^c
Dynamic Range (in a 10	Hz BW)	
Standard Configuration	and Standard Power Rai	nge (E836xA - Standard)
OR		
Standard Configuration	and Extended Power Ra	nge & Bias Tees (E836xA - Option
UNL)		
-	94	NA
UNL)	94 119	NA NA
UNL) 45 MHz to 500 MHz ^d		
UNL) 45 MHz to 500 MHz ^d 500 MHz to 2 GHz	119	NA
UNL) 45 MHz to 500 MHz ^d 500 MHz to 2 GHz 2 GHz to 10 GHz	119 122	NA NA
UNL) 45 MHz to 500 MHz ^d 500 MHz to 2 GHz 2 GHz to 10 GHz 10 GHz to 20 GHz	119 122 125	NA NA NA

OR

Extended Configuration and Extended Power Range & Bias Tees (E836xA - Option UNL&014)

94	132	
119	138	
122	137	
124	139	
113	125	
110	122	
109	120	
	119 122 124 113 110	119 138 122 137 124 139 113 125 110 122

^a The receiver dynamic range is calculated as the difference between the noise floor and the receiver maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.

The test port receiver dynamic range is calculated as the difference between the test port noise floor and the receiver maximum input level. The effective dynamic range must take measurement uncertainties and interfering signals into account.

^c The direct receiver access input receiver dynamic range is calculated as the difference between the direct receiver access input noise floor and the receiver maximum input level. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its damage level. When the analyzer is in segment sweep mode, the analyzer can have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with high insertion loss), and reduced power when receiver damage may occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

^d May be degraded by 10 dB at particular frequencies (multiples of 5 MHz) below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

Note: This E836xA document provides technical specifications for the following calibration kits only: 85056A, 85056D, 85056K, 85052B, 85052C, 85052D, 85050B, 85050C, 85050D, 85054B, 85054D, K11644A, P11644A, R11644A, and the X11644A.

Table 3. 85056A Calibration Kit

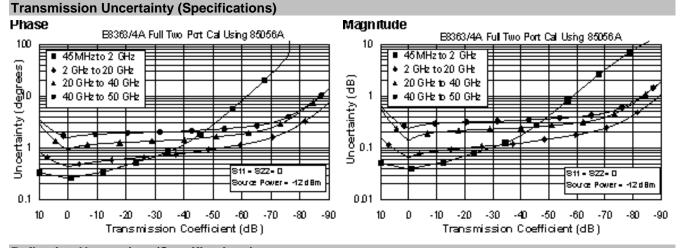
Standard Configuration and Standard Power Range

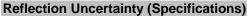
(E8363/4A)

Applies to the E8363/4A analyzers, 85056A (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)						
	0.045 to	2 to	10 to	20 to	40 to		
	2 GHz	10 GHz	20 GHz	40 GHz	50 GHz		
Directivity	42	42	42	38	36		
Source Match	41	38	38	33	31		
Load Match	42	42	42	37	35		
Reflection Tracking	±0.001	±0.008	±0.008	±0.020	±0.027		
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	+0.04/°C		
Transmission Tracking	±0.014	±0.033	±0.039	±0.105	±0.200		
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	+0.04/°C		

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature





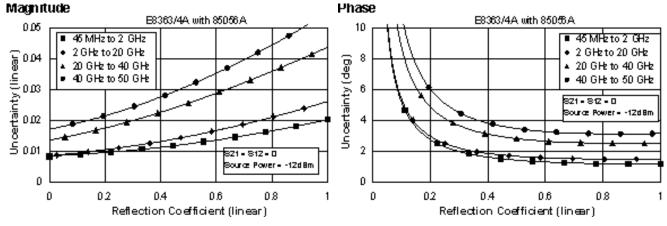


Table 4. 85056A Calibration Kit

Extended Configuration and Standard Power Range (E8363/4A - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E8363/4A - Option UNL) -OR-

Extended Configuration and Extended Power Range & Bias-Tees (E8363/4A - Option UNL&014)

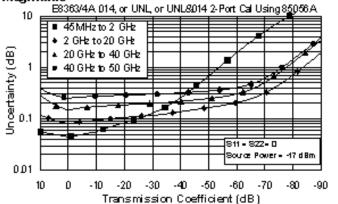
Applies to the, E8363/4A analyzers, 85056A (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)				
	0.045 to	2 to 10 to		20 to	40 to
	2 GHz	10 GHz	20 GHz	40 GHz	50 GHz
Directivity	42	42	42	38	36
Source Match	41	38	38	33	31
Load Match	42	42	42	37	35
Reflection Tracking	±0.001 +0.02/°C	±0.008 +0.02/°C	±0.008 +0.02/°C	±0.020 +0.03/°C	±0.027 +0.04/°C
Transmission Tracking	±0.019	±0.039	±0.053	±0.114	±0.215
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	+0.04/°C

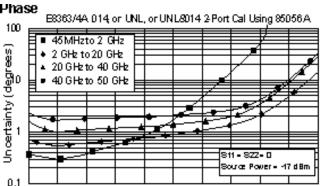
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications)

Magnitude



Phase





Reflection Uncertainty (Specifications)

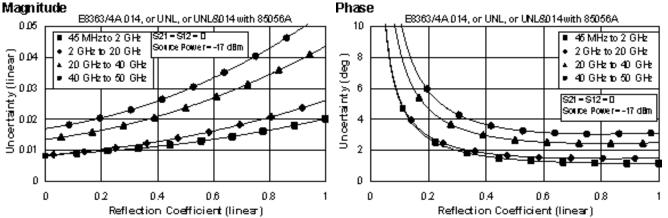


Table 5. 85056D Calibration Kit Standard Configuration and Standard Power Range (E8363/4A)

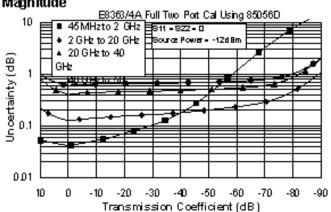
Applies to the, E8363/4A analyzers, 85056D (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

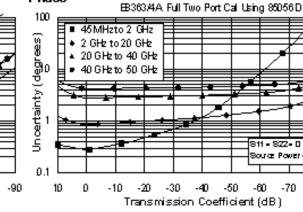
Phase

Description	Specification (dB)				
	0.045 to	2 to	20 to	40 to	
	2 GHz	20 GHz	40 GHz	50 GHz	
Directivity	42	34	34	26	
Source Match	40	30	30	23	
Load Match	42	34	34	25	
Reflection Tracking	±0.002	±0.029	±0.029	±0.075	
	+0.02/°C	+0.02/°C	+0.03/°C	+0.04/°C	
Transmission Tracking	±0.016	±0.081	±0.095	±0.544	
	+0.02/°C	+0.02/°C	+0.03/°C	+0.04/°C	

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications) Magnitude





811 **-** 877 - D Bource Power = -12 d Bm

-70

-80

-90

-60

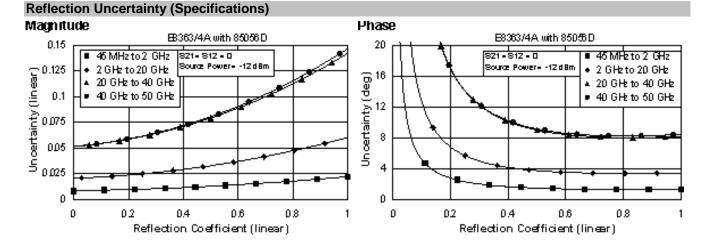


Table 6. 85056D Calibration Kit

Extended Configuration and Standard Power Range (E8363/4A - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E8363/4A - Option UNL) -OR-

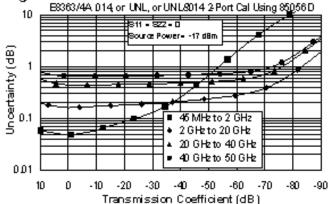
Extended Configuration and Extended Power Range & Bias-Tees (E8363/4A - Option UNL & 014)

Applies to the, E8363/4A analyzers, 85056D (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

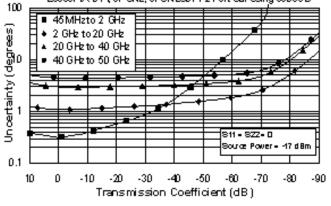
Description	Specification (dB)					
	0.045 to	2 to	20 to	40 to		
	2 GHz	20 GHz	40 GHz	50 GHz		
Directivity	42	34	26	26		
Source Match	40	30	24	23		
Load Match	42	33	25	25		
Reflection Tracking	±0.002	±0.029	±0.079	0.075		
	+0.02/°C	+0.02/°C	+0.03/°C	+0.04/°C		
Transmission Tracking	±0.022	±0.130	±0.384	0.589		
	+0.02/°C	+0.02/°C	+0.03/°C	+0.04/°C		

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications) Magnitude



Phase E8363/4A 014 or UNL, or UNL8014 2 Port Cal Using 85056 D



Reflection Uncertainty (Specifications)

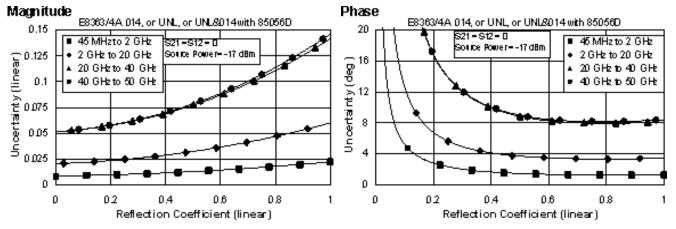


Table 7. 85056K Calibration KitStandard Configuration and Standard Power Range

(E8363/4A)

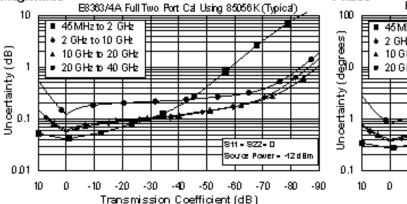
Applies to the, E8363/4A analyzers, 85056K (2.92mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Phase

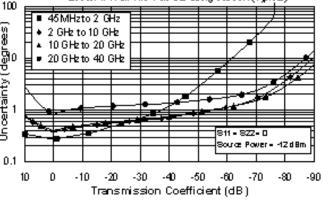
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

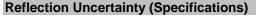
Description	Specification (dB)				
	0.045 to 2 to		10 to	20 to	
	2 GHz	10 GHz	20 GHz	40 GHz	
Directivity	42	42	42	40	
Source Match	40	40	40	35	
Load Match	42	42	42	38	
Reflection Tracking	±0.018	±0.018	±0.018	±0.067	
	+0.02/°C	+0.02/°C	+0.03/°C	+0.04/°C	
Transmission Tracking	±0.016	±0.028	±0.033	±0.089	
	+0.02/°C	+0.02/°C	+0.03/°C	+0.04/°C	

Transmission Uncertainty (Specifications) Magnitude









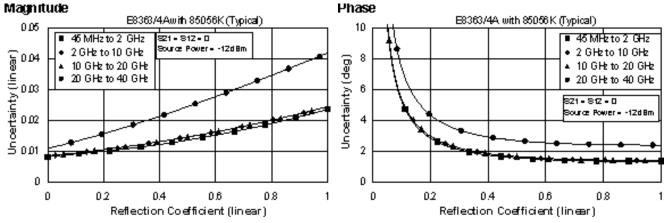


Table 8. 85056K Calibration Kit

Extended Configuration and Standard Power Range (E8363/4A - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E8363/4A - Option UNL) -OR-

Extended Configuration and Extended Power Range & Bias-Tees (E8363/4A - Option UNL&014)

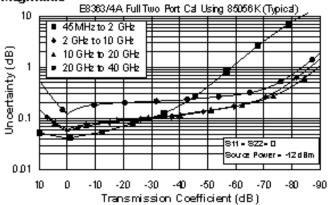
Applies to the, E8363/4A analyzers, 85056K (2.92mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	on Specification (dB)					
	0.045 to	2 to	10 to	20 to		
	2 GHz	10 GHz	20 GHz	40 GHz		
Directivity	42	42	42	40		
Source Match	40	40	40	35		
Load Match	42	42	41	38		
Reflection Tracking	±0.018	±0.018	±0.018	±0.067		
	+0.02/°C	+0.02/°C	+0.03/°C	+0.04/°C		
Transmission Tracking	±0.021	±0.033	±0.046	±0.098		
	+0.02/°C	+0.02/°C	+0.03/°C	+0.04/°C		

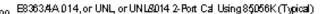
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

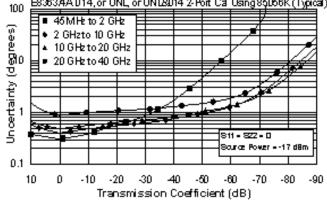
Transmission Uncertainty (Specifications

Magnitude



Phase





Reflection Uncertainty (Specifications)

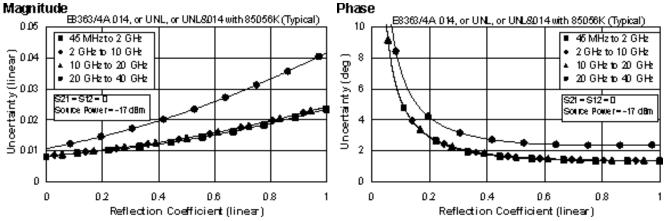


Table 9, 85052B Calibration Kit

Standard Configuration and Standard Power Range

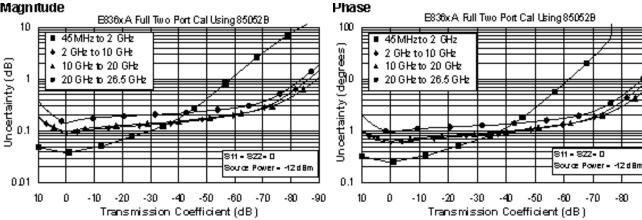
(E836xA)

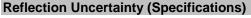
Applies to the, E836xA analyzers, 85052B (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

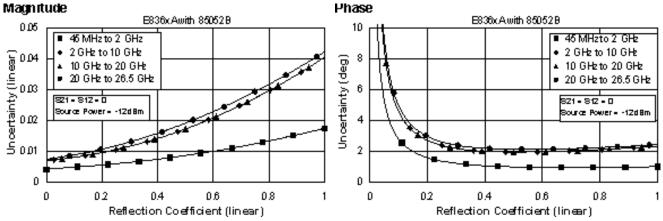
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)				
	0.045 to 2 to		10 to	20 to	
	2 GHz	10 GHz	20 GHz	26.5 GHz	
Directivity	48	44	44	44	
Source Match	40	31	31	31	
Load Match	48	44	44	44	
Reflection Tracking	±0.003	±0.006	±0.006	±0.006	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	
Transmission Tracking	±0.013	±0.057	±0.065	±0.104	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	

Transmission Uncertainty (Specifications) Magnitude







-80

-90

Table 10. 85052B Calibration Kit

Extended Configuration and Standard Power Range (E836xA - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL) -OR-

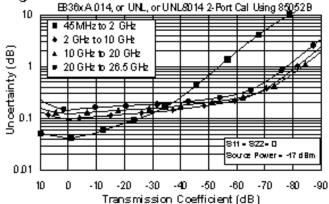
Extended Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL&014)

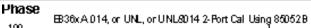
Applies to the, E836xA analyzers, 85052B (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

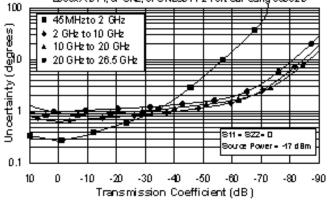
Description	Specification (dB)				
	0.045 to	2 to	10 to	20 to	
	2 GHz	10 GHz	20 GHz	26.5 GHz	
Directivity	48	44	44	44	
Source Match	40	31	31	31	
Load Match	48	44	44	44	
Reflection Tracking	±0.003	±0.006	±0.006	±0.006	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	
Transmission Tracking	±0.017	±0.065	±0.091	±0.109	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications) Magnitude







Reflection Uncertainty (Specifications)

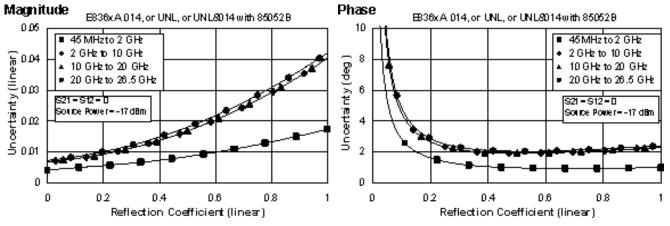


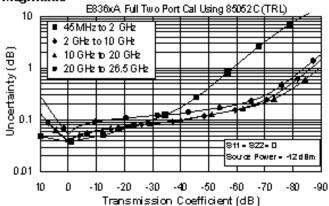
Table 11. 85052C Calibration Kit Standard Configuration and Standard Power Range (E836xA)

Applies to the, E836xA analyzers, 85052C (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specificatio	Specification (dB)				
	0.045 to	2 to	10 to	20 to		
	2 GHz	10 GHz	20 GHz	26.5 GHz		
Directivity	48	50	50	50		
Source Match	40	50	50	50		
Load Match	48	50	50	50		
Reflection Tracking	±0.003	±0.000	±0.000	±0.000		
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C		
Transmission Tracking	±0.013	±0.010	±0.012	±0.018		
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C		

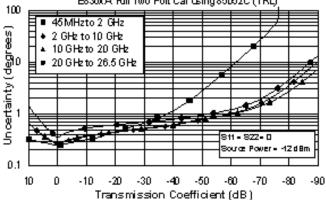
Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications) Magnitude





E836xA Full Two Port Cal Using 85052C (TRL)



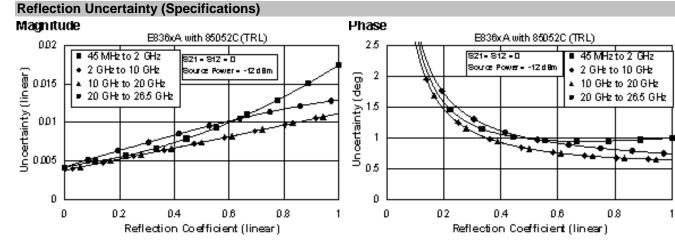


Table 12. 85052C Calibration Kit

Extended Configuration and Standard Power Range (E836xA - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL) -OR-

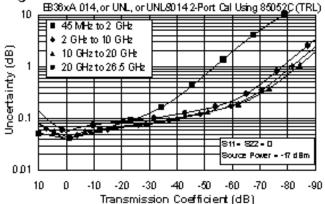
Extended Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL&014)

Applies to the, E836xA analyzers, 85052C (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

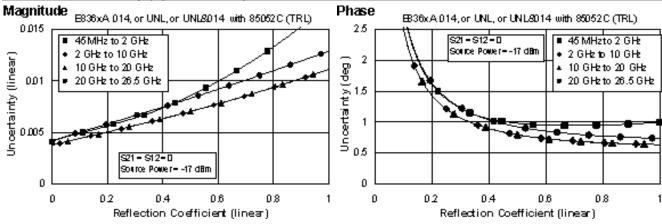
Description	Specification (dB)				
	0.045 to	2 to	10 to	20 to	
	2 GHz	10 GHz	20 GHz	26.5 GHz	
Directivity	48	50	50	50	
Source Match	40	50	50	50	
Load Match	48	50	50	50	
Reflection Tracking	±0.003	±0.000	±0.000	±0.000	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	
Transmission Tracking	±0.017	±0.012	±0.016	±0.021	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications) Magnitude



Reflection Uncertainty (Specifications)



Phase 100 B336xA014, or UNL, or UNL2014 2-Port Cal Using 85052C (TRL)

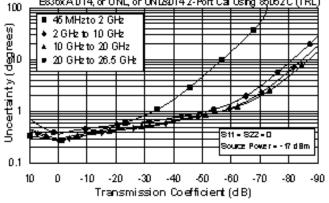
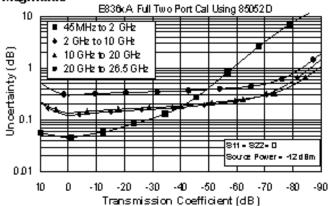


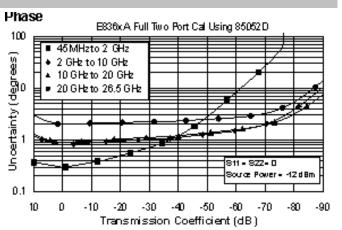
Table 13. 85052D Calibration Kit Standard Configuration and Standard Power Range (E836xA)

Applies to the, E836xA analyzers, 85052D (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specificatio	Specification (dB)				
	0.045 to	2 to	10 to	20 to		
	2 GHz	10 GHz	20 GHz	26.5 GHz		
Directivity	42	36	36	30		
Source Match	37	28	28	25		
Load Match	42	36	36	30		
Reflection Tracking	±0.003	±0.008	±0.008	±0.011		
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C		
Transmission Tracking	±0.020	±0.087	±0.101	±0.250		
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C		

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature







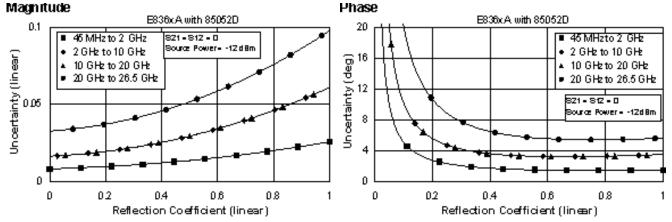


Table 14. 85052D Calibration Kit

Extended Configuration and Standard Power Range (E836xA - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL) -OR-

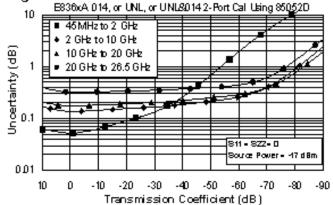
Extended Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL&014)

Applies to the, E836xA analyzers, 85052D (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

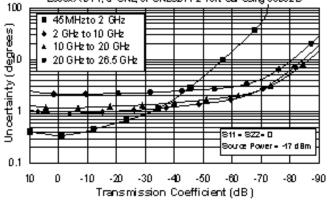
Description	Specification (dB)				
	0.045 to	2 to	10 to	20 to	
	2 GHz	10 GHz	20 GHz	26.5 GHz	
Directivity	42	36	36	30	
Source Match	37	28	28	25	
Load Match	42	36	36	30	
Reflection Tracking	±0.003	±0.008	±0.008	±0.011	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	
Transmission Tracking	±0.026	±0.101	±0.138	±0.272	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

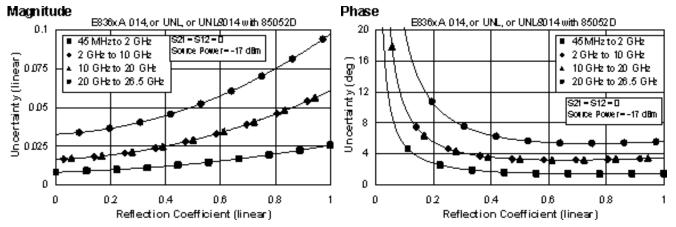
Transmission Uncertainty (Specifications) Magnitude



Phase B336x A 014, or UNL or UNLS014 2-Port Cal Using 85052 D



Reflection Uncertainty (Specifications)



E836xA Corrected System Performance with 7mm Connectors

Table 15. 85050B Calibration Kit Standard Configuration and Standard Power Range (E836xA)

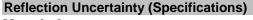
Applies to the, E836xA analyzers, 85050B (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)				
	0.045 to	2 to	10 to		
	2 GHz	10 GHz	18 GHz		
Directivity	52	52	52		
Source Match	48	41	41		
Load Match	52	52	52		
Reflection Tracking	±0.003	±0.047	±0.047		
	+0.02/°C	+0.02/°C	+0.02/°C		
Transmission Tracking	±0.006	±0.019	±0.022		
	+0.02/°C	+0.02/°C	+0.02/°C		

Transmission Uncertainty (Specifications) Magnitude

Phase E836xA Full Two Port Cal Using 85050B E836x A Full Two Port Cal Using 85050 B 100 100 45 MHz to 2 GHz 45 MHzto 2 GHz 2 GHz to 10 GHz Uncertainty (degrees) ٠ 2 GHz to 10 GHz ٠ Uncertainty (dB) 10 10 10 10 GHz to 18 GHz 10 GHz to 18 GHz . ٠ -811 **-** 822 -311 -877 - D Source Power = -12 d Bm Source Power--12 d Bm 0.01 0.1 -90 -60 10 D - 10 -20 -30 -40 -50 -60 -70 -80 10 ٥ -10 -20 -30 -40 -50 -70 -80 -90 Transmission Coefficient (dB) Transmission Coefficient (dB)



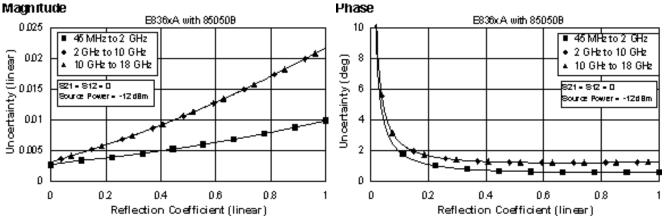


Table 16. 85050B Calibration Kit

Extended Configuration and Standard Power Range (E836xA - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL) -OR-

Extended Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL&014)

Applies to the, E836xA analyzers, 85050B (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

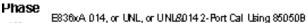
Description	Specification (dB)				
	0.045 to	2 to	10 to		
	2 GHz	10 GHz	18 GHz		
Directivity	52	52	52		
Source Match	48	41	41		
Load Match	52	52	47		
Reflection Tracking	±0.003	±0.047	±0.047		
	+0.02/°C	+0.02/°C	+0.02/°C		
Transmission Tracking	±0.008	±0.022	±0.034		
	+0.02/°C	+0.02/°C	+0.02/°C		

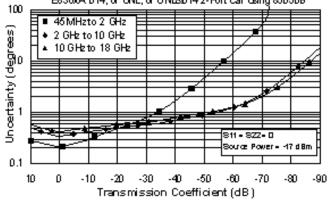
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications)

Magnitude E836xA 014,or UNL or UNLS014 2-Port Cal Using 85050B 100 45 MHzto 2 GHz 2 GHz to 10 GHz 10 GHz to 18 GHz 10 GHz to 18 GHz 0 0.1

0.1 -20 -30 -40 -50 -60 -70 -80 -90 10 Transmission Coefficient (dB)





Reflection Uncertainty (Specifications)

0.01

10

D

-10

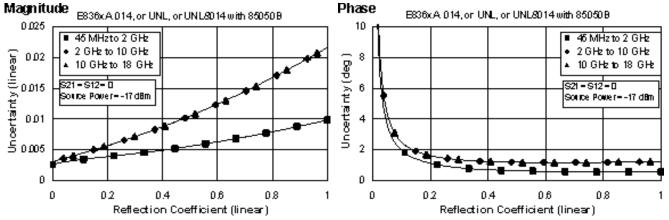


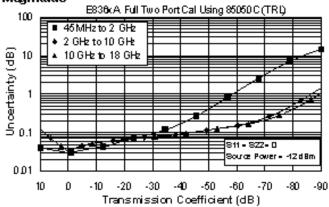
Table 17. 85050C Calibration Kit Standard Configuration and Standard Power Range (E836xA)

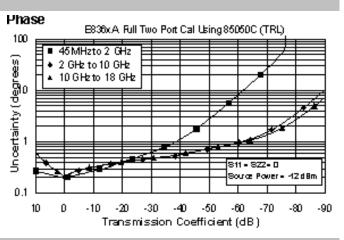
Applies to the, E836xA analyzers, 85050C (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)				
	0.045 to	2 to	10 to		
	2 GHz	10 GHz	18 GHz		
Directivity	52	60	60		
Source Match	48	60	60		
Load Match	52	60	60		
Reflection Tracking	±0.003	±0.000	±0.000		
	+0.02/°C	+0.02/°C	+0.02/°C		
Transmission Tracking	±0.006	±0.003	±0.004		
	+0.02/°C	+0.02/°C	+0.02/°C		

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications) Magnitude





Reflection Uncertainty (Specifications)

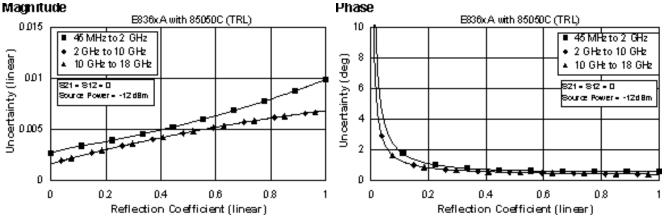


Table 18. 85050C Calibration Kit

Extended Configuration and Standard Power Range (E836xA - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL) -OR-

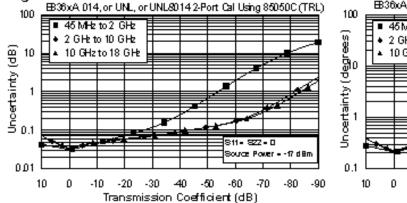
Extended Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL&014)

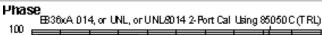
Applies to the, E836xA analyzers, 85050C (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

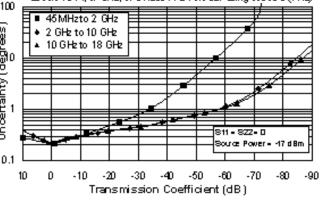
Description	Specification	Specification (dB)				
	0.045 to	2 to	10 to			
	2 GHz	10 GHz	18 GHz			
Directivity	52	60	60			
Source Match	48	60	60			
Load Match	52	60	60			
Reflection Tracking	±0.003	±0.000	±0.000			
	+0.02/°C	+0.02/°C	+0.02/°C			
Transmission Tracking	±0.008	±0.004	±0.005			
	+0.02/°C	+0.02/°C	+0.02/°C			

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications) Magnitude







Reflection Uncertainty (Specifications)

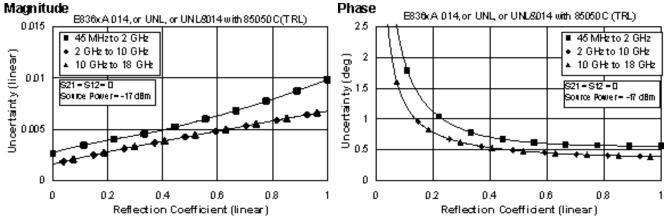
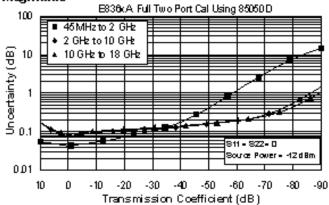


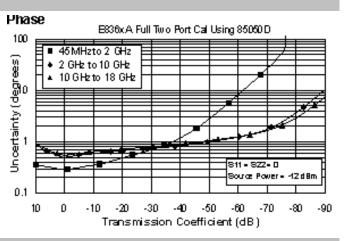
Table 19. 85050D Calibration Kit Standard Configuration and Standard Power Range (E836xA)

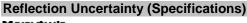
Applies to the, E836xA analyzers, 85050D (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)			
	0.045 to	2 to	10 to	
	2 GHz	10 GHz	18 GHz	
Directivity	40	40	40	
Source Match	39	35	35	
Load Match	40	40	40	
Reflection Tracking	±0.010	±0.100	±0.100	
	+0.02/°C	+0.02/°C	+0.02/°C	
Transmission Tracking	±0.018	±0.044	±0.052	
	+0.02/°C	+0.02/°C	+0.02/°C	

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature







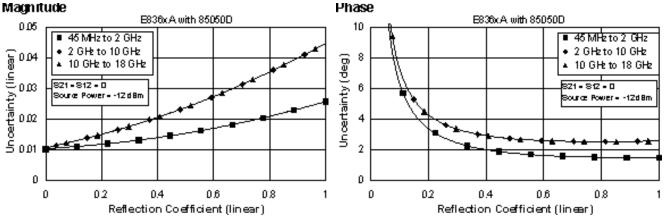


Table 20. 85050D Calibration Kit

Extended Configuration and Standard Power Range (E836xA - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL) -OR-

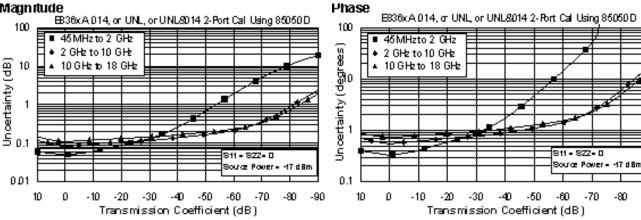
Extended Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL&014)

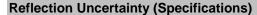
Applies to the, E836xA analyzers, 85050D (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

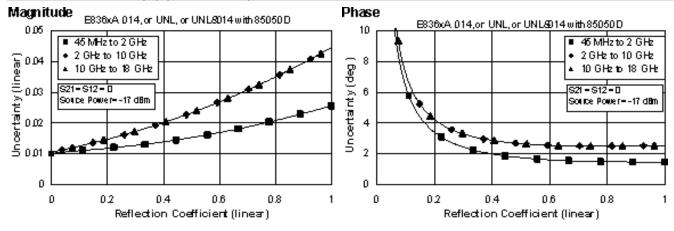
Description	Specification (dB)				
	0.045 to	2 to	10 to		
	2 GHz	10 GHz	18 GHz		
Directivity	40	40	40		
Source Match	39	35	35		
Load Match	40	40	37		
Reflection Tracking	±0.010	±0.100	±0.100		
	+0.02/°C	+0.02/°C	+0.02/°C		
Transmission Tracking	±0.025	±0.052	±0.078		
	+0.02/°C	+0.02/°C	+0.02/°C		

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications) Magnitude







-80

-90

Table 21. 85054B Calibration Kit

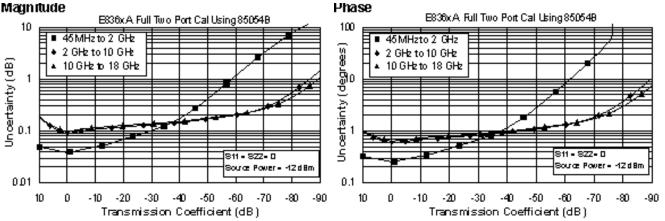
Standard Configuration and Standard Power Range

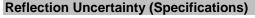
(E836xA)

Applies to the, E836xA analyzers, 85054B (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification	Specification (dB)				
	0.045 to	2 to	10 to			
	2 GHz	10 GHz	18 GHz			
Directivity	48	42	42			
Source Match	45	33	33			
Load Match	48	42	42			
Reflection Tracking	±0.007	±0.096	±0.096			
	+0.02/°C	+0.02/°C	+0.02/°C			
Transmission Tracking	±0.009	±0.052	±0.060			
	+0.02/°C	+0.02/°C	+0.02/°C			





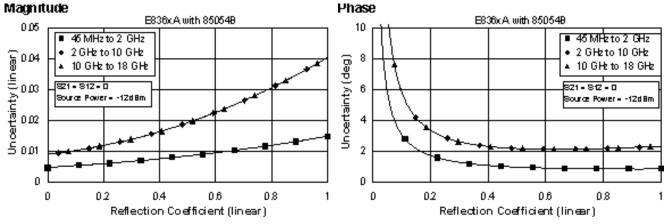


Table 22. 85054B Calibration Kit

Extended Configuration and Standard Power Range (E836xA - Option 014) -OR-

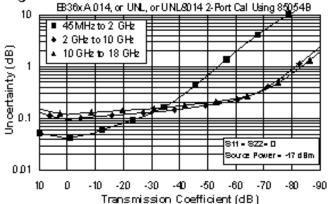
Standard Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL) -OR-

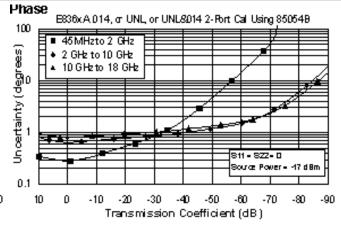
Extended Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL&014)

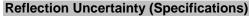
Applies to the, E836xA analyzers, 85054B (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)		
	0.045 to	2 to	10 to
	2 GHz	10 GHz	18 GHz
Directivity	48	42	42
Source Match	45	33	33
Load Match	48	42	41
Reflection Tracking	±0.007	±0.096	±0.096
	+0.02/°C	+0.02/°C	+0.02/°C
Transmission Tracking	±0.011	±0.060	±0.083
	+0.02/°C	+0.02/°C	+0.02/°C

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature







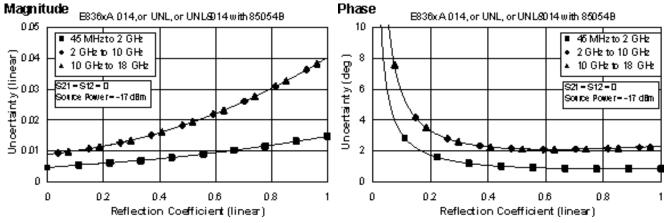


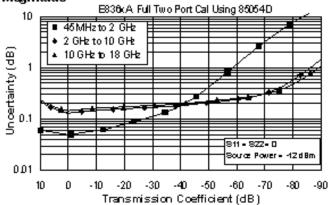
Table 23. 85054D Calibration Kit Standard Configuration and Standard Power Range (E836xA)

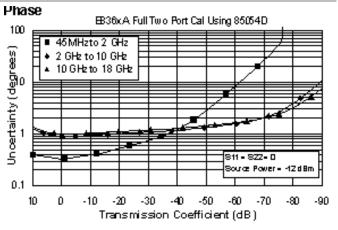
Applies to the, E836xA analyzers, 85054D (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

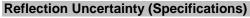
Description	Specification (dB)		
	0.045 to	2 to	10 to
	2 GHz	10 GHz	18 GHz
Directivity	40	34	34
Source Match	39	29	29
Load Match	40	34	34
Reflection Tracking	±0.003	±0.027	±0.027
	+0.02/°C	+0.02/°C	+0.02/°C
Transmission Tracking	±0.019	±0.091	±0.105
	+0.02/°C	+0.02/°C	+0.02/°C

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature









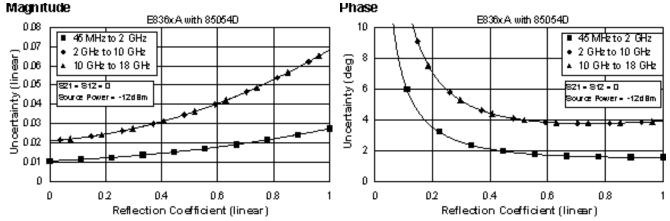


Table 24. 85054D Calibration Kit

Extended Configuration and Standard Power Range (E836xA - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL) -OR-

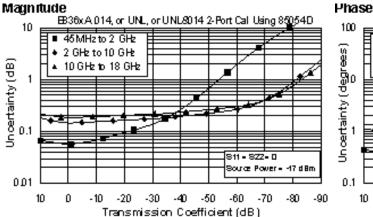
Extended Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL&014)

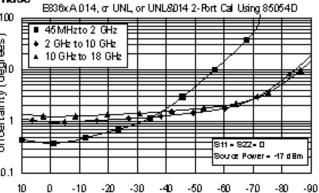
Applies to the, E836xA analyzers, 85054D (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

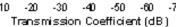
Description	Specification (dB)		
	0.045 to	2 to	10 to
	2 GHz	10 GHz	18 GHz
Directivity	40	34	34
Source Match	39	29	29
Load Match	40	34	34
Reflection Tracking	±0.003	±0.027	±0.027
	+0.02/°C	+0.02/°C	+0.02/°C
Transmission Tracking	±0.025	±0.105	±0.145
	+0.02/°C	+0.02/°C	+0.02/°C

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

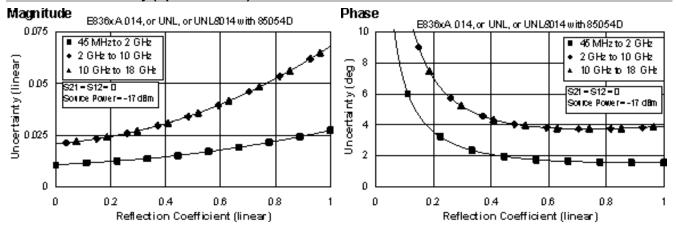
Transmission Uncertainty (Specifications) Magnitude







Reflection Uncertainty (Specifications)



E8363/4A Corrected System Performance with WR-28 Connectors

Table 25. R11644A Calibration Kit

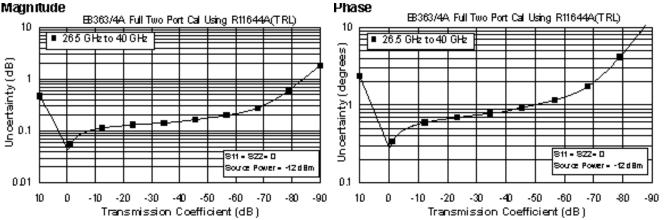
Standard Configuration and Standard Power Range

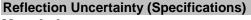
(E8363/4A)

Applies to the, E8363/4A analyzers, R11644A (WR-28) calibration kit, 85133F flexible test port cable set with the R281A and R281B launch sets with the R281A and R281B launch sets, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Specification (dB)	
26.5 to	
40 GHz	
50	
50	
50	
±0.000	
+0.03/°C	
±0.018	
+0.03/°C	





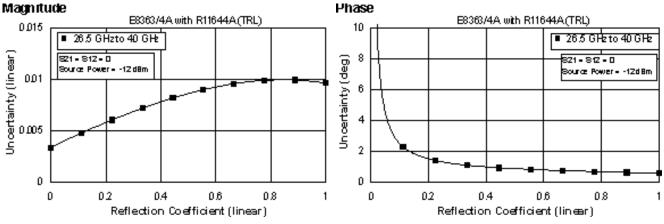


Table 26. R11644A Calibration Kit

Extended Configuration and Standard Power Range (E8363/4A - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E8363/4A - Option UNL) -OR-

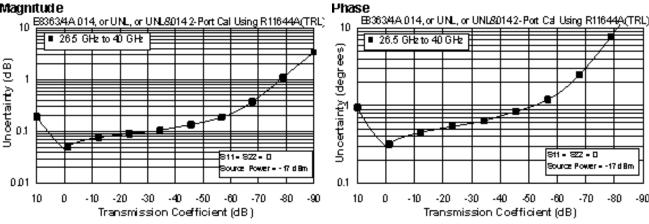
Extended Configuration and Extended Power Range & Bias-Tees (E8363/4A - Option UNL&014)

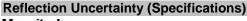
Applies to the, E8363/4A analyzers, R11644A (WR-28) calibration kit, 85133F flexible test port cable set with the R281A and R281B launch sets with the R281A and R281B launch sets, and a full 2-port calibration. Also applies to the following condition:

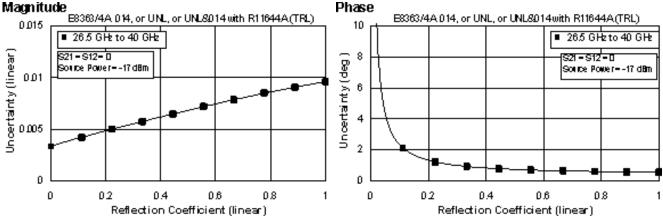
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)	
	26.5 to	
	40 GHz	
Directivity	50	
Source Match	50	
Load Match	50	
Reflection Tracking	±0.000	
	+0.03/°C	
Transmission Tracking	±0.021	
	+0.03/°C	

Transmission Uncertainty (Specifications) Magnitudie







-80

-90

E8363/4A Corrected System Performance with WR-42 Connectors

Table 27. K11644A Calibration Kit

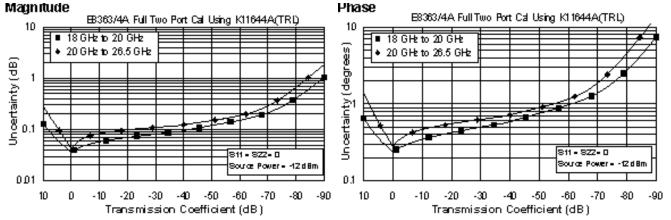
Standard Configuration and Standard Power Range

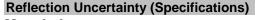
(E8363/4A)

Applies to the, E8363/4A analyzers, K11644A (WR-42) calibration kit, 85134F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)	Specification (dB)		
	18 to	20 to		
	20 GHz	26.5 GHz		
Directivity	50	50		
Source Match	50	50		
Load Match	50	50		
Reflection Tracking	±0.000	±0.000		
	+0.02/°C	+0.02/°C		
Transmission Tracking	±0.010	±0.012		
	+0.02/°C	+0.02/°C		





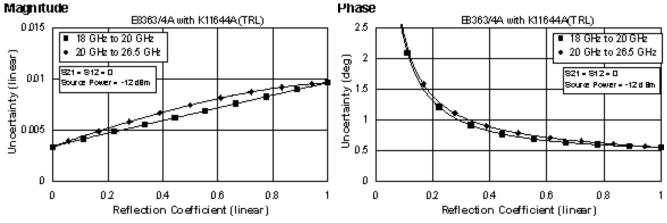


Table 28. K11644A Calibration Kit

Extended Configuration and Standard Power Range (E8363/4A - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E8363/4A - Option UNL) -OR-

Extended Configuration and Extended Power Range & Bias-Tees (E8363/4A - Option UNL&014)

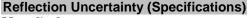
Applies to the, E8363/4A analyzers, K11644A (WR-42) calibration kit, 85134F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

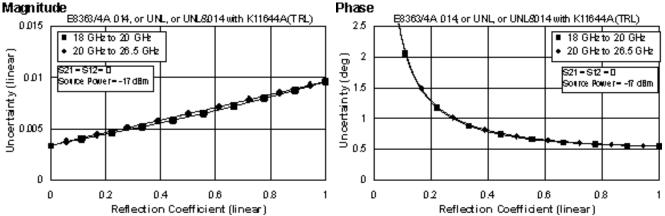
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)		
	18 to	20 to	
	20 GHz	26.5 GHz	
Directivity	50	50	
Source Match	50	50	
Load Match	50	50	
Reflection Tracking	±0.000	±0.000	
	+0.02/°C	+0.02/°C	
Transmission Tracking	±0.016	±0.021	
	+0.02/°C	+0.02/°C	

Transmission Uncertainty (Specifications)

Magnitudie Phase E83634A 014, or UNL or UNL8014 2-Port Cal Using K11644A(TRL) EB363.4A.014, or UNL, or UNL80142-Port Cal Using K11644 10 18 GHz to 20 GHz 18 GHzto 20 GHz Uncertainty (degrees) 20 GHz to 26.5 GHz 20 GHzto 26.5 GH₂ Uncertainty (dB) 1 0.1 811 -872 • 0 811 - 877 - 0 Source Power = -17 d Bm Bource Power = - 17 d Bm 0.01 0.1 -20 -80 10 Û - 10 -20 -30 -40 -50 -60 -70 -80 -90 10 D -10 -30 -40 -50 -60 -70 -90 Transmission Coefficient (dB) Transmission Coefficient (dB)





E836xA Corrected System Performance with WR-62 Connectors

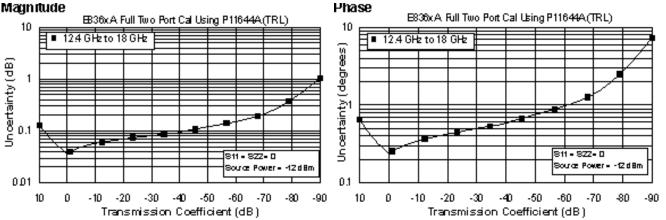
Table 29. P11644A Calibration Kit Standard Configuration and Standard Power Range

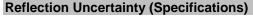
(E836xA)

Applies to the, E836xA analyzers, R11644A (WR-62) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)
	12.4 to
	18 GHz
Directivity	50
Source Match	50
Load Match	50
Reflection Tracking	±0.000
	+0.02/°C
Transmission Tracking	±0.012
	+0.02/°C





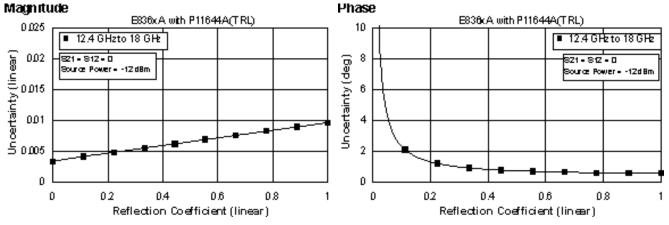


Table 30. P11644A Calibration Kit

Extended Configuration and Standard Power Range (E836xA - Option 014) -OR-

Standard Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL) -OR-

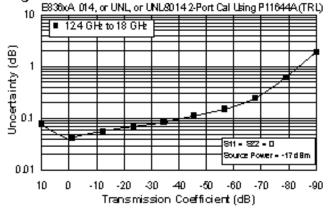
Extended Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL&014)

Applies to the, E836xA analyzers, P11644A (WR-62) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

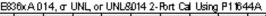
Description	Specification (dB)	
	12.4 to	
	18 GHz	
Directivity	50	
Source Match	50	
Load Match	50	
Reflection Tracking	±0.000	
	+0.02/°C	
Transmission Tracking	±0.016	
	+0.02/°C	

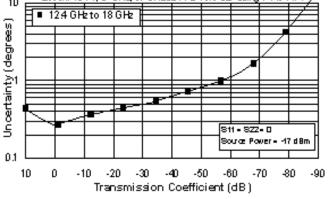
Transmission Uncertainty (Specifications) Magnitude

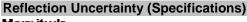


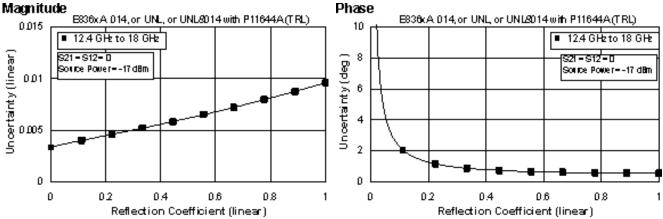


Phase









E836xA Corrected System Performance with WR-90 Connectors

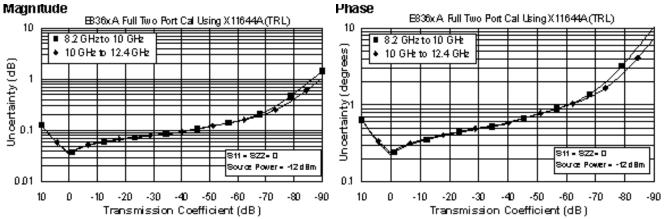
Table 31. X11644A Calibration Kit Standard Configuration and Standard Power Range

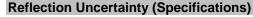
(E836xA)

Applies to the, E836xA analyzers, X11644A (WR-90) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)	
	8.2 to	10 to
	10 GHz	12.4 GHz
Directivity	50	50
Source Match	50	50
Load Match	50	50
Reflection Tracking	±0.000	±0.000
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.010	±0.012
	+0.02/°C	+0.02/°C





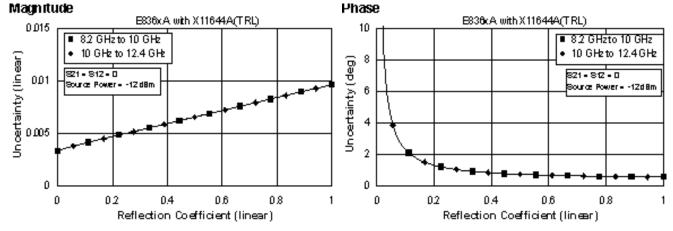


Table 32. X11644A Calibration Kit

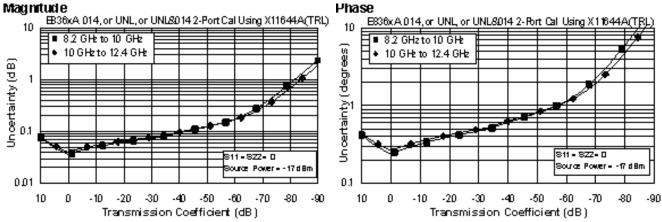
Extended Configuration and Standard Power Range (E836xA - Option 014) -OR-Standard Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL) -OR-

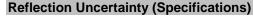
Extended Configuration and Extended Power Range & Bias-Tees (E836xA - Option UNL&014)

Applies to the, E836xA analyzers, X11644A (WR-90) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)		
	8.2 to	10 to	
	10 GHz	12.4 GHz	
Directivity	50	50	
Source Match	50	50	
Load Match	50	50	
Reflection Tracking	±0.000	±0.000	
	+0.02/°C	+0.02/°C	
Transmission Tracking	±0.012	±0.016	
	+0.02/°C	+0.02/°C	





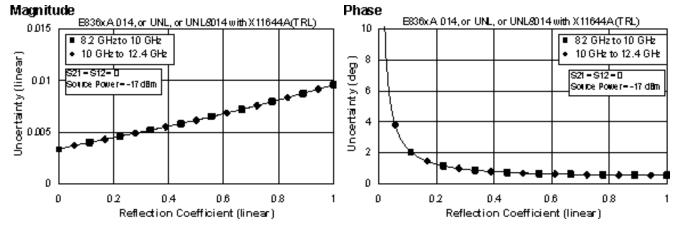


Table 33. Uncorrected System Performance

Specifications apply over environmental temperature of 23° ±3 °C, with < 1 °C deviation from the calibration temperature

Description	Specification	Supplemental Information
Directivity		
		Typical:
45 MHz to 2 GHz	24 dB	29 dB
2 GHz to 10 GHz	22 dB	25 dB
10 GHz to 20 GHz	16 dB	20 dB
20 GHz to 40 GHz	16 dB	20 dB
40 GHz to 45 GHz	15 dB	18 dB
45 GHz to 50 GHz	13 dB	18 dB
Source Match - Stand	lard	
		Typical:
45 MHz to 2 GHz	23 dB	27 dB
2 GHz to 10 GHz	16 dB	19 dB
10 GHz to 20 GHz	14 dB	19 dB
20 GHz to 40 GHz	10 dB	14 dB
40 GHz to 45 GHz	9 dB	13.5 dB
45 GHz to 50 GHz	5.5 dB	9 dB
Source Match - Opt L		
		Typical:
45 MHz to 2 GHz	18 dB	22.5 dB
2 GHz to 10 GHz	14 dB	18 dB
10 GHz to 20 GHz	12 dB	15 dB
20 GHz to 40 GHz	8 dB	10 dB
40 GHz to 45 GHz	7 dB	10 dB
45 GHz to 50 GHz	4 dB	6.5 dB
Load Match - Standar		0.0 00
		Typical:
45 MHz to 2 GHz	23 dB	29 dB
2 GHz to 10 GHz	14 dB	16 dB
10 GHz to 20 GHz	10 dB	12 dB
20 GHz to 40 GHz	9 dB	12 dB
40 GHz to 45 GHz	9 dB	13 dB
45 GHz to 50 GHz	7 dB	10 dB
Load Match - Opt UN		10 08
Load Match - Opt ON		Typical:
45 MHz to 2 GHz	17 dB	21.5 dB
	13 dB	16.5 dB
2 GHz to 10 GHz 10 GHz to 20 GHz	10 dB	13 dB
20 GHz to 40 GHz		
	9 dB	11 dB
40 GHz to 45 GHz	8 dB	11 dB
45 GHz to 50 GHz	6 dB	8 dB
Reflection Tracking		Trainel
		Typical:
45 MHz to 20 GHz		±1.5
20 GHz to 40 GHz		±1.5
40 GHz to 50 GHz		±2.0

Transmission Tracking ^a				
		Typical:		
45 MHz to 2 GHz		±2.5 dB		
2 GHz to 10 GHz		±2.0 dB		
10 GHz to 20 GHz		±3.0 dB		
20 GHz to 40 GHz		±4.5 dB		
40 GHz to 45 GHz		±6.0 dB		
45 GHz to 50 GHz		±6.0 dB		
Crosstalk - Standard				
45 MHz to 1 GHz	-85 dB			
1 GHz to 2 GHz	-100 dB			
2 GHz to 20 GHz	-110 dB			
20 GHz to 40 GHz	-108 dB			
40 GHz to 45 GHz	-105 dB			
45 GHz to 50 GHz	-100 dB			
Crosstalk - Option UNL of	or 014			
45 MHz to 1 GHz	-85 dB			
1 GHz to 2 GHz	-100 dB			
2 GHz to 20 GHz	-109 dB			
20 GHz to 40 GHz	-106 dB			
40 GHz to 45 GHz	-103 dB			
45 GHz to 50 GHz	-98 dB			
Crosstalk - Option UNL8	014			
45 MHz to 1 GHz	-85 dB			
1 GHz to 2 GHz	-98 dB			
2 GHz to 10 GHz	-108 dB			
10 GHz to 20 GHz	-107 dB			
20 GHz to 40 GHz	-104 dB			
40 GHz to 45 GHz	-100 dB			
45 GHz to 50 GHz	-95 dB			

^a Measurement conditions: normalized to a thru, measured with two shorts, 10 Hz IF bandwidth, averaging factor of 8, alternate mode, source power set to the lesser of the maximum power out or the maximum receiver power.

Table 34. Test Port Output^a

	Specification				Supplemental
	Specificatio	חע			Supplemental
Frequency		0.1011	0		
	Standard	Opt 014	Opt UNL	Opt UNL&014	
E8362A	45 MHz to 2				
E8363A	45 MHz to 4				
E8364A	45 MHz to 5	0 GHz			
Nominal Po					
	-12 dBm	-17 dBm	-17 dBm	-17 dBm	
Frequency					
	1 Hz				
CW Accura	cy				
	+/-1 ppm				
Frequency	Stability				
					+/-1 ppm 0° to 40° C, typical +/-0.2 ppm/yr, typical
Power Leve	Accuracy				
45 MHz to 10 GHz	+/-1.5 dB	+/-1.5 dB	+/-1.5 dB	+/-1.5 dB	Variation from nominal power in range 0 (step
10 GHz to 20 GHz	+/-2.0 dB	+/-2.0 dB	+/-2.0 dB	+/-2.0 dB	attenuator at 0 dB)
20 GHz to 40 GHz	+/-3.0 dB	+/-3.0 dB	+/-3.0 dB	+/-3.0 dB	
40 GHz to 45 GHz	+/-3.0 dB	+/-3.5 dB	+/-3.0 dB	+/-3.5 dB	
45 GHz to 50 GHz	+/-3.0 dB	+/-4.0 dB	+/-3.0 dB	+/-4.0 dB	
Power Leve	Linearity				
45 MHz to 20 GHz	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB ^c	+/-1.0 dB ^c	Test reference is at the nominal power level (step
20 GHz to 40 GHz	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB ^c	+/-1.0 dB ^c	attenuator at 0 dB)
40 GHz to 50 GHz	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	
Power Rang	ge⁴				
45 MHz to	-25 to	-25 to	-87 to	-87 to	
10 GHz	+5 dBm	+5 dBm	+3 dBm	+3 dBm	
10 GHz to	-24 to	-25 to	-86 to	-87 to	
20 GHz	+3 dBm	+2 dBm	+1 dBm	0 dBm	
20 GHz to	-23 to	-25 to	-85 to	-87 to	
30 GHz	0 dBm	-2 dBm	-2 dBm	-4 dBm	
30 GHz to	-23 to	-25 to	-85 to	-87 to	
40 GHz	-4 dBm	-6 dBm	-6 dBm	-8 dBm	
40 GHz to	-25 to	-27 to	-87 to	-87 to	
45 GHz	-5 dBm	-7 dBm	-9 dBm	-11 dBm	
45 GHz to	-25 to	-27 to	-87 to	-87 to	
50 GHz	-10 dBm	-12 dBm	-15 dBm	-17 dBm	

Power Swee	ep Range (<i>I</i>	ALC)			
45 MHz to 10 GHz	30 dB	30 dB	30 dB	30 dB	ALC range starts at maximum leveled output
10 GHz to 20 GHz	27 dB	27 dB	27 dB	27 dB	power and goes down to power level indicated by dB
20 GHz to 30 GHz	23 dB	23 dB	23 dB	23 dB	amount specified
30 GHz to 40 GHz	19 dB	19 dB	19 dB	19 dB	
40 GHz to 45 GHz	20 dB	20 dB	18 dB	16 dB	
45 GHz to 50 GHz	15 dB	15 dB	12 dB	10 dB	
Power Reso	olution				
	0.01 dB				
Phase Nois	е				
10 kHz offse	et from cente	er frequency, n	ominal power a	at test port	
45 MHz to 10 GHz					-70 dBc, typical
10 GHz to					-65 dBc, typical
20 GHz 20 GHz to					-55 dBc, typical
40 GHz 40 GHz to 50 GHz					-55 dBc, typical
Harmonics	(2nd or 3rd)			
	(-23 dBc typical, in power range 0
Non-Harmo	nic Spuriou	us (at Nomina	I Output Powe	er)	
45 MHz to 20 GHz					-50 dBc typical, for offset frequency > 1 kHz
20 GHz to 40 GHz					-30 dBc typical, for offset frequency > 1 kHz
40 GHz to 50 GHz					-30 dBc typical, for offset frequency > 1 kHz

^a Source output performance on Port 1 only. Port 2 output performance is a characteristic.

^b Preset power.

^c 1.5 dB for power <= -23 dBm.

^d Power to which the source can be set and phase lock is assured.

Table 35: Test Po					1
Description	Specification				Supplemental
	Standard	Opt 014	Opt UNL	Opt UNL&014	
Test Port Noise					
10 Hz IF Bandw					
45 MHz to	<-89 dBm	<-89 dBm	<-89 dBm	<-89 dBm	
500 MHz ²					
500 MHz to 2 GHz	<-114 dBm	<-114 dBm	<-114 dBm	<-114 dBm	
2 GHz to	<-117 dBm	<-117 dBm	<-117 dBm	<-117 dBm	
10 GHz					
10 GHz to	<-120 dBm	<-119 dBm	<-120 dBm	<-119 dBm	
20 GHz					
20 GHz to	<-120 dBm	<-113 dBm	<-114 dBm	<-113 dBm	
40 GHz					
40 GHz to	<-114 dBm	<-112 dBm	<-114 dBm	<-112 dBm	
50 GHz					
1 Hz IF Bandwi	dth				
45 MHz to	<-69 dBm	<-69 dBm	<-69 dBm	<-69 dBm	
500 MHz ²					
500 MHz to	<-94 dBm	<-94 dBm	<-94 dBm	<-94 dBm	
2 GHz					
2 GHz to	<-97 dBm	<-97 dBm	<-97 dBm	<-97 dBm	
10 GHz					
10 GHz to	<-100 dBm	<-99 dBm	<-100 dBm	<-99 dBm	
20 GHz					
20 GHz to	<-94 dBm	<-93 dBm	<-94 dBm	<-93 dBm	
40 GHz					
	<-94 dBm	<-92 dBm	<-94 dBm	<-92 dBm	
40 GHz to 50 GHz					
Direct Receive	r Access Input	Noise Floor ¹			
10 Hz IF Bandw					
45 MHz to 500 MHz ²		<-127 dBm		<-127 dBm	
500 MHz to 2		<-133 dBm		<-133 dBm	
GHz					
2 GHz to		<-132 dBm		<-132 dBm	
10 GHz					
10 GHz to 20		<-134 dBm		<-134 dBm	
GHz					
20 GHz to 40		<-125 dBm		<-125 dBm	
GHz		, 100 dD			
40 GHz to 50 GHz		<-123 dBm		<-123 dBm	
	1				1

1 Hz IF Bandw	vidth					
45 MHz to		<-107 dBm	<-107 dBm			
500 MHz						
500 MHz to 2		<-113 dBm	<-113 dBm			
GHz						
2 GHz to		<-112 dBm	<-112 dBm			
10 GHz						
10 GHz to		<-114 dBm	<-114 dBm			
20 GHz						
20 GHz to		<-105 dBm	<-105 dBm			
40 GHz						
40 GHz to		<-103 dBm	<-103 dBm			
50 GHz						
Receiver Com	pression Level					
45 MHz to	<0.6 dB comp	ression at +5 dBm				
20 GHz						
20 GHz to	<0.6 dB comp	ression at 0 dBm				
30 GHz						
30 GHz to	<0.6 dB comp	ression at-3 dBm				
40 GHz						
40 GHz to	<0.6 dB comp	ression at -3 dBm				
50 GHz						
System Comp	ression Level					
	maximum outp	out power		See <u>dynamic</u> accuracy table		
Trace Noise M						
	<pre></pre>	surement, nominal powe	r at test port.			
45 MHz to		>				
500 MHz	<0.006 dB rms	<0.006 dB rms				
500 MHz to	<0.000 dB mia					
20 GHz	<0.006 dB rms					
20 GHz to	<0.000 dB mis					
40 GHz	<0.006 dB rms					
40 GHz to	<0.000 ub mia	>				
50 GHz Trace Noise P	hasa					
		surement, nominal powe	r at test port			
45 MHz to	<0.100° rms	aremon, norminar powe				
500 MHz ³						
500 MHz to	<0.060° rms					
20 GHz						
20 GHz to	<0.100° rms					
40 GHz						
	<0.100° rms					
	<0.100° rms					
40 GHz to 50 GHz	<0.100° rms					

Reference Lev		
Range	+/-200 dB	
Resolution	0.001 dB	
Reference Lev		
Range	+/-500°	
Resolution	0.01°	
Stability Magn		
	easurement, made at the test port.	+/-0.02 dB/°C
45 MHz to		+/-0.02 db/ C
20 GHz		
20 GHz to		+/-0.03 dB/°C
40 GHz		
40 GHz to		+/-0.04 dB/°C
50 GHz		
Stability Phase	9 ⁴	
Typical ratio me	easurement, measured at the test port.	
45 MHz to		+/-0.2°/°C
20 GHz		
20 GHz to		+/-0.5°/°C
40 GHz		
40 GHz to		+/-0.8°/°C
50 GHz		
Damage Input	Level	
Test Port 1		+20 dBm or
and 2		+/-40 VDC,
		typical
R1, R2 in		+15 dBm or
		+/-15 VDC,
		typical
A, B in	+ + +	+15 dBm or
		+/-15 VDC,
		typical
Coupler Thru	+ + +	+30 dBm or
•		+/-40 VDC,
		typical
Coupler Arm		+30 dBm or
		+30 dBin of +/-7 VDC,
		typical
		μιγρισαι

¹Total average (rms) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.

²Noise floor may be degraded by 10 dB at particular frequencies (multiples of 5 MHz) due to spurious receiver residuals.

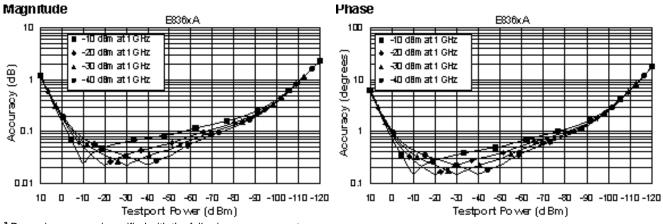
³Trace noise magnitude may be degraded to 20 mdB rms at harmonic frequencies of the first IF (8.33 MHz) below 80 MHz.

⁴Stability is defined as a ratio measurement made at the test port.

Table 36. Dynamic Accuracy (Specification^a)

Accuracy of the test port input power reading is relative to the reference input power level. Applies to input ports 1 and 2 with the following conditions:

- IF bandwidth = 10 Hz
- Test port powers = > -50 dBm and < 0 dBm



^a Dynamic accuracy is verified with the following measurements:

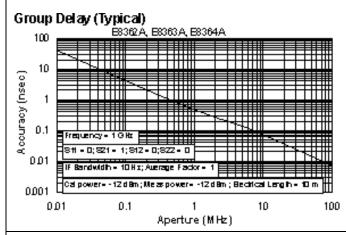
• compression over frequency

• IF linearity at a single frequency of 1.195 GHz and a reference level of -20 dBm

Description	Specification	Supplemental Information
Aperture (selectable)	(frequency span)/(number of points - 1)	
Maximum Aperture	20% of frequency span	
Range	0.5 x (1/minimum aperture)	
Maximum Delay		Limited to measuring no more than 180° of phase change within the minimum aperture.)
Accuracy		See graph below. Char.

Table 37. Test Port Input (Group Delay)^a

The following graph shows characteristic group delay accuracy with full 2-port calibration and a 10 Hz IF bandwidth. Insertion loss is assumed to be < 2 dB and electrical length to be ten meters.



In general, the following formula can be used to determine the accuracy, in seconds, of specific group delay measurement:

±Phase Accuracy (deg)/[360 × Aperture (Hz)]

Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst case phase accuracy.

^a Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and the number of points per sweep).

General Information

Table 38. Miscellaneous Information

Description	Specification	Supplemental Information
System IF Bandwidth Range		1 Hz to 40 kHz, nominal
CPU		Intel® 500 MHz Pentium® III

Description	nformation
Description	Supplemental Information
RF Connectors	
E8362A	
	3.5 mm (male), 50 ohm, (nominal)
Center Pin Recession	0.002 in. (characteristic)
E8363/4A	
Туре	2.4 mm (male), 50 ohm, (nominal)
Center Pin Recession	0.002 in. (characteristic)
Display	
Size	21.3 cm (8.4 in) diagonal color active matrix LCD; 640 (horizontal) X 480
	(vertical) resolution; 59.83 Hz vertical refresh rate; 31.41 Hz horizontal
Dafaab Data	refresh rate
Refresh Rate	Vertical 59.83 Hz; Horizontal 31.41 Hz
Display Range	
Magnitude	±200 dB (at 20 dB/div), max
Phase	±180°, max
Polar	10 pUnits, min
Diambars Data batta	1000 Units, max
Display Resolution	
Magnitude	0.001 dB/div, min
Phase	0.01°/div, min
Marker Resolution	
Magnitude	0.001 dB, min
Phase	0.01°, min
Polar	0.01 mUnit, min; 0.01°,min
Table 40. Rear Panel In	
Description	Supplemental Information
10 MHz Reference In	
Connector	BNC, female
Input Frequency	10 MHz ± 10 ppm, typical
Input Level	-15 dBm to +20 dBm, typical
Input Impedance	200 Ω, nom.
Input Impedance 10 MHz Reference Ou	
10 MHz Reference O	ut
10 MHz Reference Ou Connector	ut BNC, female
10 MHz Reference O Connector Output Frequency	ut BNC, female 10 MHz ± 1 ppm, typical
10 MHz Reference O Connector Output Frequency Signal Type	ut BNC, female 10 MHz ± 1 ppm, typical Sine Wave, typical +10 dBm ± 4 dB into 50 Ω, typical
10 MHz Reference Ou Connector Output Frequency Signal Type Output Level Output Impedance	ut BNC, female 10 MHz \pm 1 ppm, typical Sine Wave, typical +10 dBm \pm 4 dB into 50 Ω , typical 50 Ω , nominal
10 MHz Reference O Connector Output Frequency Signal Type Output Level	ut BNC, female 10 MHz ± 1 ppm, typical Sine Wave, typical +10 dBm ± 4 dB into 50 Ω, typical
10 MHz Reference Ou Connector Output Frequency Signal Type Output Level Output Impedance Harmonics	ut BNC, female 10 MHz \pm 1 ppm, typical Sine Wave, typical +10 dBm \pm 4 dB into 50 Ω , typical 50 Ω , nominal <-40 dBc, typical
10 MHz Reference Or Connector Output Frequency Signal Type Output Level Output Impedance Harmonics VGA Video Output Connector	ut BNC, female 10 MHz \pm 1 ppm, typical Sine Wave, typical +10 dBm \pm 4 dB into 50 Ω , typical 50 Ω , nominal
10 MHz Reference Ou Connector Output Frequency Signal Type Output Level Output Impedance Harmonics VGA Video Output	ut BNC, female 10 MHz ± 1 ppm, typical Sine Wave, typical +10 dBm ± 4 dB into 50 Ω, typical 50 Ω, nominal <-40 dBc, typical 15-pin mini D-Sub; Drives VGA compatible monitors
10 MHz Reference Ou Connector Output Frequency Signal Type Output Level Output Impedance Harmonics VGA Video Output Connector Devices Supported:	ut BNC, female 10 MHz ± 1 ppm, typical Sine Wave, typical +10 dBm ± 4 dB into 50 Ω, typical 50 Ω, nominal <-40 dBc, typical 15-pin mini D-Sub; Drives VGA compatible monitors Resolutions:
10 MHz Reference Ou Connector Output Frequency Signal Type Output Level Output Impedance Harmonics VGA Video Output Connector Devices Supported: Flat Panel (TFT)	ut BNC, female 10 MHz ± 1 ppm, typical Sine Wave, typical +10 dBm ± 4 dB into 50 Ω, typical 50 Ω, nominal <-40 dBc, typical
10 MHz Reference Ou Connector Output Frequency Signal Type Output Level Output Impedance Harmonics VGA Video Output Connector Devices Supported: Flat Panel (TFT) Flat Panel (DSTN)	ut BNC, female 10 MHz ± 1 ppm, typical Sine Wave, typical +10 dBm ± 4 dB into 50 Ω, typical 50 Ω, nominal <-40 dBc, typical
10 MHz Reference Ou Connector Output Frequency Signal Type Output Level Output Impedance Harmonics VGA Video Output Connector Devices Supported: Flat Panel (TFT)	ut BNC, female 10 MHz ± 1 ppm, typical Sine Wave, typical +10 dBm ± 4 dB into 50 Ω, typical 50 Ω, nominal <-40 dBc, typical
10 MHz Reference Ou Connector Output Frequency Signal Type Output Level Output Impedance Harmonics VGA Video Output Connector Devices Supported: Flat Panel (TFT) Flat Panel (DSTN)	utBNC, female10 MHz \pm 1 ppm, typicalSine Wave, typical \pm 10 dBm \pm 4 dB into 50 Ω , typical50 Ω , nominal<-40 dBc, typical
10 MHz Reference Ou Connector Output Frequency Signal Type Output Level Output Impedance Harmonics VGA Video Output Connector Devices Supported: Flat Panel (TFT) Flat Panel (DSTN)	utBNC, female10 MHz \pm 1 ppm, typicalSine Wave, typical \pm 10 dBm \pm 4 dB into 50 Ω , typical50 Ω , nominal<-40 dBc, typical
10 MHz Reference Ou Connector Output Frequency Signal Type Output Level Output Impedance Harmonics VGA Video Output Connector Devices Supported: Flat Panel (TFT) Flat Panel (DSTN)	utBNC, female10 MHz \pm 1 ppm, typicalSine Wave, typical \pm 10 dBm \pm 4 dB into 50 Ω , typical50 Ω , nominal<-40 dBc, typical

Aux IO	
	25-pin D-Sub connector, male, analog and digital IO
Handler IO	
	36-pin parallel I/O port; all input/output signals are default set to negative logic; can be reset to positive logic via GPIB command
GPIB	
	24-pin D-sub (Type D-24), female; compatible with IEEE-488.
Parallel Port (LPT1)	
	25-pin D-Sub miniature connector, female; provides connection to printers or any other parallel port peripherals
Serial Port (COM 1)	
	9-pin D-Sub, male; compatible with RS-232
USB Port	
	Universal Serial Bus jack, Type A configuration (4 contacts inline, contact 1 on left); female
Contact 1	Vcc: 4.75 to 5.25 VDC, 500 mA, maximum
Contact 2	-Data
Contact 3	+Data
Contact 4	Ground
LAN	
	10/100BaseT Ethernet, 8-pin configuration; auto selects between the two data rates
Line Power ^a	
Frequency	48 Hz to 66 Hz
Voltage at 115 V Setting	90 to 132 VAC; 120 VAC, nominal
Voltage at 220 V Setting	198 to 264 VAC; 240 VAC, nominal
VA Max	600 VA maximum
^a A third-wire ground is requi	

^a A third-wire ground is required.

Table 41. Analyzer Environme	Supplemental Informat	ion	1		
Description General Environmental					
RFI/EMI Susceptibility	Defined by CISPR Pub	11, Group 1, Class A, and	IEC 50082-1		
ESD		e work procedures and an			
Dust	Minimize for optimum re		antistatic bench mat		
	iminimize for optimum re	liability			
Operating Environment					
Temperature	0 °C to +40 °C				
	Instrument powers up, phase locks, and displays no error messages				
	within this temperature range (except for "source unleveled" error				
	message that may occur at temperature extremes when power				
	approaches limits of ALC	Crange).			
Error-Corrected	23°C ± 3°C				
Temperature Range		tion from calibration temp.			
Humidity	5% to 95% at +40 °C				
Altitude	0 to 4500 m (14,760 ft.)				
Non-Operating Storage Er	nvironment				
Temperature	-40 °C to +70 °C				
Humidity	0% to 90% at +65 °C (no	on-condensing)			
Altitude	0 to 15,240 m (50,000 ft.				
Cabinet Dimensions		/			
	Height	Width	Depth		
Excluding front and rear	267 mm	425 mm	426 mm		
panel hardware and feet	10.5 in	16.75 in	16.8 in		
As shipped - includes front	305 mm	425 mm	470 mm		
panel connectors, rear	12.0 in	16.75 in	18.5 in		
panel bumpers, and feet.					
As shipped plus handles	305 mm	458 mm	502 mm		
	12.0 in	18 in	19.75 in		
As shipped plus rack-	305 mm	483 mm	470 mm		
mount flanges	12.0 in	19 in	18.5 in		
As shipped plus handles	305 mm	483 mm	502 mm		
and flanges	12.0 in	19 in	19.75 in		
Weight	·				
Net					
E8362A	28.6 kg (63.5 lb), nominal				
20002/1					
E8363/4A	29 kg (64 lb), nominal				
E8363/4A	29 kg (64 lb), nominal				
	29 kg (64 lb), nominal 35.8 kg (79.5 lb), nominal				

Table 41. Analyzer Environment and Dimensions

Table 42. Typical Cycle Time ⁴³ (ms) for Measurement Comple				
		er of Poin		
	51	201	401	1601
Start 13.5 GHz	, Stop 16	.5 GHz, 3	5 kHz IF b	andwidth
Uncorrected,	21	23	28	65
1-port cal				
2-Port cal	52	57	70	152
Start 45 MHz, S	Stop 10 G	6Hz, 35 k⊦	Iz IF band	dwidth
Uncorrected,	71	79	84	110
1-port cal				
2-Port cal	153	171	182	243
Start 45 MHz, S	Stop 20 G	6Hz, 35 kH	Iz IF band	dwidth
Uncorrected,	103	116	121	139
1-port cal				
2-Port cal	216	245	256	303
Start 45 MHz, S	Stop 40 G	6Hz, 35 kH	Iz IF band	dwidth
Uncorrected,	145	181	190	232
1-port cal				
2-Port cal	293	367	382	428
Start 45 MHz, S	Stop 50 G	6Hz, 35 k⊦	Iz IF band	dwidth
Uncorrected,	163	210	218	256
1-port cal				
2-Port cal	332	425	442	487
Time Domain ^c	(increase	e over un	corrected	sweep time)
Conversions	< 1	< 1	4	13
Gating	< 1	< 1	4	17

Measurement Throughput Summary Table 42. Typical Cycle Time^{a,b} (ms) for Measurement Completion

^a Typical performance.
 ^b Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S11) measurement.

 $^{\rm c}$ Option 010 only.

Table 43. Cycle Time vs IF Bandwidth^a

Applies to the Preset condition (201 points, correction off) except for the following changes:

- CF = 1 GHz •
- Span = 100 MHz ٠
- Display off (add 21 ms for display on) ٠

IF Bandwidth	Cycle Time (ms) ^b
(Hz)	
40,000	8
35,000	9
30,000	11
20,000	13
10,000	28
7000	36
5000	48
3000	72
1000	196
300	620
100	3853
30	8041
10	19855
^a Typical parformana	

^a Typical performance. ^b Cycle time includes sweep and retrace time.

Table 44. Cycle Time vs Number of Points^a

Applies to the Preset condition (35 kHz IF bandwidth, correction off) except for the following changes:

- CF = 1 GHz ٠
- Span = 100 MHz •
- Display off (add 21 ms for display on) •

Number of	Cycle Time (ms) ^b
Points	
3 11 51 101	4
11	4
51	5
101	6
201	9
201 401 801	16
	29 55
1601	55

^a Typical performance. ^b Cycle time includes sweep and retrace time.

Table 45. Data Transfer Time (ms)^a

	Number of Points			
	51	201	401	1601
SCPI over GPIB				
(program executed on	externa	I PC) ^a		
32-bit floating point	3	7	12	43
64-bit floating point	4	12	22	84
ASCII	18	64	124	489
SCPI over 100 Mbit/s I	AN			
(program executed on	externa	I PC) ^b		
32-bit floating point	1	1	1	1
64-bit floating point	1	1	1	2
ASCII	5	15	26	96
SCPI (program execut	ed in the	analyze	r)°	
32-bit floating point	1	1	2	3
64-bit floating point	1	2	2	4
ASCII	8	29	56	222
COM (program execut	ed in the	e analyze	r) ^d	
32-bit floating point	1	1	1	1
Variant type	1	1	2	6
DCOM over 100 Mbit/s LAN				
(program executed on	externa	I PC) ^f		
32-bit floating point	1	1	1	2
Variant type	1	3	6	19

^a Typical performance

Note: Specifications for Recall & Sweep Speed are not provided for the E836xA analyzers.

Models E8362A, E8363A, and E8364A Option 014

See Front-panel jumper configurations.

NOTE: The standard E8362A /63A/ 64A has no front-panel jumpers.

Description	Specification	Supplemental Information
Maximum Input Level		· · · ·
E8362A:		
45 MHz to 500 MHz		-15 dBm, typical
500 MHz to 2 GHz		-11 dBm, typical
2 GHz to 10 GHz		-11 dBm, typical
10 GHz to 20 GHz		-11 dBm, typical
E8363A:		
45 MHz to 500 MHz		-14 dBm, typical
500 MHz to 2 GHz		-10 dBm, typical
2 GHz to 10 GHz		-10 dBm, typical
10 GHz to 20 GHz		-10 dBm, typical
20 GHZ to 30 GHz		-14.5 dBm, typical
30 GHZ to 40 GHz		-16.5 dBm, typical
E8364A:		
45 MHz to 500 MHz		- 14 dBm, typical
500 MHz to 2 GHz		- 10 dBm, typical
2 GHz to 10 GHz		- 10 dBm, typical
10 GHz to 20 GHz		- 10 dBm, typical
20 GHZ to 30 GHz		- 14.5 dBm, typical
30 GHZ to 40 GHz		- 16.5 dBm, typical
40 GHZ to 45 GHz		- 16 dBm, typical
45 GHZ to 50 GHz		- 15 dBm, typical
Noise Floor		
E8362A:		
	10 Hz IF Bandwidth	
45 MHz to 500 MHz	< -109 dBm	
500 MHz to 2 GHz	< -130 dBm	
2 GHz to 10 GHz	< -133 dBm	
10 GHz to 20 GHz	< -135 dBm	
	1 kHz IF Bandwidth	
45 MHz to 500 MHz	< -89 dBm	
500 MHz to 2 GHz	< -110 dBm	
2 GHz to 10 GHz	< -113 dBm	
10 GHz to 20 GHz	< -115 dBm	

E8363A:		
	10 Hz IF Bandwidth	
45 MHz to 500 MHz	< -127 dBm	
500 MHz to 2 GHz	< -133 dBm	
2 GHz to 10 GHz	< -132 dBm	
10 GHz to 20 GHz	< -134 dBm	
20 GHZ to 40 GHz	< -125 dBm	
	1 kHz IF Bandwidth	
45 MHz to 500 MHz	< -107 dBm	
500 MHz to 2 GHz	< -113 dBm	
2 GHz to 10 GHz	< -112 dBm	
10 GHz to 20 GHz	< -114 dBm	
20 GHZ to 40 GHz	< -105 dBm	
E8364A:	·	· ·
	10 Hz IF Bandwidth	
45 MHz to 500 MHz	< - 127 dBm	
500 MHz to 2 GHz	< - 133 dBm	
2 GHz to 10 GHz	< - 132 dBm	
10 GHz to 20 GHz	< - 134 dBm	
20 GHZ to 40 GHz	< - 125 dBm	
40 GHZ to 50 GHz	< - 123 dBm	
	1 kHz IF Bandwidth	
45 MHz to 500 MHz	< -107 dBm	
500 MHz to 2 GHz	< -113 dBm	
2 GHz to 10 GHz	< -112 dBm	
10 GHz to 20 GHz	< -114 dBm	
20 GHZ to 40 GHz	< -105 dBm	
40 GHZ to 50 GHz	< -103 dBm	
Damage Level		
E8362A		+ 15 dBm, typical
E8363A		+ 15 dBm, typical
E8364A		+ 15 dBm, typical
Maximum DC Level		
E8362A		+ 15 V, typical
E8363A		+ 15 V, typical
E8364A		+ 15 V, typical

Description	Specification	Supplemental Information	
Maximum Input Level			
E8362A:			
45 MHz to 500 MHz		-15 dBm, typical	
500 MHz to 2 GHz		-11 dBm, typical	
2 GHz to 10 GHz		-11 dBm, typical	
10 GHz to 20 GHz		-11 dBm, typical	
E8363A:			
45 MHz to 500 MHz		-14 dBm, typical	
500 MHz to 2 GHz		-10 dBm, typical	
2 GHz to 10 GHz		-10 dBm, typical	
10 GHz to 20 GHz		-9.5 dBm, typical	
20 GHZ to 30 GHz		-14 dBm, typical	
30 GHZ to 40 GHz		-15.5 dBm, typical	
E8364A:			
45 MHz to 500 MHz		- 14 dBm, typical	
500 MHz to 2 GHz		- 10 dBm, typical	
2 GHz to 10 GHz		- 10 dBm, typical	
10 GHz to 20 GHz		- 9.5 dBm, typical	
20 GHZ to 30 GHz		- 14 dBm, typical	
30 GHZ to 40 GHz		- 15.5 dBm, typical	
40 GHZ to 45 GHz		- 14 dBm, typical	
45 GHZ to 50 GHz		- 15 dBm, typical	
Damage Level			
E8362A		+ 15 dBm, typical	
E8363A		+ 15 dBm, typical	
E8364A		+ 15 dBm, typical	
Maximum DC Level			
E8362A		+/- 15 V, typical	
E8363A		+/- 15 V, typical	
E8364A		+/- 15 V, typical	

Table 47: Reference Receiver Inputs (Rcvr R1, Rcvr R2)

Description	Specification	Supplemental Information	
Maximum Output Level			
E8362A:			
45 MHz to 500 MHz		-24 dBm, typical	
500 MHz to 2 GHz		-23 dBm, typical	
2 GHz to 10 GHz		-23 dBm, typical	
10 GHz to 20 GHz		-26 dBm, typical	
E8363A:			
45 MHz to 500 MHz		-11.5 dBm, typical	
500 MHz to 2 GHz		-10.5 dBm, typical	
2 GHz to 10 GHz		-11 dBm, typical	
10 GHz to 20 GHz		-11 dBm, typical	
20 GHZ to 30 GHz		-11 dBm, typical	
30 GHZ to 40 GHz		-11 dBm, typical	
E8364A:			
45 MHz to 500 MHz		- 11.5 dBm, typical	
500 MHz to 2 GHz		- 10.5 dBm, typical	
2 GHz to 10 GHz		- 11 dBm, typical	
10 GHz to 20 GHz		- 11 dBm, typical	
20 GHZ to 30 GHz		- 11 dBm, typical	
30 GHZ to 40 GHz		- 11 dBm, typical	
40 GHZ to 45 GHz		- 11 dBm, typical	
45 GHZ to 50 GHz		- 15 dBm, typical	
Damage Level			
E8362A		+ 20 dBm, typical	
E8363A		+ 20 dBm, typical	
E8364A		+ 20 dBm, typical	
Maximum DC Level			
E8362A		+/- 15 V, typical	
E8363A		+/- 15 V, typical	
E8364A		+/- 15 V, typical	

 Table 48: Reference Outputs (Reference 1 Source Out, Reference 2 Source Out)

Description	Specification	Supplemental Information
Maximum Output Level		
E8362A, Option 014:		
45 MHz to 500 MHz		6 dBm, typical
500 MHz to 2 GHz		7 dBm, typical
2 GHz to 10 GHz		7 dBm, typical
10 GHz to 20 GHz		4 dBm, typical
E8362A, Option 014 and UN	NL:	
45 MHz to 500 MHz		4 dBm, typical
500 MHz to 2 GHz		5 dBm, typical
2 GHz to 10 GHz		5 dBm, typical
10 GHz to 20 GHz		2 dBm, typical
E8363A, Option 014:		
45 MHz to 500 MHz		5.5 dBm, typical
500 MHz to 2 GHz		6.5 dBm, typical
2 GHz to 10 GHz		6.5 dBm, typical
10 GHz to 20 GHz		4 dBm, typical
20 GHZ to 30 GHz		1- dBm, typical
30 GHZ to 40 GHz		-2 dBm, typical
E8363A, Option 014 and UN	NL:	
45 MHz to 500 MHz		3.5 dBm, typical
500 MHz to 2 GHz		5 dBm, typical
2 GHz to 10 GHz		5 dBm, typical
10 GHz to 20 GHz		3.5- dBm, typical
20 GHZ to 30 GHz		0 dBm, typical
30 GHZ to 40 GHz		-2.5 dBm, typical
E8364A, Option 014:		
45 MHz to 500 MHz		5.5 dBm, typical
500 MHz to 2 GHz		6.5 dBm, typical
2 GHz to 10 GHz		6.5 dBm, typical
10 GHz to 20 GHz		4 dBm, typical
20 GHZ to 30 GHz		1 dBm, typical
30 GHZ to 40 GHz		-2 dBm, typical
40 GHZ to 45 GHz		-3 dBm, typical
45 GHZ to 50 GHz		-7.5 dBm, typical
E8364A, Option 014 and UN		
45 MHz to 500 MHz		3.5 dBm, typical
500 MHz to 2 GHz		5 dBm, typical
2 GHz to 10 GHz		5 dBm, typical
10 GHz to 20 GHz		3.5 dBm, typical
20 GHZ to 30 GHz		0 dBm, typical
30 GHZ to 40 GHz		-2.5 dBm, typical
40 GHZ to 45 GHz		-5 dBm, typical
45 GHZ to 50 GHz		-10 dBm, typical

Table 49: Source Outputs (Port 1 Source Out, Port 2 Source Out)

Damage Level	
E8362A	20 dBm, typical
E8363A	20 dBm, typical
E8364A	20 dBm, typical
Maximum DC Level	
E8362A	0 V, typical
E8363A	0 V, typical
E8364A	0 V, typical

Table 50: Coupler Inputs (Port 1 Cplr Thru, Port 2 Cplr Thru)

Description	Specification	Supplemental Information	
be a sufficient to a sufficient Densit			
Insertion Loss to Test Port			
E8362A, Option 014:			
45 MHz to 500 MHz		0.5 dB, typical	
500 MHz to 2 GHz		1.5 dB, typical	
2 GHz to 10 GHz		1.5 dB, typical	
10 GHz to 20 GHz	•	1.5 dB, typical	
E8362A, Option 014 and UN	L:		
45 MHz to 500 MHz		1 dB, typical	
500 MHz to 2 GHz		2 dB, typical	
2 GHz to 10 GHz		2 dB, typical	
10 GHz to 20 GHz		2 dB, typical	
E8363A, Option 014:			
45 MHz to 500 MHz		0.5 dB, typical	
500 MHz to 2 GHz		0.5 dB, typical	
2 GHz to 10 GHz		1.5 dB, typical	
10 GHz to 20 GHz		2 dB, typical	
20 GHZ to 30 GHz		3 dB, typical	
30 GHZ to 40 GHz		3.5 dB, typical	
E8363A, Option 014 and UN	L:		
45 MHz to 500 MHz		0.5 dB, typical	
500 MHz to 2 GHz		1 dB, typical	
2 GHz to 10 GHz		2 dB, typical	
10 GHz to 20 GHz		3 dB, typical	
20 GHZ to 30 GHz		4 dB, typical	
30 GHZ to 40 GHz		5 dB, typical	
E8364A, Option 014:	·	· · · ·	
45 MHz to 500 MHz		0.5 dB, typical	
500 MHz to 2 GHz		0.5 dB, typical	
2 GHz to 10 GHz		1.5 dB, typical	
10 GHz to 20 GHz		2 dB, typical	
20 GHZ to 30 GHz		3 dB, typical	
30 GHZ to 40 GHz		3.5 dB, typical	
40 GHZ to 45 GHz		3.5 dB, typical	
45 GHZ to 50 GHz		4 dB, typical	

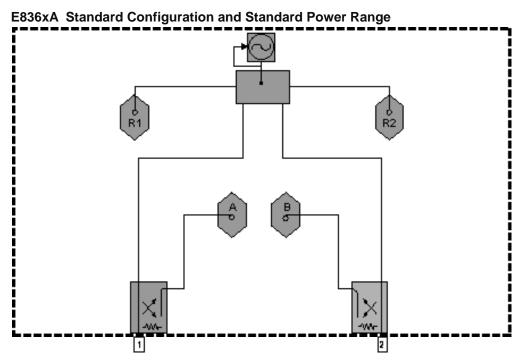
E8364A. Option 014 and UNL:

E8364A, Option 014 and UNL:	
45 MHz to 500 MHz	0.5 dB, typical
500 MHz to 2 GHz	1 dB, typical
2 GHz to 10 GHz	2 dB, typical
10 GHz to 20 GHz	3 dB, typical
20 GHZ to 30 GHz	4 dB, typical
30 GHZ to 40 GHz	5 dB, typical
40 GHZ to 45 GHz	5.5 dB, typical
45 GHZ to 50 GHz	6 dB, typical
Damage Level	
E8362A	+ 30 dBm, typical
E8363A	+ 30 dBm, typical
E8364A	+ 30 dBm, typical
Maximum DC Level	
E8362A	+/- 40 V, typical
E8363A	+/- 40 V, typical
E8364A	+/- 40 V, typical

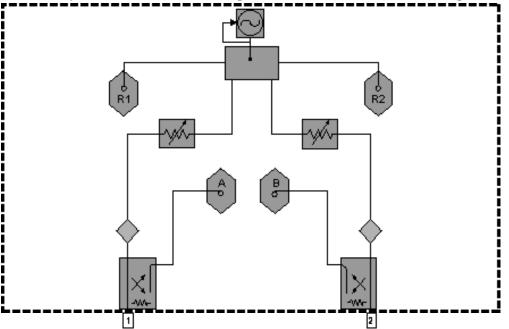
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Description	Specification	Supplemental Information	
Damage Level			
E8362A		+ 30 dBm, typical	
E8363A		+ 30 dBm, typical	
E8364A		+ 30 dBm, typical	
Maximum DC Level			
E8362A		+/- 7 V, typical	
E8363A		+/- 7 V, typical	
E8364A		+/- 7 V, typical	

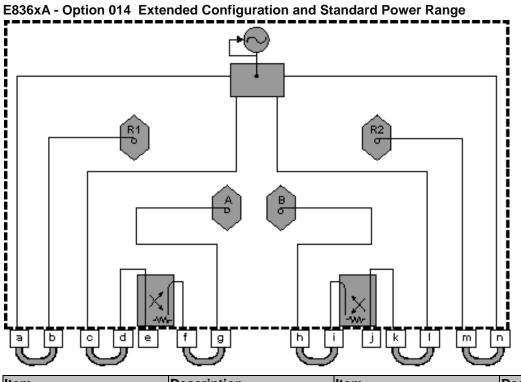
Test Set Block Diagrams



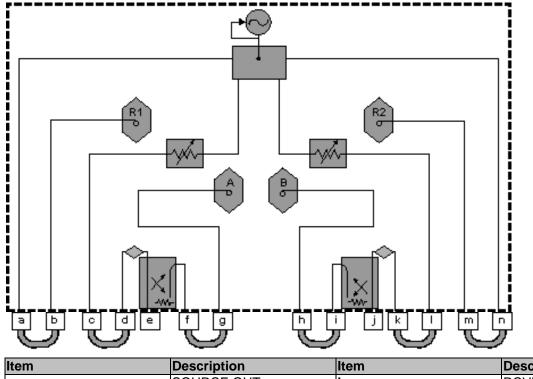
E836xA - Option UNL Standard Configuration with Extended Power Range and Bias - Tees



Test Set with Option 014 Block Diagrams



Item	Description	Item	Description
а	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
С	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
е	PORT 1	I	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT



E836xA - Option UNL&014 Extended Configuration with Extended Power Range and Bias - Tees

ltem	Description	Item	Description
а	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
С	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
е	PORT 1	I	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT

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This is a complete list of the E8362B, E8363B, and E8364B network analyzer technical specifications.

- To optimize viewing of uncertainty curves, click the Maximize button.
- To view or print the PNA Series Data Sheet (a condensed version of the specifications), visit our web site at http://www.agilent.com/find/pna, select your analyzer model, and click on the link for the data sheet.
- The uncertainty curves contained in this document apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

Definitions

All specifications and characteristics apply over a 25 °C \pm 5 °C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable) errors.

Corrected (residual): Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Corrected System Performance

The specifications in this section apply for measurements made with the E836xB analyzer with the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data
- Isolation calibration with an averaging factor of 8

Table 1. System Dynamic Range^a

Description	Specification (dB) at Test Port ^b	Typical (dB) at Direct Receiver Access Input ^c	Supplemental Information
Dynamic Range (in a 1	0 Hz BW)		
Standard Configuratio	n and Standard Po	ower Range	
(E836xB - Standard)			
10 MHz to 45 MHz ^d	79		
45 MHz to 500 MHz ^e	94	NA	
500 MHz to 2 GHz	119	NA	
2 GHz to 10 GHz	122	NA	
10 GHz to 20 GHz	123	NA	
20 GHz to 30 GHz	114	NA	
30 GHz to 40 GHz	110	NA	
40 GHz to 45 GHz	109	NA	
45 GHz to 50 GHz	104	NA	
Configurable Test Set	and Standard Pow	ver Range	
(E836xB - Option 014)			
10 MHz to 45 MHz ^d	79	129	
45 MHz to 500 MHz ^e	94	132	
500 MHz to 2 GHz	119	138	
2 GHz to 10 GHz	122	137	
10 GHz to 20 GHz	121	136	
20 GHz to 30 GHz	111	123	Option 016 degrades
30 GHz to 40 GHz	107	119	performance by 2 dB.
40 GHz to 45 GHz	105	116	
45 GHz to 50 GHz	100	111	
Standard Configuratio	n and Extended Po	ower Range & Bias-Tees	· · · · · · · · · · · · · · · · · · ·
(E836xB - Option UNL)			
10 MHz to 45 MHz ^d	79		
45 MHz to 500 MHz ^e	92	NA	
500 MHz to 2 GHz	117	NA	
2 GHz to 10 GHz	120	NA	
10 GHz to 20 GHz	121	NA	
20 GHz to 30 GHz	112	NA	
30 GHz to 40 GHz	108	NA	
40 GHz to 45 GHz	105	NA	
45 GHz to 50 GHz	99	NA	

Configurable Test Set and Extended Power Range & Bias-Tees						
(E836xB - Option 014/UNL)						
10 MHz to 45 MHz ^d	79	129				
45 MHz to 500 MHz ^e	92	130				
500 MHz to 2 GHz	117	136				
2 GHz to 10 GHz	120	135				
10 GHz to 20 GHz	119	134				
20 GHz to 30 GHz	109	121	Option 016 degrades			
30 GHz to 40 GHz	105	117	performance by 2 dB.			
40 GHz to 45 GHz	101	112				
45 GHz to 50 GHz	95	106				

^a The system dynamic range is calculated as the difference between the noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.

^b The test port system dynamic range is calculated as the difference between the test port noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.

^c The direct receiver access input system dynamic range is calculated as the difference between the receiver access input noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its damage level. When the analyzer is in segment sweep mode, the analyzer can have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with high insertion loss), and reduced power when receiver damage may occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

^d Typical performance.

^e May be limited to 100 dB at particular frequencies below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

 Table 2. Receiver Dynamic Range^a

Description	Specification (dB) at Test Port ^b	Typical (dB) at Direct Receiver Access Input ^c	
Dynamic Range (in a	10 Hz BW)		
Standard Configurati	on and Standard	d Power Range (E836xB - Star	ndard)
OR			
Standard Configurati	on and Extended	d Power Range & Bias Tees (I	E836xB - Option UNL)
10 MHz to 45 MHz ^d	82	NA	
45 MHz to 500 MHz ^e	94	NA	NA
500 MHz to 2 GHz	119	NA	
2 GHz to 10 GHz	122	NA	
10 GHz to 20 GHz	125	NA	
20 GHz to 30 GHz	114	NA	
30 GHz to 40 GHz	111	NA	
40 GHz to 50 GHz	111	NA	
OR Configurable Test Se	t and Extended	Power Range (E836xB - Optio	
10 MHz to 45 MHz ^d	82	132	
45 MHz to 500 MHz ^e	94	132	
500 MHz to 2 GHz	119	138	
2 GHz to 10 GHz	122	137	
10 GHz to 20 GHz	124	139	
20 GHz to 30 GHz	113	125	Option 016 degrades
	110		
30 GHz to 40 GHz 40 GHz to 50 GHz	110	122	performance by 2 dB.

^a The receiver dynamic range is calculated as the difference between the noise floor and the receiver maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.

^b The test port receiver dynamic range is calculated as the difference between the test port noise floor and the receiver maximum input level. The effective dynamic range must take measurement uncertainties and interfering signals into account.

^c The direct receiver access input receiver dynamic range is calculated as the difference between the direct receiver access input noise floor and the receiver maximum input level. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its compression or damage level. When the analyzer is in segment sweep mode, the analyzer can have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with high insertion loss), and reduced power when compression or receiver damage may occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

^d Typical performance.

^e May be degraded by 10 dB at particular frequencies (multiples of 5 MHz) below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

Note: This E836xB document provides technical specifications for the following calibration kits only: 85056A, 85056D, 85056K, 85052B, 85052C, 85052D, 85050B, 85050C, 85050D, 85054B, 85054D, K11644A, P11644A, R11644A, and the X11644A.

E8363/4B Corrected System Performance with 2.4mm Connectors

Table 3. 85056A Calibration Kit

Standard Configuration and Standard Power Range

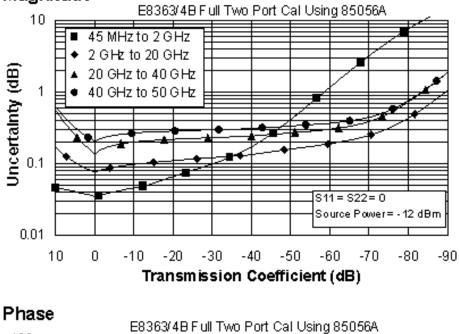
(E8363/4B)

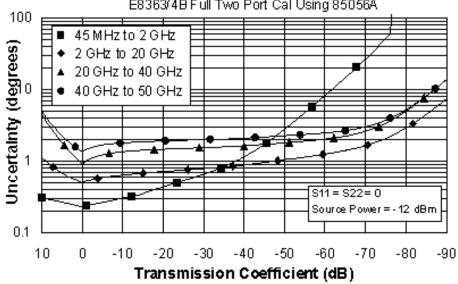
Applies to the E8363/4B analyzers, 85056A (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)				
	45 MHz to 2 GHz	2 to 20 GHz	20 to 40 GHz	40 to 50 GHz	
Directivity	42	42	38	36	
Source Match	41	38	33	31	
Load Match	42	42	37	35	
Reflection Tracking	±0.001	±0.008	±0.020	±0.027	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	
Transmission Tracking	±0.010	±0.049	±0.105	±0.170	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	

Transmission Uncertainty (Specifications) Magnitude





Reflection Uncertainty (Specifications) Magnitude

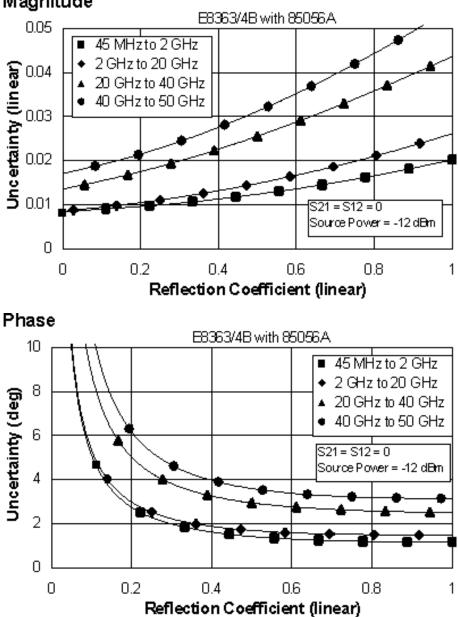


Table 4. 85056A Calibration Kit

Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

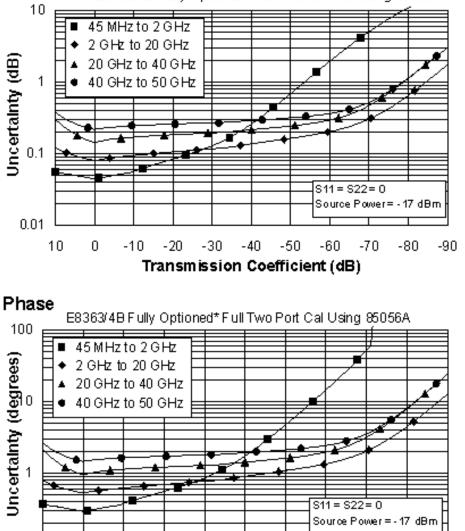
(E836xB - Option 014, UNL, 016, 080, and 081)

Applies to the, E8363/4B analyzers, 85056A (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)				
	45 MHz to	2 to	20 to	40 to	
	2 GHz	20 GHz	40 GHz	50 GHz	
Directivity	42	42	38	36	
Source Match	41	38	33	31	
Load Match	42	42	37	35	
Reflection Tracking	±0.001	±0.008	±0.020	±0.027	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	
Transmission Tracking	±0.019	±0.053	±0.109	±0.182	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications)



E8363/4B Fully Optioned* Full Two Port Cal Using 85056A

* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

-60

-70

-80

-90

0.1

10

0

-10

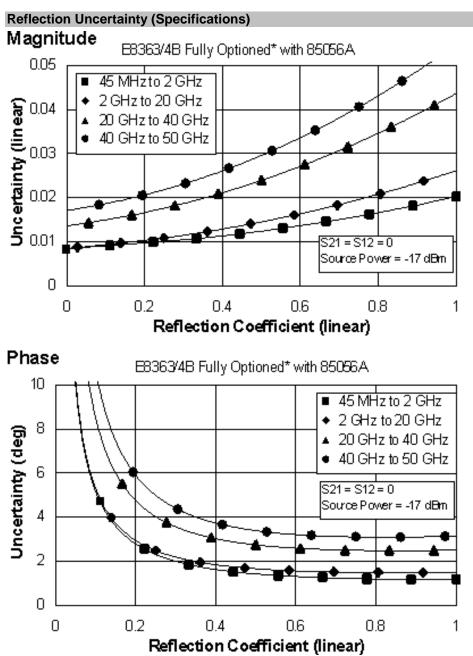
-20

-30

-40

Transmission Coefficient (dB)

-50



* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

Table 5. 85056D Calibration Kit

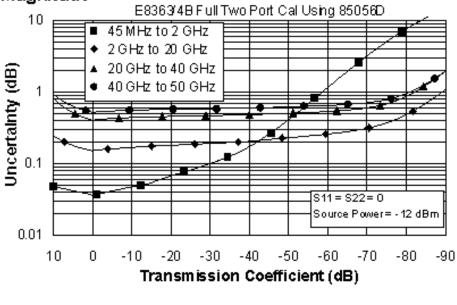
Standard Configuration and Standard Power Range (E8363/4B)

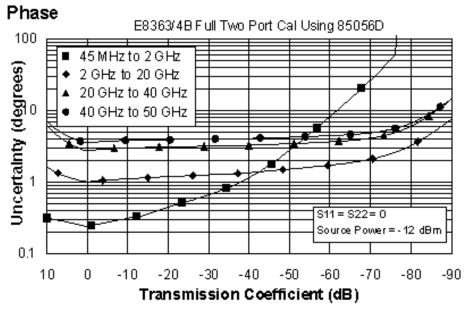
Applies to the, E8363/4B analyzers, 85056D (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification	Specification (dB)				
	45 MHz to	2 to	20 to	40 to		
	2 GHz	20 GHz	40 GHz	50 GHz		
Directivity	42	34	26	26		
Source Match	40	30	24	23		
Load Match	42	33	25	25		
Reflection Tracking	±0.002	±0.029	±0.079	±0.075		
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C		
Transmission Tracking	±0.011	±0.121	±0.347	±0.462		
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C		

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications) Magnitude





Reflection Uncertainty (Specifications) Magnitude

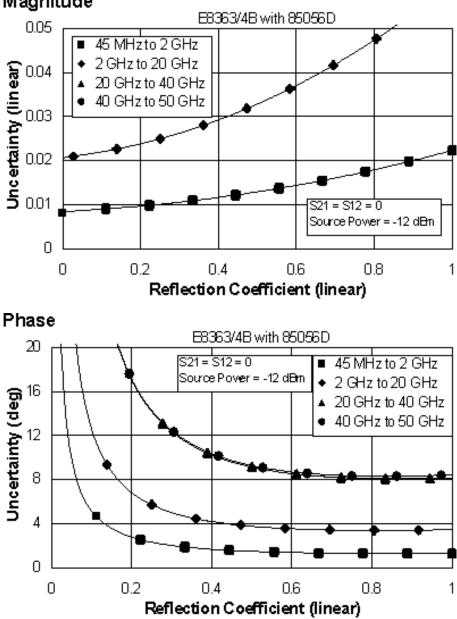


Table 6. 85056D Calibration Kit

Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

(E836xB - Option 014, UNL, 016, 080, and 081)

Applies to the, E8363/4B analyzers, 85056D (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

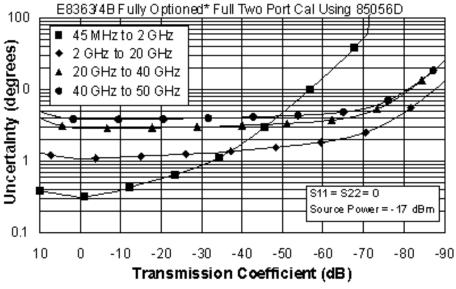
Description	Specification (dB)				
	45 MHz to	2 to	20 to	40 to	
	2 GHz	20 GHz	40 GHz	50 GHz	
Directivity	42	34	26	26	
Source Match	40	30	24	23	
Load Match	42	33	25	25	
Reflection Tracking	±0.002	±0.029	±0.079	±0.075	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	
Transmission Tracking	±0.022	±0.130	±0.365	±0.498	
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C	

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications)

Magnitude E8363/4B Fully Optioned* Full Two Port Cal Using 85056D 10 45 MHz to 2 GHz ٠ 2 GHz to 20 GHz 20 GHz to 40 GHz Uncertainty (dB) 40 GHz to 50 GHz 1 0.1 S11 = S22 = 0 Source Power= - 17 dBm 0.01 10 0 -10 -20 -30 -40 -50 -60 -70 -80 Transmission Coefficient (dB)

Phase



* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

-90

Reflection Uncertainty (Specifications)

Magnitude B363/4B Fully Optioned* with 85056D 0.05 45 MHzto 2 GHz 2 GHz to 20 GHz ٠ Uncertainty (linear) 0.04 20 GHz to 40 GHz 40 GHz to 50 GHz 0.03 0.02 0.01 S21 = S12 = 0 Source Power = -17 dBn 0 0 0.2 0.4 0.6 0.8 Reflection Coefficient (linear) Phase E8363/4B Fully Optioned* with 85056D 20 S21 = S12 = 0 45 MHz to 2 GHz Source Power = -17 dBm 2 GHz to 20 GHz Uncertainty (deg) 20 GHz to 40 GHz 40 GHz to 50 GHz 4 0 0.2 0.4 0.6 0.8 0 Reflection Coefficient (linear)

* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

1

1

E8363/4B Corrected System Performance with 2.92mm Connectors

85056K Calibration Kit:

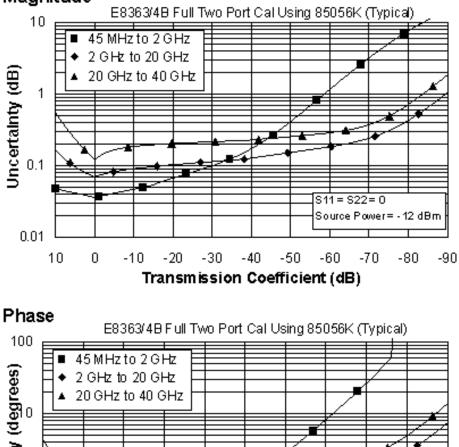
Table 7. 85056K Calibration KitStandard Configuration and Standard Power Range(E8363/4B)

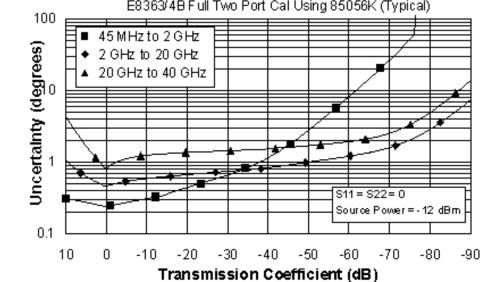
Applies to the, E8363/4B analyzers, 85056K (2.92mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification		
	0.045 to	2 to	20 to
	2 GHz	20 GHz	40 GHz
Directivity	42	42	40
Source Match	40	40	35
Load Match	42	41	38
Reflection Tracking	±0.018	±0.018	±0.067
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.011	±0.042	±0.089
	+0.02/°C	+0.02/°C	+0.03/°C

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications) Magnitude





Reflection Uncertainty (Specifications)

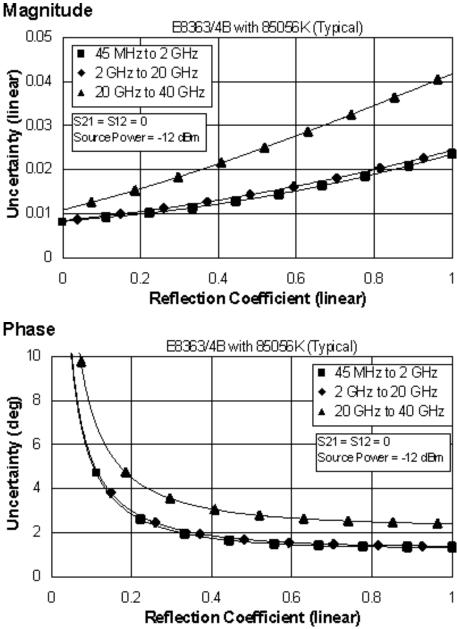


Table 8. 85056K Calibration Kit

Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

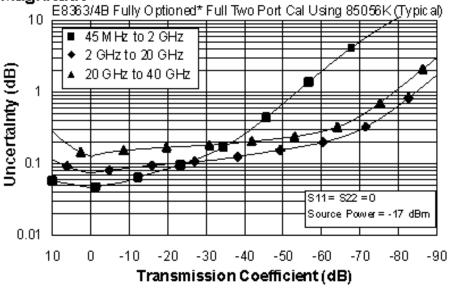
(E836xB - Option 014, UNL, 016, 080, and 081)

Applies to the, E8363/4B analyzers, 85056K (2.92mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

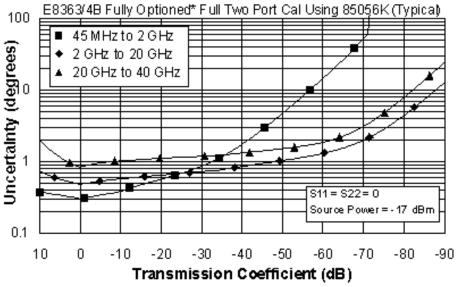
Description	Specification (dB)		
	0.045 to	2 to	20 to
	2 GHz	20 GHz	40 GHz
Directivity	42	42	40
Source Match	40	40	35
Load Match	42	41	38
Reflection Tracking	±0.018	±0.018	±0.067
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.021	±0.046	±0.094
	+0.02/°C	+0.02/°C	+0.03/°C

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications Magnitude







* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

Magnitude E8363/4B Fully Optioned* with 85056K (Typical) 0.05 45 MHzto 2 GHz 2 GHz to 20 GHz Uncertainty (linear) 0.04 20 GHz to 40 GHz 0.03 = S12 = 0 SourcePower= -17 dBm 0.02 0.01 0 0.2 0.4 0.6 0 0.8 1 Reflection Coefficient (linear) Phase E8363/4B Fully Optioned* with 85056K (Typical) 10 45 MHz to 2 GHz 2 GHz to 20 GHz ٠ 8 Uncertainty (deg) 20 GHz to 40 GHz ٠ 6 S21 = S12 = 0 Source Power = -17 dBm 4 2 0 0 0.2 0.4 0.6 0.8 1 Reflection Coefficient (linear)

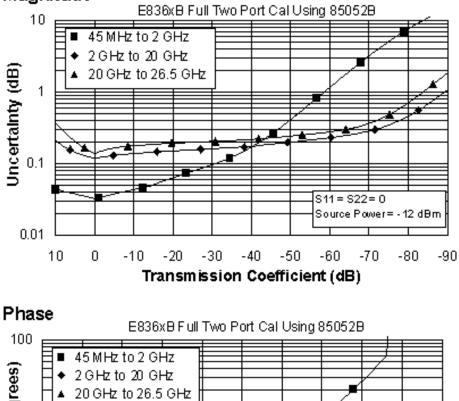
* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

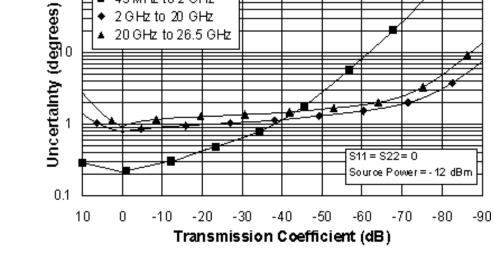
E836xB Corrected System Performance with 3.5mm Connectors

Table 9. 85052B Calibration KitStandard Configuration and Standard Power Range (E836xB)

Applies to the, E836xB analyzers, 85052B (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)			
	45 MHz to	2 to	20 to	
	2 GHz	20 GHz	26.5 GHz	
Directivity	48	44	44	
Source Match	40	31	31	
Load Match	48	44	44	
Reflection Tracking	±0.003	±0.006	±0.006	
	+0.02/°C	+0.02/°C	+0.03/°C	
Transmission Tracking	±0.009	±0.088	±0.104	
	+0.02/°C	+0.02/°C	+0.03/°C	





Reflection Uncertainty (Specifications) Magnitude

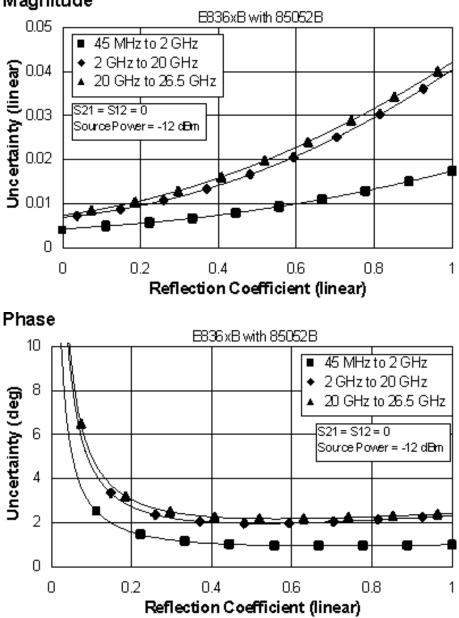


Table 10. 85052B Calibration Kit

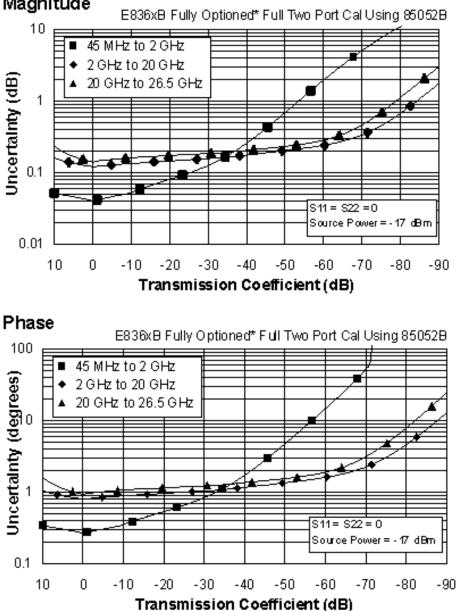
Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

(E836xB - Option 014, UNL, 016, 080, and 081)

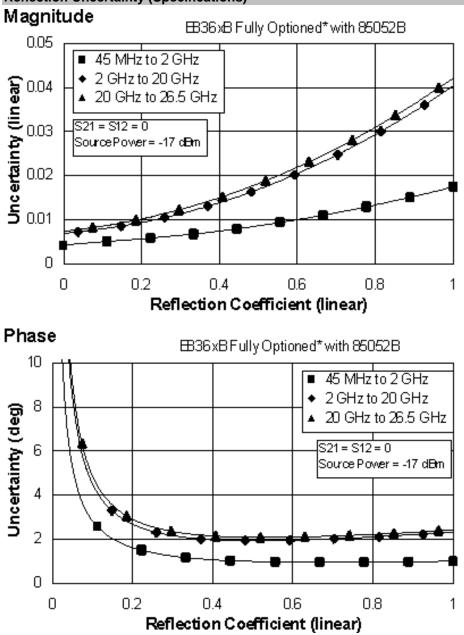
Applies to the, E836xB analyzers, 85052B (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)			
	45 MHz to	2 to	20 to	
	2 GHz	20 GHz	26.5 GHz	
Directivity	48	44	44	
Source Match	40	31	31	
Load Match	48	44	44	
Reflection Tracking	±0.003	±0.006	±0.006	
	+0.02/°C	+0.02/°C	+0.03/°C	
Transmission Tracking	±0.017	±0.091	±0.106	
	+0.02/°C	+0.02/°C	+0.03/°C	



* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)





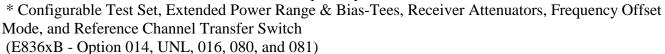


Table 11. 85052C Calibration Kit

Standard Configuration and Standard Power Range (E836xB)

Applies to the, E836xB analyzers, 85052C (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)		(dB)
	45 MHz to	2 to	20 to
	2 GHz	20 GHz	26.5 GHz
Directivity	48	50	50
Source Match	40	50	50
Load Match	48	50	50
Reflection Tracking	±0.003	±0.000	±0.000
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.009	±0.014	±0.018
	+0.02/°C	+0.02/°C	+0.03/°C

0.1

10

0

-10

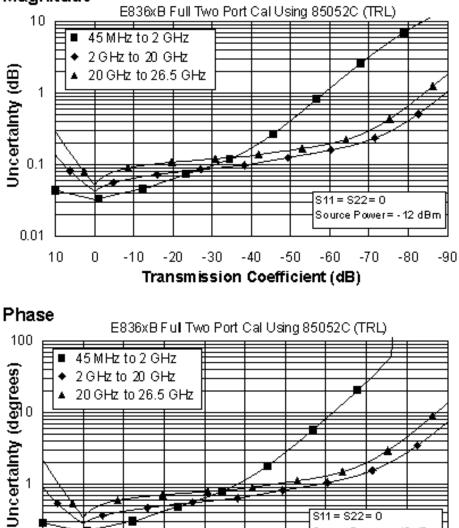
-20

-30

-40

Transmission Coefficient (dB)

-50



S11 = S22 = 0

-60

Source Power=-12 dBm

-80

-90

-70

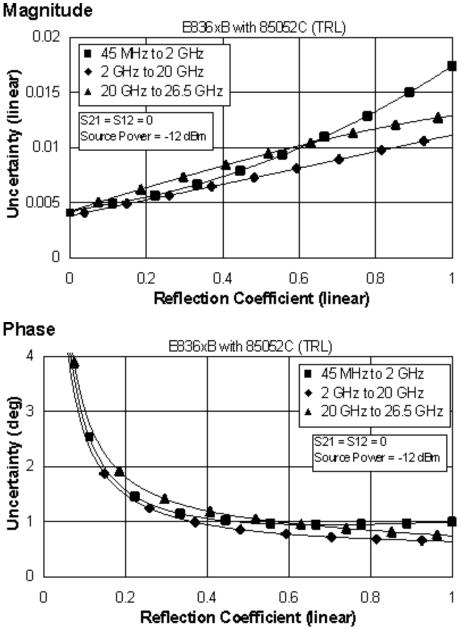


Table 12. 85052C Calibration Kit

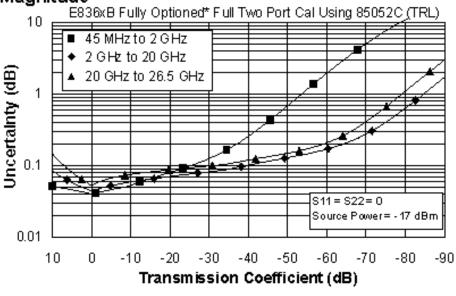
Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

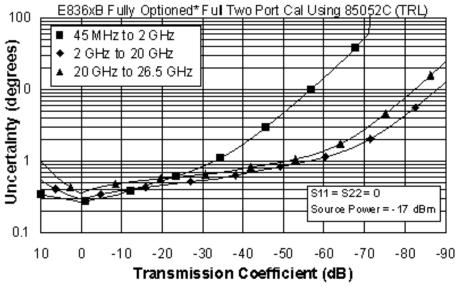
(E836xB - Option 014, UNL, 016, 080, and 081)

Applies to the, E836xB analyzers, 85052C (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

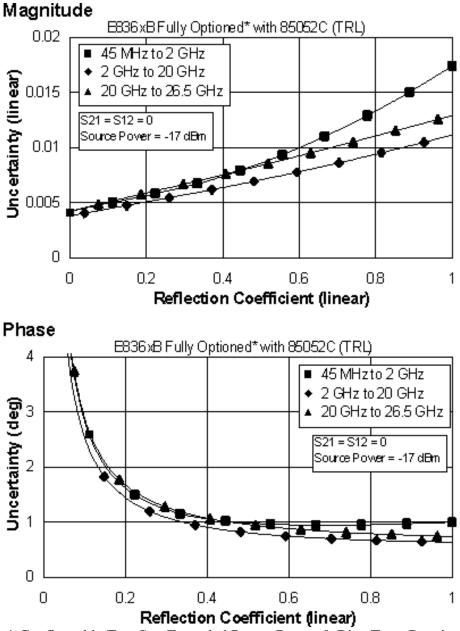
Description		Specification (dB)	
	45 MHz to	2 to	20 to
	2 GHz	20 GHz	26.5 GHz
Directivity	48	50	50
Source Match	40	50	50
Load Match	48	50	50
Reflection Tracking	±0.003	±0.000	±0.000
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.017	±0.016	±0.019
	+0.02/°C	+0.02/°C	+0.03/°C



Phase



* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)



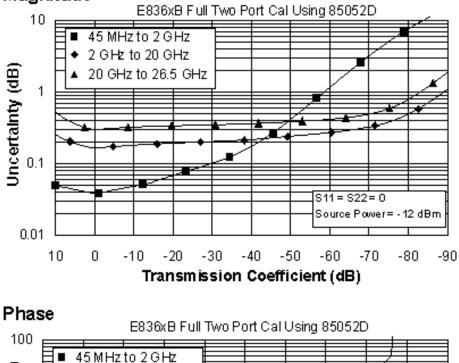
* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

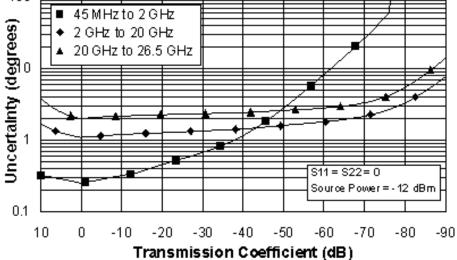
Table 13. 85052D Calibration Kit

Standard Configuration and Standard Power Range (E836xB)

Applies to the, E836xB analyzers, 85052D (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description		Specification (dB)	
	45 MHz to	2 to	20 to
	2 GHz	20 GHz	26.5 GHz
Directivity	42	36	30
Source Match	37	28	25
Load Match	42	36	30
Reflection Tracking	±0.003	±0.008	±0.011
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.014	±0.131	±0.250
	+0.02/°C	+0.02/°C	+0.03/°C





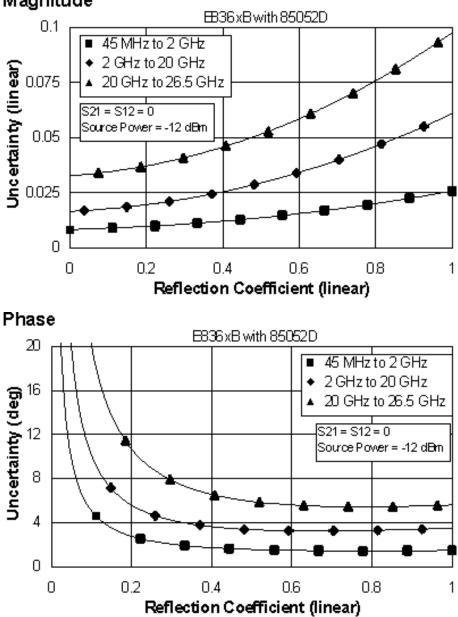


Table 14. 85052D Calibration Kit

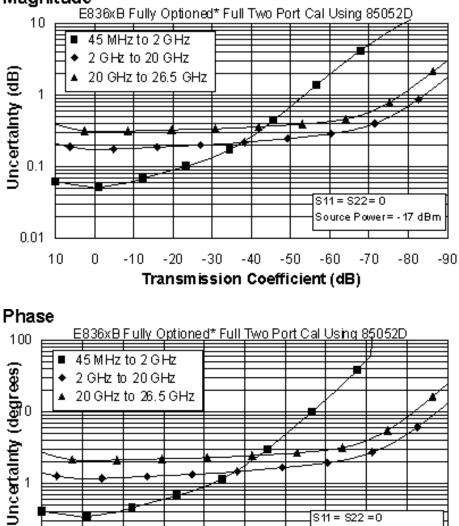
Fully Optioned

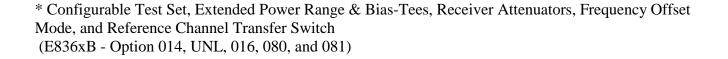
Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

(E836xB - Option 014, UNL, 016, 080, and 081)

Applies to the, E836xB analyzers, 85052D (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description		Specification (dB)	
	45 MHz to	2 to	20 to
	2 GHz	20 GHz	26.5 GHz
Directivity	42	36	30
Source Match	37	28	25
Load Match	42	36	30
Reflection Tracking	±0.003	±0.008	±0.011
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.026	±0.138	±0.261
	+0.02/°C	+0.02/°C	+0.03/°C





-60

S11 = S22 = 0

Source Power = -17 dBm

-80

-90

-70

0.1

10

0

-10

-20

-30

-40

Transmission Coefficient (dB)

-50

Magnitude B36xB Fully Optioned* with 85052D 0.1 45 MHz to 2 GHz 2 GHz to 20 GHz Uncertainty (linear) 0.075 20 GHz to 26.5 GHz S21 = S12 = 0 Source Power = -17 dBm 0.05 0.025 0 0 0.2 0.4 0.6 08 **Reflection Coefficient (linear)** Phase E836xB Fully Optioned* with 85052D 20 45 MHz to 2 GHz 2 GHz to 20 GHz ٠ Uncertainty (deg) 20 GHz to 26.5 GHz S21 = S12 = 0 Source Power = -17 dBm 4 0 0.2 0 0.4 0.6 0.8 Reflection Coefficient (linear)

* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

1

1

E836xB Corrected System Performance with 7mm Connectors

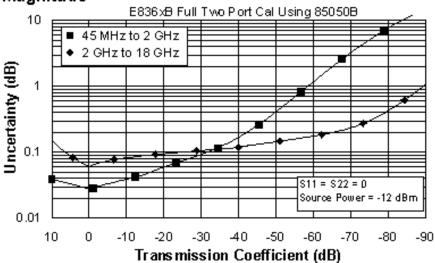
 Table 15.
 85050B
 Calibration Kit

 Standard Configuration and Standard Power Range
 (E836xB)

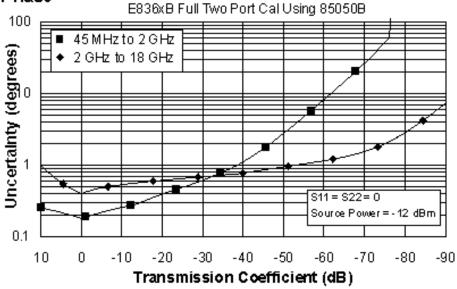
Applies to the, E836xB analyzers, 85050B (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)		
	0.045 to	2 to	
	2 GHz	18 GHz	
Directivity	52	52	
Source Match	48	41	
Load Match	52	47	
Reflection Tracking	±0.003	±0.047	
	+0.02/°C	+0.02/°C	
Transmission Tracking	±0.004	±0.032	
	+0.02/°C	+0.02/°C	

Magnitude







Reflection Uncertainty (Specifications) Magnitude

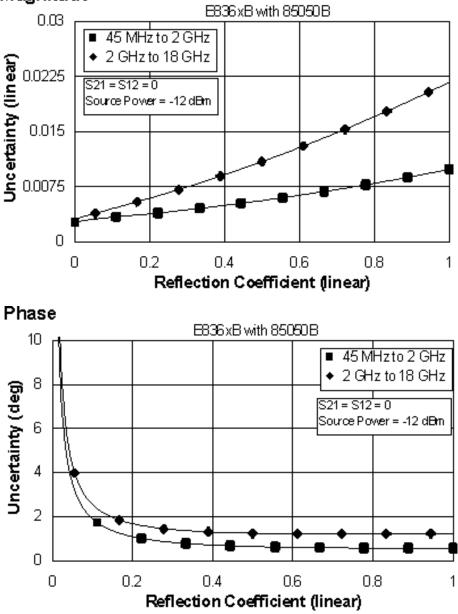


Table 16. 85050B Calibration Kit

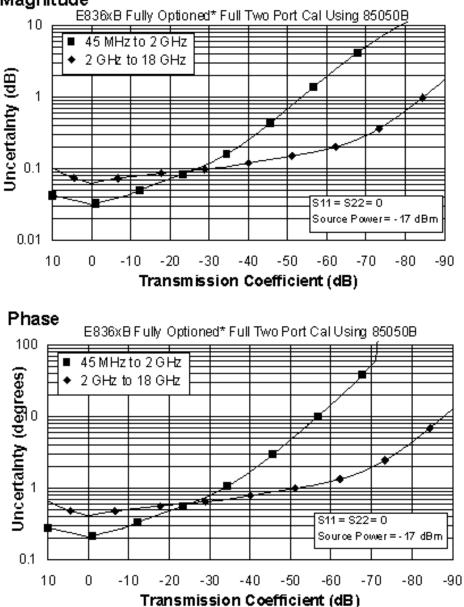
Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

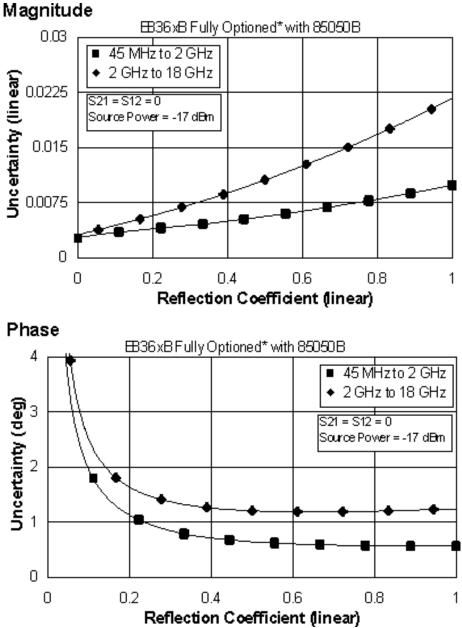
Applies to the, E836xB analyzers, 85050B (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature	23° \pm 3 °C, with < 1 °C deviation from	calibration temperature
Environmental temperature		ounoration temperature

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	52	52
Source Match	48	41
Load Match	52	47
Reflection Tracking	±0.003	±0.047
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.008	±0.034
	+0.02/°C	+0.02/°C



*Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)



*Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

Table 17. 85050C Calibration Kit

Standard Configuration and Standard Power Range (E836xB)

Applies to the, E836xB analyzers, 85050C (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)		
	0.045 to	2 to	
	2 GHz	18 GHz	
Directivity	52	60	
Source Match	48	60	
Load Match	52	60	
Reflection Tracking	±0.003	±0.000	
	+0.02/°C	+0.02/°C	
Transmission Tracking	±0.004	±0.004	
	+0.02/°C	+0.02/°C	

0

1

0.1

10

0

-10

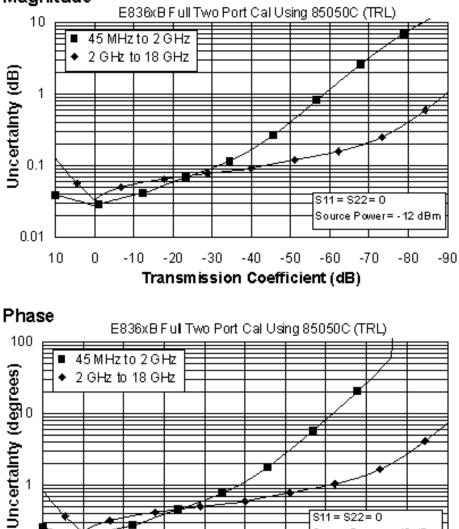
-20

-30

-40

Transmission Coefficient (dB)

-50



S11 = S22 = 0

-60

Source Power = -12 dBm

-70

-80

-90

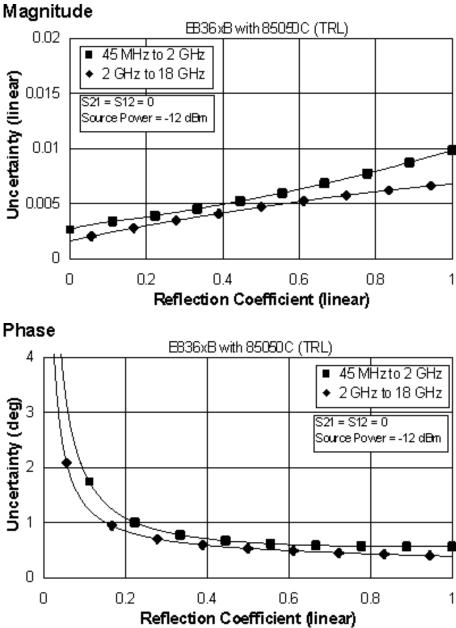


Table 18. 85050C Calibration Kit

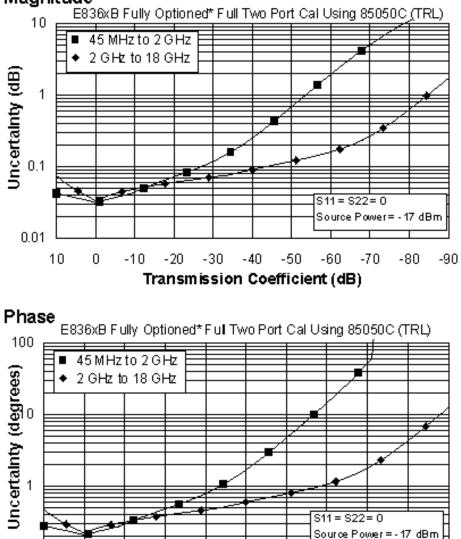
Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

Applies to the, E836xB analyzers, 85050C (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

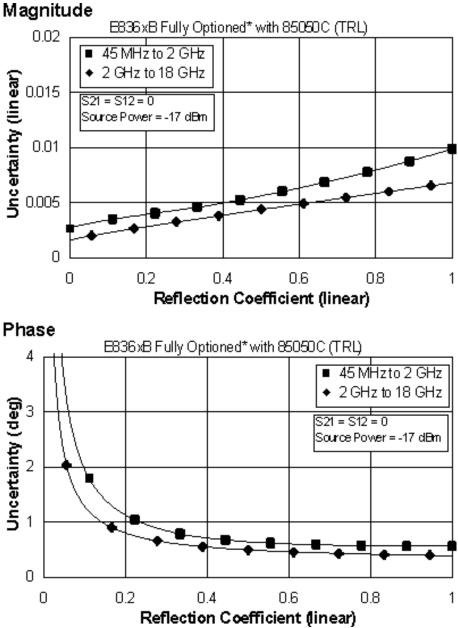
Environmental temperature	23° \pm 3 °C, with < 1 °C deviation from	calibration temperature
Environmental temperature		ounoration temperature

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	52	60
Source Match	48	60
Load Match	52	60
Reflection Tracking	±0.003	±0.000
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.008	±0.005
	+0.02/°C	+0.02/°C





*Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)



*Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

Table 19. 85050D Calibration Kit

Standard Configuration and Standard Power Range (E836xB)

Applies to the, E836xB analyzers, 85050D (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	40	40
Source Match	39	35
Load Match	40	37
Reflection Tracking	±0.010	±0.100
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.013	±0.072
	+0.02/°C	+0.02/°C

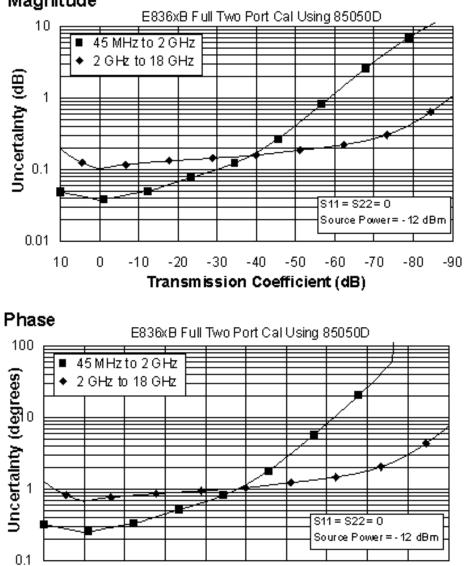
10

0

-20

-30

-10



-40

Transmission Coefficient (dB)

-50

-60

-70

-80

-90

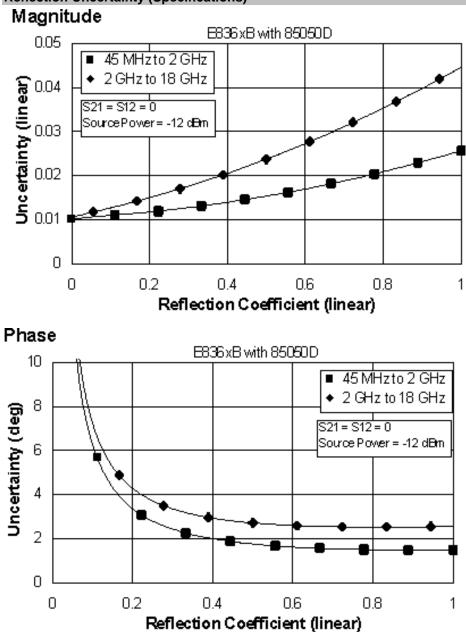


Table 20. 85050D Calibration Kit

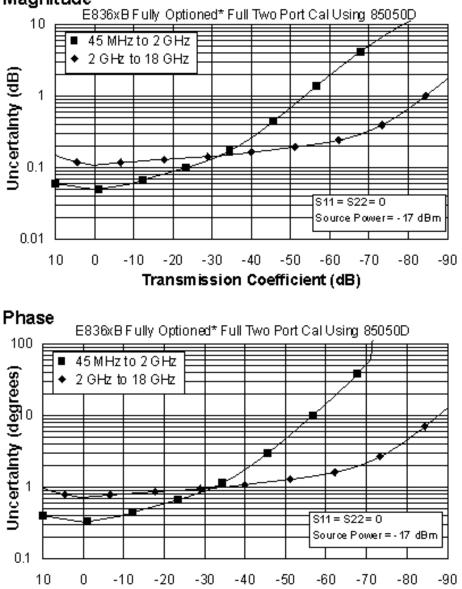
Fully Optioned

*Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

(E836xB - Option 014, UNL, 016, 080, and 081)

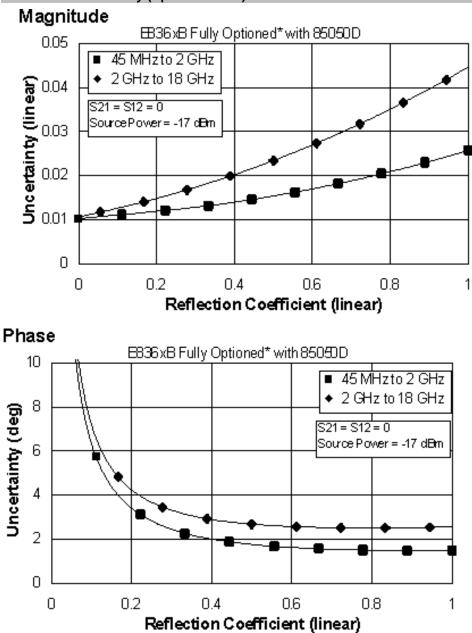
Applies to the, E836xB analyzers, 85050D (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	40	40
Source Match	39	35
Load Match	40	37
Reflection Tracking	±0.010	±0.100
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.025	±0.078
	+0.02/°C	+0.02/°C



Transmission Coefficient (dB)

*Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)



*Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

E836xB Corrected System Performance with Type-N Connectors

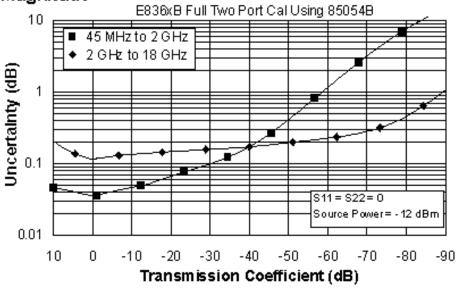
Table 21. 85054B Calibration KitStandard Configuration and Standard Power Range (E836xB)

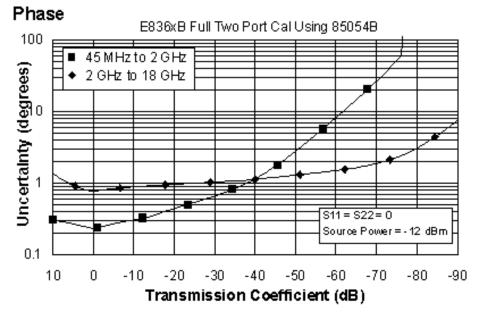
Applies to the, E836xB analyzers, 85054B (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	48	42
Source Match	45	33
Load Match	48	41
Reflection Tracking	±0.001	±0.015
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.006	±0.079
	+0.02/°C	+0.02/°C

Transmission Uncertainty (Specifications) Magnitude





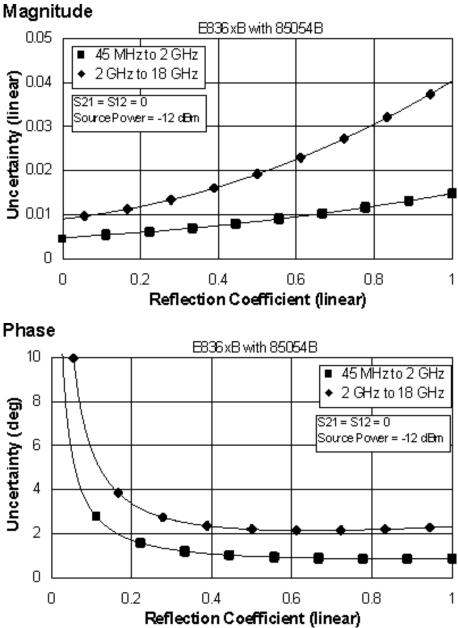


Table 22. 85054B Calibration Kit

Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

(E836xB - Option 014, UNL, 016, 080, and 081)

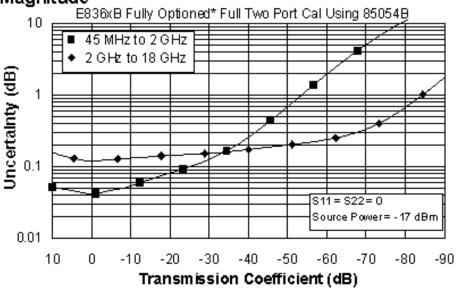
Applies to the, E836xB analyzers, 85054B (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

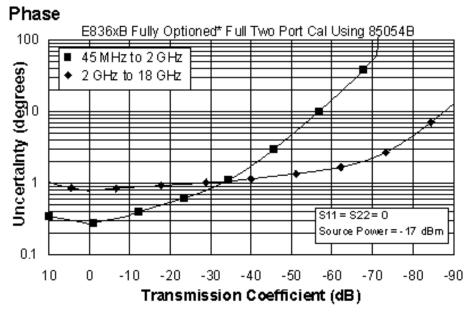
Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	48	42
Source Match	45	33
Load Match	48	41
Reflection Tracking	+0.001	+0.015

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

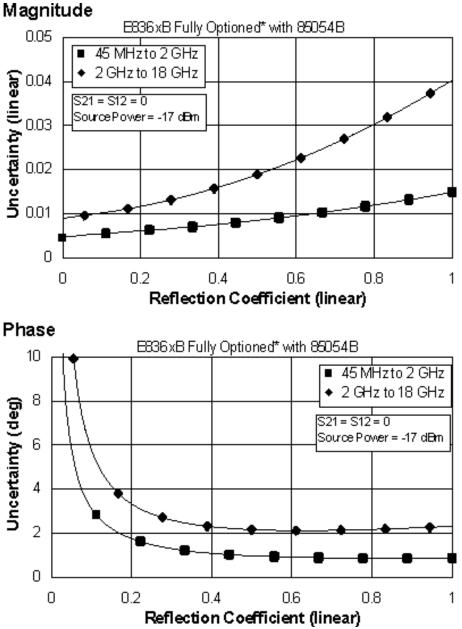
	2 GHz	18 GHz
Directivity	48	42
Source Match	45	33
Load Match	48	41
Reflection Tracking	±0.001	±0.015
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.011	±0.083
	+0.02/°C	+0.02/°C

Transmission Uncertainty (Specifications) Magnitude





* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)



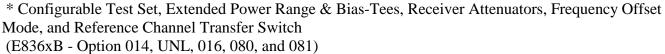


Table 23. 85054D Calibration Kit

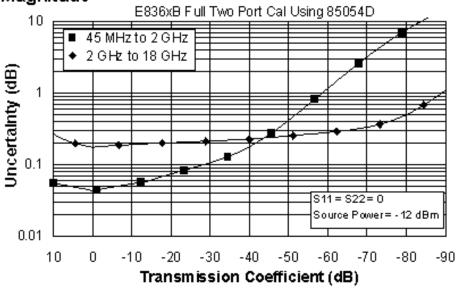
Standard Configuration and Standard Power Range (E836xB)

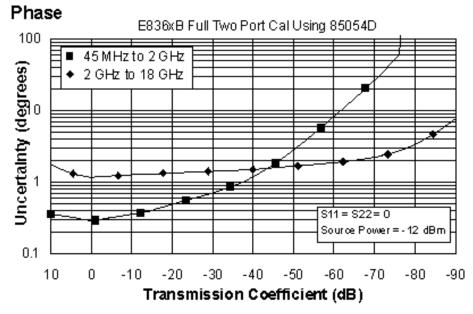
Applies to the, E836xB analyzers, 85054D (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	40	34
Source Match	39	29
Load Match	40	34
Reflection Tracking	±0.003	±0.027
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.013	±0.136
	+0.02/°C	+0.02/°C

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

Transmission Uncertainty (Specifications) Magnitude





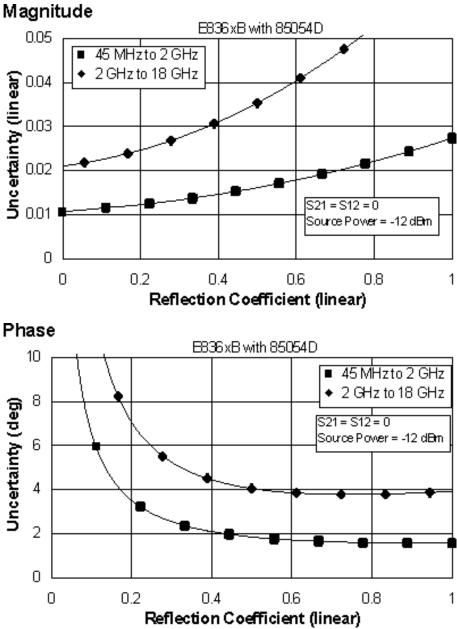


Table 24. 85054D Calibration Kit

Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

(E836xB - Option 014, UNL, 016, 080, and 081)

Applies to the, E836xB analyzers, 85054D (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

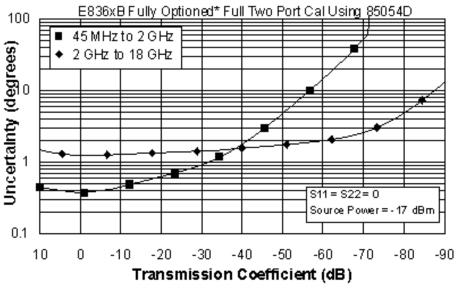
Environmental temperature 23° ±3 °C,	with < 1 °C deviation fro	m calibration temperature
--------------------------------------	---------------------------	---------------------------

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	40	34
Source Match	39	29
Load Match	40	34
Reflection Tracking	±0.003	±0.027
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.025	±0.145
	+0.02/°C	+0.02/°C

Transmission Uncertainty (Specifications)

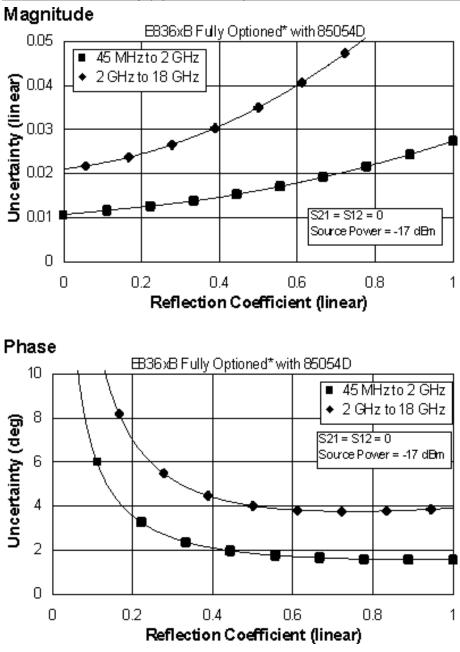
Magnitude E836xBFully Optioned*Full Two Port Cal Using 85054D 10 45 MHz to 2 GHz 2 GHz to 18 GHz ٠ Uncertainty (dB) 1 0.1 S11 = S22 = 0 Source Power= - 17 dBm 0.01 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 Transmission Coefficient (dB)





* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

(E836xB - Option 014, UNL, 016, 080, and 081)



* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

(E836xB - Option 014, UNL, 016, 080, and 081)

E8363/4B Corrected System Performance with WR-28 Connectors

R11644A Calibration Kit:

Table 25. R11644A Calibration KitStandard Configuration and Standard Power Range(E8363/4B)

Applies to the, E8363/4B analyzers, R11644A (WR-28) calibration kit, 85133F flexible test port cable set with the R281A and R281B launch sets with the R281A and R281B launch sets, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)	
	26.5 to	
	40 GHz	
Directivity	50	
Source Match	50	
Load Match	50	
Reflection Tracking	±0.000	
	+0.03/°C	
Transmission Tracking	±0.018	
	+0.03/°C	

Transmission Uncertainty (Specifications) Magnitude

1

0.1

10

0

-10

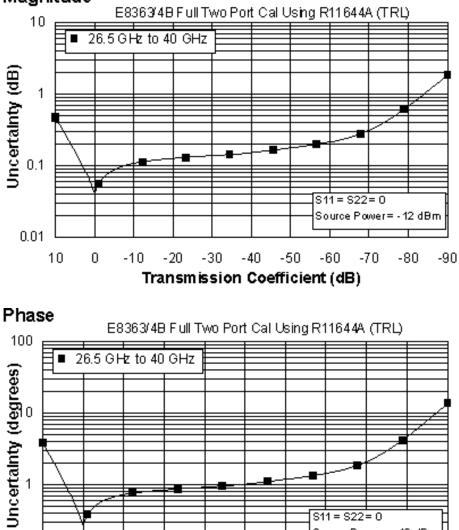
-20

-30

-40

Transmission Coefficient (dB)

-50



S11 = S22 = 0

-60

Source Power = -12 dBm

-80

-90

-70

Reflection Uncertainty (Specifications) Magnitude

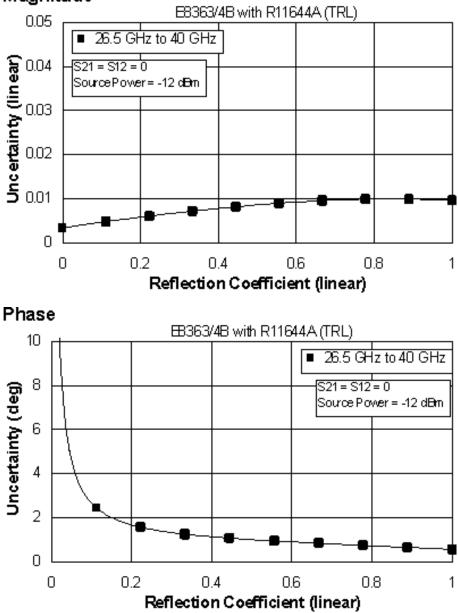


Table 26. R11644A Calibration Kit

Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

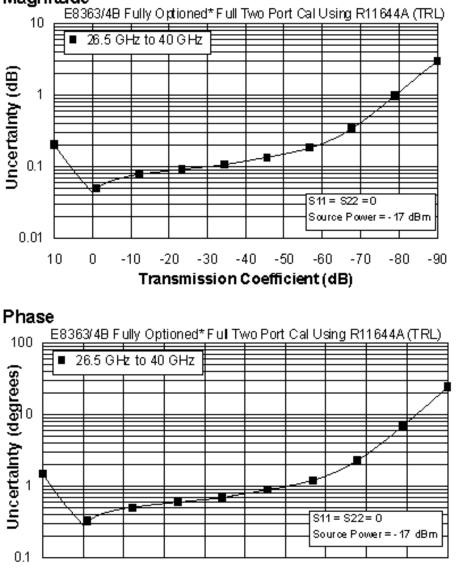
(E836xB - Option 014, UNL, 016, 080, and 081)

Applies to the, E8363/4B analyzers, R11644A (WR-28) calibration kit, 85133F flexible test port cable set with the R281A and R281B launch sets, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)	
	26.5 to	
	40 GHz	
Directivity	50	
Source Match	50	
Load Match	50	
Reflection Tracking	±0.000	
	+0.03/°C	
Transmission Tracking	±0.019	
	+0.03/°C	

Transmission Uncertainty (Specifications)



* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

-60

-70

-80

-90

10

0

-10

-20

-30

-40

Transmission Coefficient (dB)

-50

Magnitude B363/4B Fully Optioned* with R11644A (TRL) 0.05 26.5 GHz to 40 GHz Uncertainty (linear) 0.04 S21 = S12 = 0 SourcePower= -17 dBm 0.03 0.02 0.01 0 0 0.2 0.4 0.6 0.8 1 **Reflection Coefficient (linear)** Phase BB363/4B Fully Optioned* with R11644A(TRL) 10 26.5 GHz to 40 GHz 8 S21 = S12 = 0 Uncertainty (deg) Source Power = -17 dBm 6 4 2 0 0.8 0 0.2 0.4 0.6 1 Reflection Coefficient (linear)

* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

E8363/4B Corrected System Performance with WR-42 Connectors

K11644A Calibration Kit:

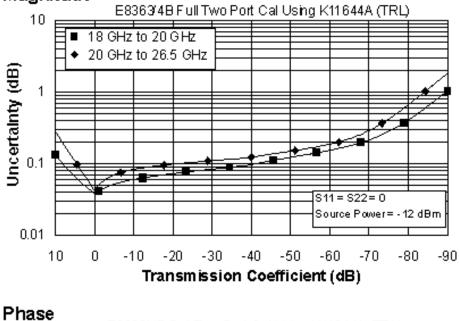
Table 27. K11644A Calibration KitStandard Configuration and Standard Power Range(E8363/4B)

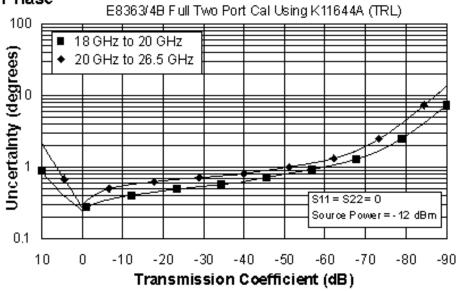
Applies to the, E8363/4B analyzers, K11644A (WR-42) calibration kit, 85134F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, wit	th < 1 °C deviation from calibration temperature
--	--

Description	Specification (dB)		
	18 to	20 to	
	20 GHz	26.5 GHz	
Directivity	50	50	
Source Match	50	50	
Load Match	50	50	
Reflection Tracking	±0.000	±0.000	
	+0.02/°C	+0.02/°C	
Transmission Tracking	±0.014	±0.018	
	+0.02/°C	+0.02/°C	

Transmission Uncertainty (Specifications) Magnitude





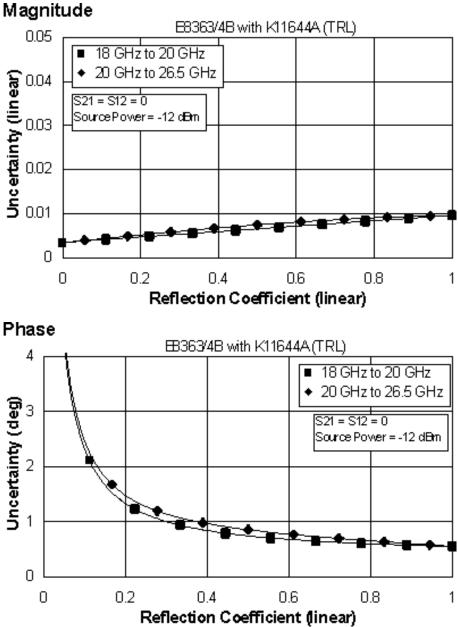


Table 28. K11644A Calibration Kit

Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

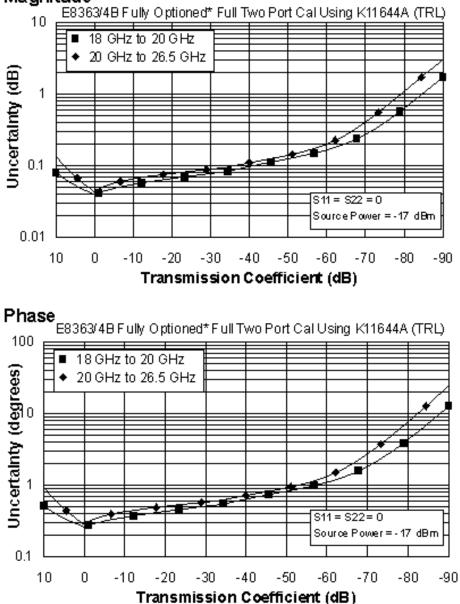
(E836xB - Option 014, UNL, 016, 080, and 081)

Applies to the, E8363/4B analyzers, K11644A (WR-42) calibration kit, 85134F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

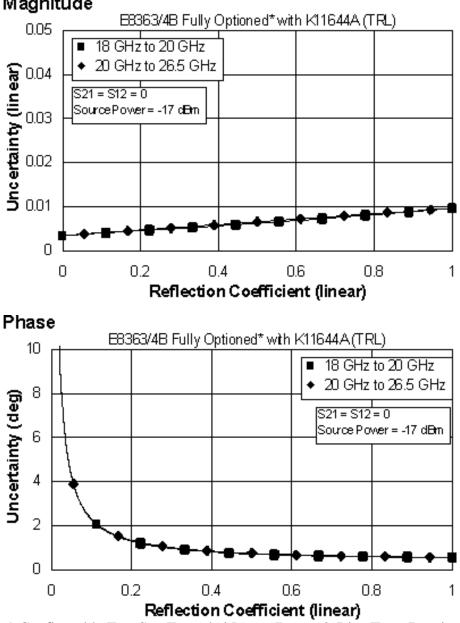
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)		
	18 to	20 to	
	20 GHz	26.5 GHz	
Directivity	50	50	
Source Match	50	50	
Load Match	50	50	
Reflection Tracking	±0.000	±0.000	
	+0.02/°C	+0.02/°C	
Transmission Tracking	±0.016	±0.019	
	+0.02/°C	+0.02/°C	

Transmission Uncertainty (Specifications)



* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)



* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

E836xB Corrected System Performance with WR-62 Connectors

P11644A Calibration Kit:

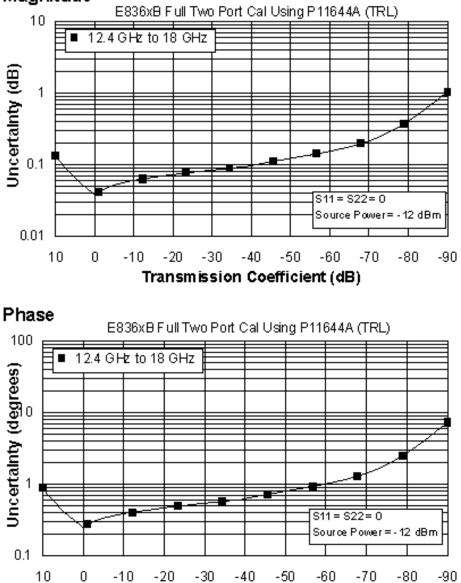
Table 29. P11644A Calibration KitStandard Configuration and Standard Power Range(E836xB)

Applies to the, E836xB analyzers, R11644A (WR-62) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)	
	12.4 to	
	18 GHz	
Directivity	50	
Source Match	50	
Load Match	50	
Reflection Tracking	±0.000	
	+0.02/°C	
Transmission Tracking	±0.014	
	+0.02/°C	

Transmission Uncertainty (Specifications) Magnitude



Transmission Coefficient (dB)

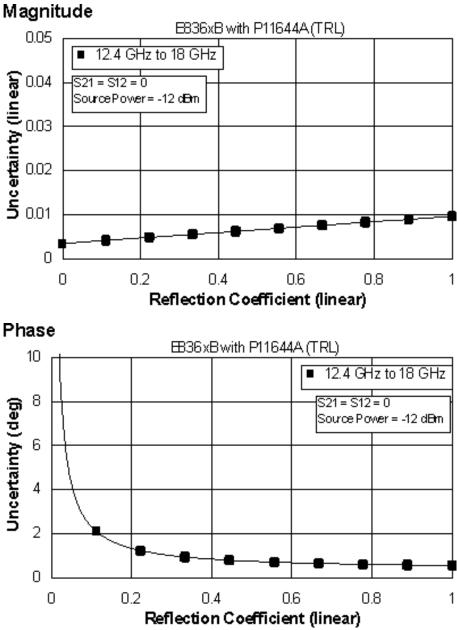


Table 30. P11644A Calibration Kit

Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

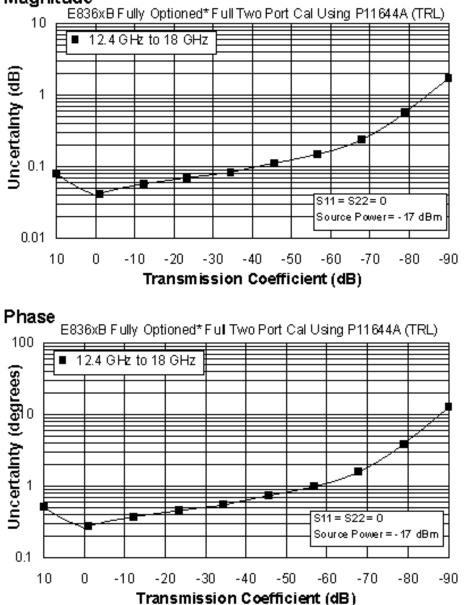
(E836xB - Option 014, UNL, 016, 080, and 081)

Applies to the, E836xB analyzers, P11644A (WR-62) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

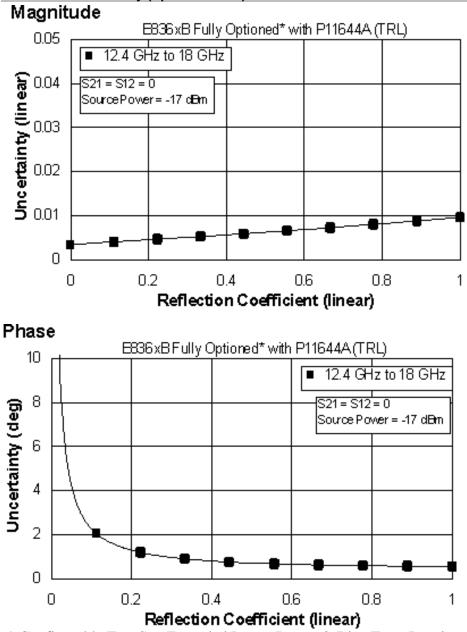
Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)
	12.4 to
	18 GHz
Directivity	50
Source Match	50
Load Match	50
Reflection Tracking	±0.000
	+0.02/°C
Transmission Tracking	±0.016
	+0.02/°C

Transmission Uncertainty (Specifications) Magnitude



* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)



* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

E836xB Corrected System Performance with WR-90 Connectors

 Table 31. X11644A Calibration Kit

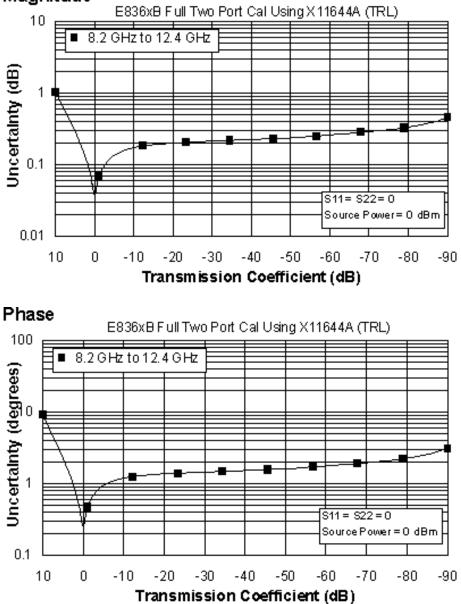
 Standard Configuration and Standard Power Range
 (E836xB)

Applies to the, E836xB analyzers, X11644A (WR-90) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)
	8.2 to
	12.4 GHz
Directivity	50
Source Match	50
Load Match	50
Reflection Tracking	±0.000
	+0.02/°C
Transmission Tracking	±0.014
	+0.02/°C

Transmission Uncertainty (Specifications) Magnitude



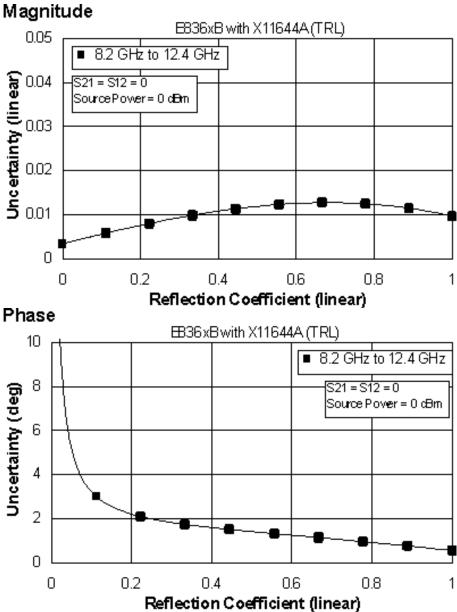


Table 32. X11644A Calibration Kit

Fully Optioned

Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch

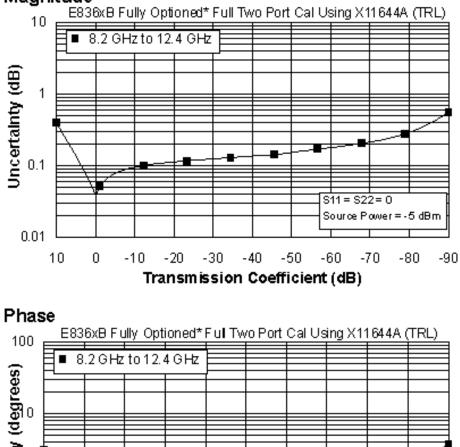
(E836xB - Option 014, UNL, 016, 080, and 081)

Applies to the, E836xB analyzers, X11644A (WR-90) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23° \pm 3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)	
	8.2 to	
	12.4 GHz	
Directivity	50	
Source Match	50	
Load Match	50	
Reflection Tracking	±0.000	
	+0.02/°C	
Transmission Tracking	±0.016	
	+0.02/°C	

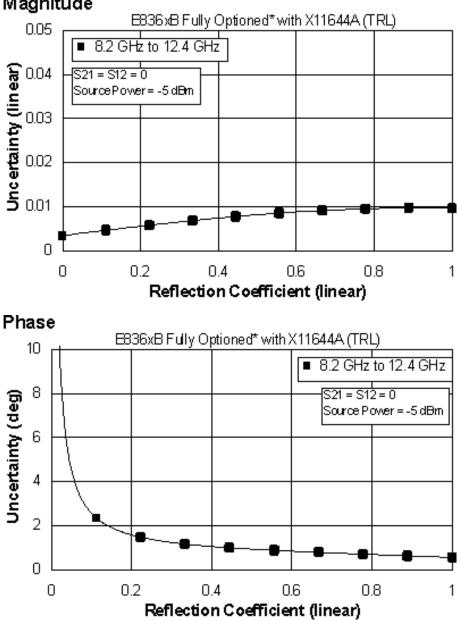
Transmission Uncertainty (Specifications) Magnitude



Uncertainty (degrees) S11 = S22 = 0 Source Power = -5 dBm 0.1 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 Transmission Coefficient (dB)

* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

Reflection Uncertainty (Specifications) Magnitude



* Configurable Test Set, Extended Power Range & Bias-Tees, Receiver Attenuators, Frequency Offset Mode, and Reference Channel Transfer Switch (E836xB - Option 014, UNL, 016, 080, and 081)

Table 33. Uncorrected System Performance^a

Description	Specification	Supplemental Information
Directivity		
10 MHz to 45 MHz ^b	23 dB	
45 MHz to 2 GHz	24 dB	
2 GHz to 10 GHz	22 dB	
10 GHz to 20 GHz	16 dB	
20 GHz to 40 GHz	16 dB	
40 GHz to 45 GHz	15 dB	
45 GHz to 50 GHz	13 dB	
Source Match - Standard	k	
10 MHz to 45 MHz ^b	11 dB	
45 MHz to 2 GHz	23 dB	
2 GHz to 10 GHz	16 dB	
10 GHz to 20 GHz	14 dB	
20 GHz to 40 GHz	10 dB	
40 GHz to 45 GHz	9 dB	
45 GHz to 50 GHz	7.5 dB	
Source Match - Opt UNL		
10 MHz to 45 MHz ^b	11 dB	
45 MHz to 2 GHz	18 dB	
2 GHz to 10 GHz	14 dB	
10 GHz to 20 GHz	12 dB	
20 GHz to 40 GHz	9 dB	
40 GHz to 45 GHz 45 GHz to 50 GHz	8 dB 6 dB	
Load Match - Standard	0 00	
10 MHz to 45 MHz ^b	11 dB	1
45 MHz to 2 GHz	23 dB	
2 GHz to 10 GHz	14 dB	
10 GHz to 20 GHz	10 dB	
20 GHz to 40 GHz	9 dB	
40 GHz to 45 GHz	9 dB	
45 GHz to 50 GHz	8 dB	
Load Match - Opt UNL, 0		
10 MHz to 45 MHz ^b	11 dB	
45 MHz to 2 GHz	17 dB	
2 GHz to 10 GHz	13 dB	
10 GHz to 20 GHz	10 dB	
20 GHz to 40 GHz	9 dB	
40 GHz to 45 GHz	9 dB	
45 GHz to 50 GHz	7 dB	
Reflection Tracking		
		Typical:
10 MHz to 45 MHz		±1.5 dB
45 MHz to 20 GHz		±1.5 dB
20 GHz to 40 GHz		±1.5 dB
40 GHz to 50 GHz		±2.0 dB

Transmission Tracking ^c		
		Typical:
10 MHz to 45 MHz		±3.0 dB
45 MHz to 2 GHz		±1.5 dB
2 GHz to 10 GHz		±2.0 dB
10 GHz to 20 GHz		±2.5 dB
20 GHz to 40 GHz		±3.5 dB
40 GHz to 45 GHz		±4.0 dB
45 GHz to 50 GHz		±4.5 dB
Crosstalk ^d - Standard		
10 MHz to 45 MHz ^b	-65 dB	
45 MHz to 1 GHz	-85 dB	
1 GHz to 2 GHz	-100 dB	
2 GHz to 20 GHz	-110 dB	
20 GHz to 40 GHz	-108 dB	
40 GHz to 45 GHz	-105 dB	
45 GHz to 50 GHz	-100 dB	
Crosstalk ^d - Option UNL	or 014	
10 MHz to 45 MHz ^b	-65 dB	
45 MHz to 1 GHz	-85 dB	
1 GHz to 2 GHz	-100 dB	
2 GHz to 20 GHz	-109 dB	
20 GHz to 40 GHz	-106 dB	
40 GHz to 45 GHz	-103 dB	
45 GHz to 50 GHz	-98 dB	
Crosstalk ^d - Option 014/	UNL	
10 MHz to 45 MHz ^b	-65 dB	
45 MHz to 1 GHz	-85 dB	
1 GHz to 2 GHz	-98 dB	
2 GHz to 10 GHz	-108 dB	
10 GHz to 20 GHz	-107 dB	
20 GHz to 40 GHz	-104 dB	
40 GHz to 45 GHz	-100 dB	
45 GHz to 50 GHz	-95 dB	
Crosstalk - Option 080 e	nabled ^{b,e}	
		Typical:
10 MHz to 45 MHz		-65
45 MHz to 1 GHz		-85
1 GHz to 2 GHz		-100
2 GHz to 10 GHz		-109
10 GHz to 20 GHz		-110
20 GHz to 40 GHz		-106
40 GHz to 45 GHz		-103
45 GHz to 50 GHz		-98

^a Specifications apply over environment temperature of 23°C +/- 3°C, with less than 1°C deviation from the calibration temperature.

^b Typical performance.

^cTransmission tracking performance is strongly dependent on cable used. These typical specifications are based on the use of the Agilent thru cable (part number 85133-60016).

^d Measurement conditions: normalized to a thru, measured with two shorts, 10 Hz IF bandwidth, averaging factor of 8, alternate mode, source power set to the lesser of the maximum power out or the maximum receiver power.

^e 0 Hz offset.

Table	34.	Test Port Output ^a	
-------	-----	-------------------------------	--

	Specificatio	n			Supplemental
· · · ·		n			Supplemental
Frequency F				0 (0 (// 1))	
	Standard	Opt 014	Opt UNL	Opt 014/UNL	
E8362B	10 MHz to 20				
E8363B	10 MHz to 40				
E8364B	10 MHz to 50) GHz			
Nominal Pov		-			
E8362B	0 dBm	-5 dBm	-5 dBm	-5 dBm	
E8363/4B	-12 dBm	-17 dBm	-17 dBm	-17 dBm	
Frequency F	Resolution				
	1 Hz				
CW Accurac	ÿ				·
	+/-1 ppm				
Frequency S					
	,				+/-1 ppm. 0° to 40° C, typical
					+/-0.2 ppm/yr, typical
Power Leve					
10 MHz to	+/-2.0 dB	+/-2.0 dB	+/-2.0 dB	+/-2.0 dB	
45 MHz ^c	17 2.0 GB	17 2.0 GB	17 2.0 00	17 2.0 00	
45 MHz to	+/-1.5 dB	+/-1.5 dB	+/-1.5 dB	+/-1.5 dB	Variation from nominal
10 GHz	+/-1.5 UD	+/-1.5 UD	+/-1.5 UD	+/-1.5 UD	power in range 0 (step
10 GHz to	+/-2.0 dB	+/-2.0 dB	+/-2.0 dB	+/-2.0 dB	attenuator at 0 dB)
20 GHz	+/-2.0 UD	+/-2.0 UD	+/-2.0 UD	+/-2.0 UD	
20 GHz to	+/-3.0 dB	+/-3.0 dB	+/-3.0 dB	+/-3.0 dB	-
40 GHz 10	+/-3.0 uB	+/-3.0 ub	+/-3.0 ub	+/-3.0 ub	
40 GHz to	1/20dB			+/-3.5 dB	-
40 GHZ 10 45 GHz	+/-3.0 dB	+/-3.5 dB	+/-3.0 dB	+/-3.5 UD	
45 GHz to	+/-3.0 dB	+/-4.0 dB	+/-3.0 dB	+/-4.0 dB	-
45 GHZ 10 50 GHz	+/-3.0 UD	+/-4.0 UD	+/-3.0 UD	+/-4.0 UD	
	Linearity				
Power Leve	+/-1.0 dB ^d	+/-1.0 dB ^d	+/-1.0 dB ^d	+/-1.0 dB ^d	To at materia as is at the
10 MHz to	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	Test reference is at the
45 MHz ^c					nominal power level (step
45 MHz to	+/-1.0 dB ^d	+/-1.0 dB ^d	+/-1.0 dB ^d	+/-1.0 dB ^d	attenuator at 0 dB)
20 GHz					_
20 GHz to	+/-1.0 dB ^d	+/-1.0 dB ^d	+/-1.0 dB ^d	+/-1.0 dB ^d	
40 GHz			(4 0 15		_
40 GHz to	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	
50 GHz	A				
Power Rang					
10 MHz to	-25 to	-25 to	-85 to	-85 to	
45 MHz ^c	+2 dBm	+2 dBm	+2 dBm	+2 dBm	
45 MHz to	-25 to	-25 to	-87 to	-87 to	
10 GHz	+5 dBm	+5 dBm	+3 dBm	+3 dBm	
10 GHz to	-24 to	-25 to	-86 to	-87 to	
20 GHz	+3 dBm	+2 dBm	+1 dBm	0 dBm	
20 GHz to	-23 to	-25 to	-85 to	-87 to	
30 GHz	0 dBm	-2 dBm	-2 dBm	-4 dBm	
30 GHz to	-23 to	-25 to	-85 to	-87 to	
40 GHz	-4 dBm	-6 dBm	-6 dBm	-8 dBm	
40 GHz to	-25 to	-27 to	-87 to	-87 to	
45 GHz	-5 dBm	-7 dBm	-9 dBm	-11 dBm	
45 GHz to	-25 to	-27 to	-87 to	-87 to	
50 GHz	-10 dBm	-12 dBm	-15 dBm	-17 dBm	

Power Swee	ep Range (<i>I</i>	ALC)			
10 MHz to	27 dB	27 dB	27 dB	27 dB	
45 MHz ^c					
45 MHz to	30 dB	30 dB	30 dB	30 dB	ALC range starts at
10 GHz					maximum leveled output
10 GHz to	27 dB	27 dB	27 dB	27 dB	power and decreases by
20 GHz					power level indicated in the
20 GHz to	23 dB	23 dB	23 dB	23 dB	table.
30 GHz					
30 GHz to	19 dB	19 dB	19 dB	19 dB	
40 GHz					
40 GHz to	20 dB	20 dB	18 dB	16 dB	
45 GHz					
45 GHz to	15 dB	15 dB	12 dB	10 dB	
50 GHz					
Power Reso	lution	·			
	0.01 dB				
Phase Noise	9				
1 kHz offset	from center	er frequency,	nominal powe	er at test port	
					Typical:
10 MHz to					-60 dBc
10 GHz					
10 GHz to					-55 dBc
20 GHz					
20 GHz to					-50 dBc
50 GHz					
1 kHz offset	from center	er frequency,	nominal powe	er at test port - 0	Option 080 enabled
					Typical:
10 MHz to					-60 dBc
10 GHz					
10 GHz to					-60 dBc
20 GHz					
20 GHz to					-50 dBc
50 GHz					
10 kHz offse	et from cen	iter frequency	, nominal pow	ver at test port	
					Typical:
10 MHz to					-70 dBc
45 MHz					
45 MHz to					-70 dBc
10 GHz					
10 GHz to					-65 dBc
20 GHz					
20 GHz to					-55 dBc
40 GHz					
40 GHz to					-55 dBc
50 GHz					

10 kHz offset from center frequency, nom	ninal power at test port - Option 080 enabled
	Typical:
10 MHz to	-70 dBc
45 MHz	
45 MHz to	-70 dBc
10 GHz	
10 GHz to	-65 dBc
20 GHz	
20 GHz to	-55 dBc
40 GHz	
40 GHz to	-55 dBc
50 GHz	
100 kHz offset from center frequency, no	minal power at test port
	Typical:
10 MHz to	-60 dBc
10 GHz	
10 GHz to	-55 dBc
20 GHz	
20 GHz to	-50 dBc
50 GHz	00 420
	minal power at test port - Option 080 enabled
10 MHz to	-75 dBc
10 GHz	10 dB0
10 GHz to	-70 dBc
20 GHz	70 460
20 GHz to	-65 dBc
50 GHz	00 020
1 MHz offset from center frequency, nom	inal power at test port
	Typical:
10 MHz to	-106 dBc
10 GHz	
10 GHz to	-103 dBc
20 GHz	-103 060
20 GHz to	-90 dBc
50 GHz	-90 000
	inal power at test port - Option 080 enabled
T WITZ OTSECTION CENter frequency, nom	Typical:
10 MHz to	-103 dBc
10 GHz	
10 GHz to	
	-97 dBc
20 GHz	
20 GHz to 50 GHz	-85 dBc
Harmonics (2nd or 3rd)	
	-23 dBc typical, in power
	range 0

Non-Harmonic Spurious (at Nominal Output Power)				
10 MHz to	-50 dBc typical, for offset			
45 MHz	frequency > 1 kHz			
45 MHz to	-50 dBc typical, for offset			
20 GHz	frequency > 1 kHz			
20 GHz to	-30 dBc typical, for offset			
40 GHz	frequency > 1 kHz			
40 GHz to	-30 dBc typical, for offset			
50 GHz	frequency > 1 kHz			

^a Source output performance on Port 1 only. Port 2 output performance is typical.

^b Preset power.

^c Typical performance.

^d 1.5 dB for power <= -23 dBm.

^e Power to which the source can be set and phase lock is assured.

Table 35: Test F Description	Specification					
Decemption	Standard	Opt 014	Opt UNL	Opt 014/UNL	Supplemental	
Test Port Nois	se Floor ^a					
10 Hz IF Band						
10 MHz to	<-77 dBm	<-77 dBm	<-77 dBm	<-77 dBm		
45 MHz ^b						
45 MHz to	<-89 dBm	<-89 dBm	<-89 dBm	<-89 dBm		
500 MHz ^c						
500 MHz to	<-114 dBm	<-114 dBm	<-114 dBm	<-114 dBm		
2 GHz						
2 GHz to	<-117 dBm	<-117 dBm	<-117 dBm	<-117 dBm		
10 GHz						
10 GHz to	<-120 dBm	<-119 dBm	<-120 dBm	<-119 dBm		
20 GHz						
20 GHz to	<-114 dBm	<-113 dBm	<-114 dBm	<-113 dBm	Option 016	
40 GHz					degrades	
40 GHz to	<-114 dBm	<-112 dBm	<-114 dBm	<-112 dBm	 performance by 2 dB. 	
50 GHz					-	
1 KHz IF Band						
10 MHz to	<-57 dBm	<-57 dBm	<-57 dBm	<-57 dBm		
45 MHz ^b						
45 MHz to	<-69 dBm	<-69 dBm	<-69 dBm	<-69 dBm		
500 MHz ^c						
500 MHz to	<-94 dBm	<-94 dBm	<-94 dBm	<-94 dBm		
2 GHz						
2 GHz to	<-97 dBm	<-97 dBm	<-97 dBm	<-97 dBm		
10 GHz						
10 GHz to	<-100 dBm	<-99 dBm	<-100 dBm	<-99 dBm		
20 GHz						
20 GHz to	<-94 dBm	<-93 dBm	<-94 dBm	<-93 dBm	Option 016	
40 GHz					degrades performance by	
40 GHz to	<-94 dBm	<-92 dBm	<-94 dBm	<-92 dBm	2 dB.	
50 GHz						

Test Port Nois	Test Port Noise Floor ^{a,b} Option 080 enabled ^d							
	10 Hz IF Bandwidth							
10 MHz to	<-77 dBm	<-77 dBm	<-77 dBm	<-77 dBm				
45 MHz ^b								
45 MHz to	<-88 dBm	<-88 dBm	<-88 dBm	<-88 dBm				
500 MHz ^c								
500 MHz to	<-113 dBm	<-113 dBm	<-113 dBm	<-113 dBm				
2 GHz								
2 GHz to	<-116 dBm	<-116 dBm	<-116 dBm	<-116 dBm				
10 GHz								
10 GHz to	<-118 dBm	<-118 dBm	<-118 dBm	<-118 dBm				
20 GHz								
20 GHz to	<-112 dBm	<-112 dBm	<-112 dBm	<-112 dBm	Option 016			
40 GHz					degrades			
40 GHz to	<-111 dBm	<-111 dBm	<-111 dBm	<-111 dBm	performance by 2 dB.			
50 GHz					2 00.			
1 KHz IF Band			-	-	·			
10 MHz to	<-57 dBm	<-57 dBm	<-57 dBm	<-57 dBm				
45 MHz ^b								
45 MHz to	<-68 dBm	<-68 dBm	<-68 dBm	<-68 dBm				
500 MHz ^c								
500 MHz to	<-93 dBm	<-93 dBm	<-93 dBm	<-93 dBm				
2 GHz								
2 GHz to	<-96 dBm	<-96 dBm	<-96 dBm	<-96 dBm				
10 GHz								
10 GHz to	<-98 dBm	<-98 dBm	<-98 dBm	<-98 dBm				
20 GHz								
20 GHz to	<-92 dBm	<-92 dBm	<-92 dBm	<-92 dBm	Option 016			
40 GHz					degrades			
40 GHz to	<-91 dBm	<-91 dBm	<-91 dBm	<-91 dBm	performance by 2 dB.			
50 GHz								

Input Noise Floor ^{a,b}		
•		
<-127 dBm	<-127 dBm	
<-127 dBm	<-127 dBm	
<-133 dBm	<-133 dBm	
<-132 dBm	<-132 dBm	
<-134 dBm	<-134 dBm	
<-125 dBm	<-125 dBm	Option 016
		degrades
<-123 dBm	<-123 dBm	performance by 2 dB.
		2 UD.
<-107 dBm	<-107 dBm	
<-107 dBm	<-107 dBm	
<-113 dBm	<-113 dBm	
<-112 dBm	<-112 dBm	
<-114 dBm	<-114 dBm	
<-105 dBm	<-105 dBm	Option 016
		degrades
<-103 dBm	<-103 dBm	performance by 2 dB.
		2 00.
Input Noise Floor ^{a,b} - Option 08	30 enabled ^d	
	1	
<-127 dBm	<-127 dBm	
<-120 dBitt	<-120 UDIII	
<-132 dBm	<-132 dBm	
<-131 dBm	<-131 dBm	
<-133 dBm	<-133 dBm	
	404 10	Ontion 010
<-124 dBm	<-124 abm	Option 016 degrades
<-122 dBm	<-122 dBm	performance by
		2 dB.
	<-127 dBm	-127 dBm <-127 dBm

1 KHz IF Bandw	ridth				
10 MHz to 45		7 dBm	<-1	07 dBm	
MHz					
45 MHz to	<-106 dBm <-106 dBm			06 dBm	
500 MHz ^c					
500 MHz to 2	<-112	2 dBm	<-1	12 dBm	
GHz					
2 GHz to	<-11	1 dBm	<-1	11 dBm	
10 GHz					
10 GHz to	<-113	3 dBm	<-1	13 dBm	
20 GHz					
20 GHz to	<-104	4 dBm	<-1	04 dBm	Option 016
40 GHz					degrades
40 GHz to	<-102	2 dBm	<-1	02 dBm	performance by 2 dB.
50 GHz					2 UD.
Receiver Comp	ression Level				
10 MHz to 45 MHz ^b	<0.45 dB compression	at +5 dBm			
45 MHz to 20 GHz	<0.45 dB compression				
20 GHz to	<0.45 dB compression				
30 GHz					
30 GHz to	<0.45 dB compression				
40 GHz					
40 GHz to	<0.45 dB compression	at -3 dBm			
50 GHz					
System Compre	ession Level				
	maximum output powe	er			See dynamic
					accuracy table
Third Order Inte	rcept - Tone spacing	from 100 kHz -	5 MHz		<u> </u>
10 MHz to 150 MHz					+38 dBm
150 MHz to 300 MHz					+34 dBm
300 MHz to 500 MHz			+30 dBm		
500 MHz to 20	+22 dBm v				
GHz					two -7 dBm tones
20 to 40 GHz					+18 dBm with two -15 dBm tones
40 to 50 GHz					+15 dBm with two -21 dBm tones
L					

Third Order Int	ercept - Tone spacing from 5 MHz - 20 MHz	
		Typical
10 MHz to 500 MHz		+20 dBm with two -7 dBm tones
500 MHz to 20 GHz		+20 dBm with two -7 dBm tones
20 to 40 GHz		+15 dBm with two -15 dBm tones
40 to 50 GHz		+15 dBm with two -21 dBm tones
Third Order Int	ercept - Tone spacing from 20 MHz - 50 MHz	
		Typical
10 MHz to 500 MHz		+24 dBm with two -7 dBm tones
500 MHz to 20 GHz		+24 dBm with two -7 dBm tones
20 to 40 GHz		+20 dBm with two -15 dBm tones
40 to 50 GHz		+20 dBm with two -21 dBm tones
Trace Noise M	agnitude	
	idth. Ratio measurement, nominal power at test port.	
10 MHz to 45 MHz ^b	<0.050 dB rms	
45 MHz to 500 MHz ^e	<0.010 dB rms	
500 MHz to 20 GHz	<0.006 dB rms	
20 GHz to 40 GHz	<0.006 dB rms	
40 GHz to 50 GHz	<0.006 dB rms	

Trace Noise Magnitude 1 kHz IF bandwidth. Ratio 10 MHz to <0.060 c 45 MHz ^b 45 MHz to <0.010 c 500 MHz ^e 500 MHz to <0.006 c 20 GHz 20 GHz to <0.007 c 40 GHz	measurement, nominal power at test port. IB rms IB rms IB rms	
10 MHz to <0.060 c 45 MHz ^b 45 MHz to <0.010 c 500 MHz ^e 500 MHz to <0.006 c 20 GHz <0.007 c	IB rms IB rms IB rms	
45 MHz to <0.010 c 500 MHz ^e 500 MHz to <0.006 c 20 GHz 20 GHz to <0.007 c	IB rms	
500 MHz ^e 500 MHz to 20 GHz to 20 GHz to	IB rms	
500 MHz to <0.006 c 20 GHz 20 GHz to <0.007 c		
20 GHz 20 GHz to <0.007 c		
20 GHz to <0.007 c	IB rms	
	IB rms	
40 GHz		
40 GHz to <0.008 c	IB rms	
50 GHz		
Trace Noise Phase		
1 kHz IF bandwidth. Ratio	measurement, nominal power at test port.	
10 MHz to <0.350°	rms	
45 MHz ^b		
45 MHz to <0.100°	rms	
500 MHz		
500 MHz to <0.060°	rms	
20 GHz		
20 GHz to <0.100°	rms	
40 GHz		
40 GHz to <0.100°	rms	
50 GHz		
Trace Noise Phase - Opt	ion 080 enabled ^{b,d}	
	measurement, nominal power at test port.	
10 MHz to <0.350°	rms	
45 MHz		
45 MHz to <0.100°	rms	
500 MHz ^e		
500 MHz to <0.060°	rms	
20 GHz		
20 GHz to <0.100°	rms	
40 GHz		
40 GHz to <0.100°	rms	
50 GHz		
Reference Level Magnitu		
Range +/-200 d Resolution 0.001 dE		
Resolution 0.001 dE Reference Level Phase		
Range +/-500°		
Resolution 0.01°		

Stability Magnitude ^d	
Typical ratio measurement, made at the test port.	
10 MHz to	+/-0.05 dB/°C
45 MHz	
45 MHz to	+/-0.02 dB/°C
20 GHz	
20 GHz to	+/-0.03 dB/°C
40 GHz	
40 GHz to	+/-0.04 dB/°C
50 GHz	
Stability Phase ^d	
Typical ratio measurement, measured at the test port	
10 MHz to	+/-0.5°/°C
45 MHz	(0.00/20
45 MHz to	+/-0.2°/°C
20 GHz	
20 GHz to	+/-0.5°/°C
40 GHz	
40 GHz to	+/-0.8°/°C
50 GHz	
Damage Input Level	T T
Test Port 1	+20 dBm or
and 2	+/-40 VDC,
	typical
R1, R2 in	+15 dBm or
	+/-15 VDC, typical
A, B in	+15 dBm or
	+/3 dBm of +/-15 VDC,
	typical
Coupler Thru	+30 dBm or
(Option 014 or	+/-40 VDC,
UNL/014)	typical
Coupler Arm	+30 dBm or
(Option 014 or	+/-7 VDC,
UNL/014)	typical

^aTotal average (rms) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.

^bTypical performance.

^cNoise floor may be degraded by 10 dB at particular frequencies (multiples of 5 MHz) due to spurious receiver residuals.

^d0 Hz offset

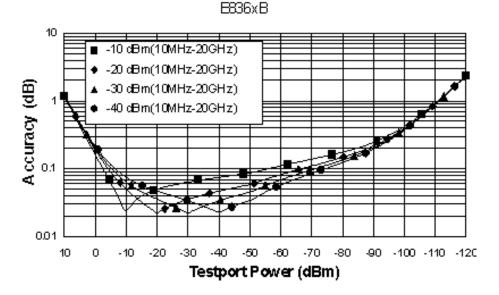
^eTrace noise magnitude may be degraded to 20 mdB rms at harmonic frequencies of the first IF (8.33 MHz) below 80 MHz.

^fStability is defined as a ratio measurement made at the test port.

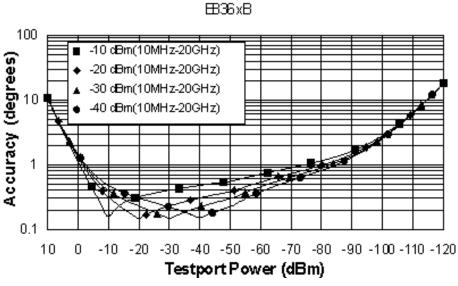
Table 36. Dynamic Accuracy (Specification^a)

Accuracy of the test port input power reading relative to the reference input power level.

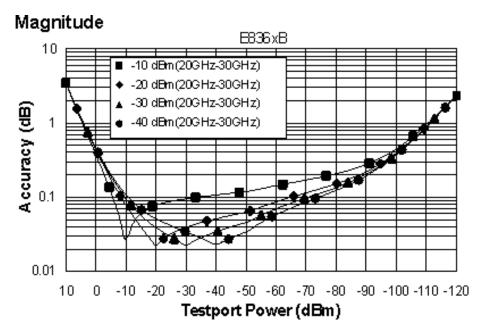
Magnitude*



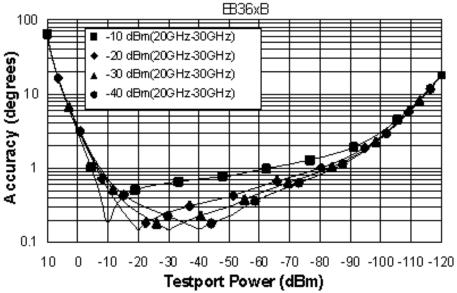


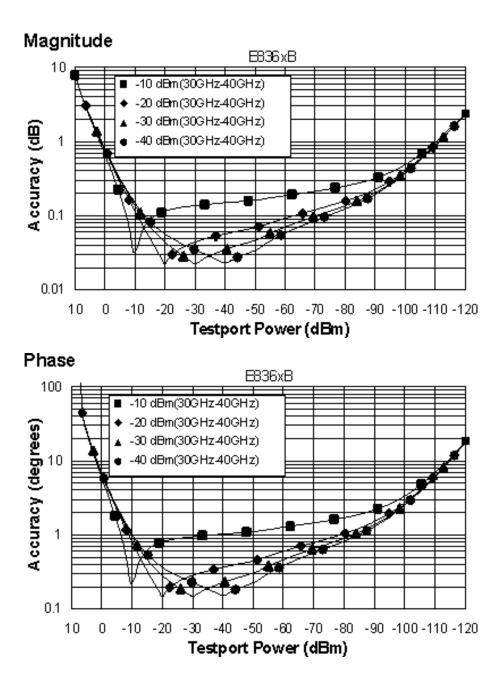


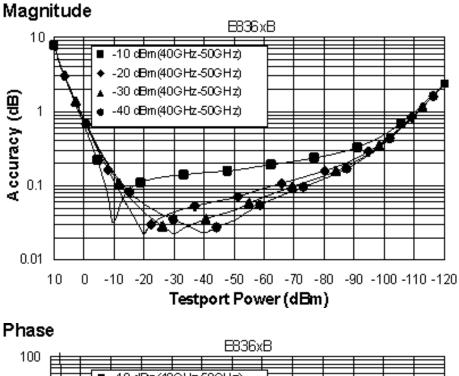
^{*}Below 800 MHz the coupling factor rolls off 20 dB per decade causing a shift in the dynamic accuracy curves. Please see the Uncertainty Calculator (<u>http://www.agilent.com/find/na_calculator</u>) for detailed compression values.

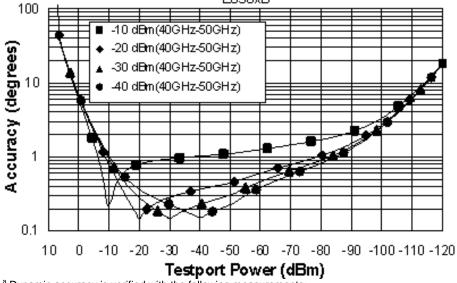












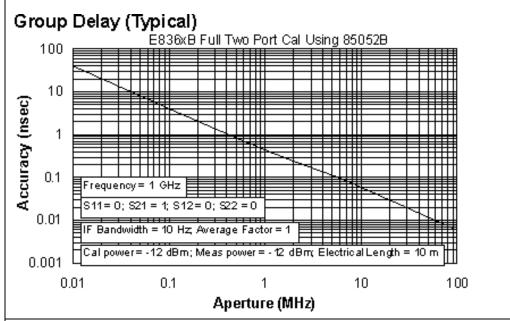
^a Dynamic accuracy is verified with the following measurements:

- compression over frequency
- IF linearity at a single frequency of 1.195 GHz and a reference level of -20 dBm

Table 37. Test Port Input (Group Delay)^a

Description	Specification	Supplemental Information
Aperture (selectable)	(frequency span)/(number of points -	
	1)	
Maximum Aperture	20% of frequency span	
Range	0.5 x (1/minimum aperture)	
Maximum Delay		Limited to measuring no more than
		180° of phase change within the
		minimum aperture.)
Accuracy		See graph below. Char.

The following graph shows characteristic group delay accuracy with full 2-port calibration and a 10 Hz IF bandwidth. Insertion loss is assumed to be < 2 dB and electrical length to be ten meters.



In general, the following formula can be used to determine the accuracy, in seconds, of specific group delay measurement:

±Phase Accuracy (deg)/[360 × Aperture (Hz)]

Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst case phase accuracy.

^a Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and the number of points per sweep).

General Information

Table 38. Miscellaneous Inf	formation	l		
Description		Specification	Supplemental Information	
System IF Bandwidth Range			1 Hz to 40 kHz, nominal	
CPU			Intel® 500 MHz Pentium® III	
Table 39. Front Panel Information				
Description	Supplemental Information			
RF Connectors				
E8362B				
· / ·		(male), 50 ohm, (n	ominal)	
	0.002 in.	(characteristic)		
E8363/4B				
Туре	2.4 mm ((male), 50 ohm, (n	ominal)	
	0.002 in.	(characteristic)		
Display				
Size			olor active matrix LCD; 640 (horizontal) X 480	
	(vertical) resolution; 59.83 Hz vertical refresh rate; 31.41 Hz horizontal			
	refresh rate			
Refresh Rate	Vertical 8	59.83 Hz; Horizont	al 31.41 Hz	
Display Range		(
		(at 20 dB/div), ma	<u>X</u>	
	±180°, m			
Polar	10 pUnit			
	1000 Ur	nits, max		
Display Resolution				
	0.001 dB/div, min			
	0.01°/div, min			
Marker Resolution				
	0.001 dB			
	0.01°, mi			
Polar	0.01 mUnit, min; 0.01°,min			

Table 40. Rear Panel In	
Description	Supplemental Information
10 MHz Reference In	1
Connector	BNC, female
Input Frequency	10 MHz ± 10 ppm, typical
Input Level	-15 dBm to +20 dBm, typical
Input Impedance	200 Ω, nom.
10 MHz Reference O	Dut
Connector	BNC, female
Output Frequency	10 MHz ± 1 ppm, typical
Signal Type	Sine Wave, typical
Output Level	+10 dBm \pm 4 dB into 50 Ω , typical
Output Impedance	50 Ω , nominal
Harmonics	<-40 dBc, typical
VGA Video Output	
Connector	15-pin mini D-Sub; Drives VGA compatible monitors
Devices Supported:	
	Resolutions:
Flat Panel (TFT)	1024 X 768, 800 X 600, 640 X 480
Flat Panel (DSTN)	800 X 600, 640 X 480
CRT Monitor	1280 X 1024, 1024 X 768, 800 X 600, 640 X 480
	Simultaneous operation of the internal and external displays is allowed, but
	with 640 X 480 resolution only. If you change resolution, you can only view the
	external display (internal display will "white out").
Test Set IO	
	25-pin D-Sub connector, available for external test set control
Aux IO	
	25-pin D-Sub connector, male, analog and digital IO
Handler IO	
	36-pin parallel I/O port; all input/output signals are default set to negative logic;
	can be reset to positive logic via GPIB command
GPIB	
	24-pin D-sub (Type D-24), female; compatible with IEEE-488.
Parallel Port (LPT1)	
	25-pin D-Sub miniature connector, female; provides connection to printers or
	any other parallel port peripherals
Serial Port (COM 1)	
	9-pin D-Sub, male; compatible with RS-232
USB Port	
	One port on front panel and five ports on rear panel. Universal Serial Bus jack, Type A configuration (4 contacts inline, contact 1 on left); female
Contact 1	Vcc: 4.75 to 5.25 VDC, 500 mA, maximum
Contact 2	-Data
Contact 3	+Data
Contact 4	Ground
LAN	
	10/100BaseT Ethernet, 8-pin configuration; auto selects between the two data rates

Line Power ^a	
Frequency	48 Hz to 66 Hz
Voltage at 115 V Setting	90 to 132 VAC; 120 VAC, nominal
Voltage at 220 V Setting	198 to 264 VAC; 240 VAC, nominal
VA Max	600 VA maximum

^a A third-wire ground is required.

Table 41. Analyzer Environment and Dimensions

Description	Supplemental Information	on			
General Environmental					
RFI/EMI Susceptibility		Defined by CISPR Pub. 11, Group 1, Class A, and IEC 50082-1			
ESD		work procedures and an ant	istatic bench mat		
Dust	Minimize for optimum relia	ability			
Operating Environment					
Temperature	0 °C to +40 °C				
	Instrument powers up, phase locks, and displays no error messages				
	within this temperature range (except for "source unleveled" error				
	message that may occur a				
Error-Corrected	23°C ± 3°C	· · · · ·			
Temperature Range	with less than 1°C deviation	on from calibration temp.			
Humidity	5% to 95% at +40 °C	•			
Altitude	0 to 4500 m (14,760 ft.)				
Non-Operating Storage Er	vironment				
Temperature	-40 °C to +70 °C				
Humidity	0% to 90% at +65 °C (non	-condensing)			
Altitude	0 to 15,240 m (50,000 ft.)				
Cabinet Dimensions	· · · · ·				
	Height	Width	Depth		
Excluding front and rear	267 mm	425 mm	426 mm		
panel hardware and feet	10.5 in	16.75 in	16.8 in		
As shipped - includes front	305 mm	425 mm	470 mm		
panel connectors, rear	12.0 in	16.75 in	18.5 in		
panel bumpers, and feet.					
As shipped plus handles					
	305 mm	458 mm	502 mm		
	12.0 in	18 in	502 mm 19.75 in		
As shipped plus rack-	12.0 in 305 mm	18 in 483 mm	502 mm 19.75 in 470 mm		
As shipped plus rack- mount flanges	12.0 in 305 mm 12.0 in	18 in 483 mm 19 in	502 mm 19.75 in 470 mm 18.5 in		
As shipped plus rack- mount flanges As shipped plus handles	12.0 in 305 mm 12.0 in 305 mm	18 in 483 mm 19 in 483 mm	502 mm 19.75 in 470 mm 18.5 in 502 mm		
As shipped plus rack- mount flanges As shipped plus handles and flanges	12.0 in 305 mm 12.0 in	18 in 483 mm 19 in	502 mm 19.75 in 470 mm 18.5 in		
As shipped plus rack- mount flanges As shipped plus handles	12.0 in 305 mm 12.0 in 305 mm	18 in 483 mm 19 in 483 mm	502 mm 19.75 in 470 mm 18.5 in 502 mm		
As shipped plus rack- mount flanges As shipped plus handles and flanges Weight Net	12.0 in 305 mm 12.0 in 305 mm	18 in 483 mm 19 in 483 mm	502 mm 19.75 in 470 mm 18.5 in 502 mm		
As shipped plus rack- mount flanges As shipped plus handles and flanges Weight Net E8362B	12.0 in 305 mm 12.0 in 305 mm 12.0 in 28.6 kg (63.5 lb), nominal	18 in 483 mm 19 in 483 mm	502 mm 19.75 in 470 mm 18.5 in 502 mm		
As shipped plus rack- mount flanges As shipped plus handles and flanges Weight Net	12.0 in 305 mm 12.0 in 305 mm 12.0 in	18 in 483 mm 19 in 483 mm	502 mm 19.75 in 470 mm 18.5 in 502 mm		
As shipped plus rack- mount flanges As shipped plus handles and flanges Weight Net E8362B	12.0 in 305 mm 12.0 in 305 mm 12.0 in 28.6 kg (63.5 lb), nominal	18 in 483 mm 19 in 483 mm	502 mm 19.75 in 470 mm 18.5 in 502 mm		
As shipped plus rack- mount flanges As shipped plus handles and flanges Weight Net E8362B E8363/4B	12.0 in 305 mm 12.0 in 305 mm 12.0 in 28.6 kg (63.5 lb), nominal	18 in 483 mm 19 in 483 mm	502 mm 19.75 in 470 mm 18.5 in 502 mm		

Measurement Throughput Summary Table 42 Typical Cycle Time^{a,b} (ms) for Measurement Completion

	Numb	Number of Points				
	201	401	1601	16,001		
Start 28 GHz, Stop 30 GHz, 35 kHz IF bandwidth						
Uncorrected,	12	19	55	503		
1-port cal						
2-Port cal	29	44	124	1112		
Start 10 MHz, S bandwidth	Stop 10	GHz, 35	5 kHz IF			
Uncorrected,	86	93	121	583		
1-port cal						
2-Port cal	179	199	267	1301		
Start 10 MHz, Standwidth	Stop 20	GHz, 35	5 kHz IF			
Uncorrected,	126	130	153	597		
1-port cal						
2-Port cal	264	275	335	1321		
Start 10 MHz, S bandwidth	Stop 40	GHz, 35	5 kHz IF			
Uncorrected,	185	190	213	621		
1-port cal						
2-Port cal	382	401	459	1374		
Start 10 MHz, Stop 50 GHz, 35 kHz IF bandwidth						
Uncorrected,	210	216	243	643		
1-port cal						
2-Port cal	436	450	522	1405		
Start 10 MHz, Stop 67 GHz, 35 kHz IF bandwidth						
Uncorrected	244	254	300	645		
Corrected	502	524	591	1423		

^a Typical performance.
 ^b Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S11) measurement.

Table 43. Cycle Time vs IF Bandwidth^a

Applies to the Preset condition (201 points, correction off) except for the following changes:

- CF = 28 GHz
- Span = 100 MHz ٠
- Display off (add 21 ms for display on) •

IF Bandwidth (Hz)	Cycle Time (ms) ^b	Cycle Time (ms) Option 080 enabled
40,000	11	100
35,000	12	101
30,000	13	102
20,000	16	106
10,000	30	127
7000	38	138
5000	50	152
3000	74	182
1000	274	326
300	694	782
100	1905	2054
30	6091	6355
10	17916	18372

^a Typical performance. ^b Cycle time includes sweep and retrace time.

Table 44. Cycle Time vs Number of Points^a

Applies to the Preset condition (35 kHz IF bandwidth, correction off) except for the following changes:

- CF = 28 GHz
- Span = 100 MHz •

Display off (add 21 ms for display on) ٠

Number of	Cycle Time (ms) [♭]
Points	
3	6
11	6
51	7
101	9
201	12
401	18
801	30
1601	55
16,001	497

^a Typical performance. ^b Cycle time includes sweep and retrace time.

Table 45. Data Transfer Time (ms)^a

	Number of Points					
	201	401	1601	16,001		
SCPI over GPIB						
(program executed on external PC)						
32-bit floating point	7	12	43	435		
64-bit floating point	12	22	84	856		
ASCII	64	124	489	5054		
SCPI						
(program executed in	the ana	lyzer)				
32-bit floating point	1	2	3	30		
64-bit floating point	2	2	4	40		
ASCII	29	56	222	2220		
COM (program execu	ted in th	e analyze	er)			
32-bit floating point	1	1	1	6		
Variant type	1	2	6	68		
DCOM over LAN						
(program executed on external PC)						
32-bit floating point	1	1	2	121		
Variant type	3	6	19	939		

^a Typical performance

Note: Specifications for Recall & Sweep Speed are not provided for the E836xB analyzers.

Models E8362B, E8363B, and E8364B Option 014

NOTE: The standard E8362/3/4B has no front-panel jumpers.

Description	Specification	Supplemental Information	
Maximum Input Level			
E8362B:			
45 MHz to 500 MHz		-15 dBm, typical	
500 MHz to 2 GHz		-11 dBm, typical	
2 GHz to 10 GHz		-11 dBm, typical	
10 GHz to 20 GHz		-11 dBm, typical	
8363B:			
45 MHz to 500 MHz		-14 dBm, typical	
500 MHz to 2 GHz		-10 dBm, typical	
2 GHz to 10 GHz		-10 dBm, typical	
10 GHz to 20 GHz		-10 dBm, typical	
20 GHZ to 30 GHz		-14.5 dBm, typical	
30 GHZ to 40 GHz		-16.5 dBm, typical	
E8364B:		· · · ·	
45 MHz to 500 MHz		- 14 dBm, typical	
500 MHz to 2 GHz		- 10 dBm, typical	
2 GHz to 10 GHz		- 10 dBm, typical	
10 GHz to 20 GHz		- 10 dBm, typical	
20 GHZ to 30 GHz		- 14.5 dBm, typical	
30 GHZ to 40 GHz		- 16.5 dBm, typical	
40 GHZ to 45 GHz		- 16 dBm, typical	
45 GHZ to 50 GHz		- 15 dBm, typical	
loise Floor			
8362B:			
	10 Hz IF Bandwidth		
45 MHz to 500 MHz	< -109 dBm		
500 MHz to 2 GHz	< -130 dBm		
2 GHz to 10 GHz	< -133 dBm		
10 GHz to 20 GHz	< -135 dBm		
	1 kHz IF Bandwidth		
45 MHz to 500 MHz	< -89 dBm		
500 MHz to 2 GHz	< -110 dBm		
2 GHz to 10 GHz	< -113 dBm		
10 GHz to 20 GHz	< -115 dBm		

E8363B:		
	10 Hz IF Bandwidth	
45 MHz to 500 MHz	< -127 dBm	
500 MHz to 2 GHz	< -133 dBm	
2 GHz to 10 GHz	< -132 dBm	
10 GHz to 20 GHz	< -134 dBm	
20 GHZ to 40 GHz	< -125 dBm	
	1 kHz IF Bandwidth	
45 MHz to 500 MHz	< -107 dBm	
500 MHz to 2 GHz	< -113 dBm	
2 GHz to 10 GHz	< -112 dBm	
10 GHz to 20 GHz	< -114 dBm	
20 GHZ to 40 GHz	< -105 dBm	
E8364B:		
	10 Hz IF Bandwidth	
45 MHz to 500 MHz	< - 127 dBm	
500 MHz to 2 GHz	< - 133 dBm	
2 GHz to 10 GHz	< - 132 dBm	
10 GHz to 20 GHz	< - 134 dBm	
20 GHZ to 40 GHz	< - 125 dBm	
40 GHZ to 50 GHz	< - 123 dBm	
	1 kHz IF Bandwidth	
45 MHz to 500 MHz	< -107 dBm	
500 MHz to 2 GHz	< -113 dBm	
2 GHz to 10 GHz	< -112 dBm	
10 GHz to 20 GHz	< -114 dBm	
20 GHZ to 40 GHz	< -105 dBm	
40 GHZ to 50 GHz	< -103 dBm	
Damage Level		
E8362B		+ 15 dBm, typical
E8363B		+ 15 dBm, typical
E8364B		+ 15 dBm, typical
Maximum DC Level		
E8362B		+ 15 V, typical
E8363B		+ 15 V, typical
E8364B		+ 15 V, typical

Description	Specification Supplemental Information	
Maximum Input Level		
E8362B:		
45 MHz to 500 MHz		-15 dBm, typical
500 MHz to 2 GHz		-11 dBm, typical
2 GHz to 10 GHz		-11 dBm, typical
10 GHz to 20 GHz		-11 dBm, typical
E8363B:		
45 MHz to 500 MHz		-14 dBm, typical
500 MHz to 2 GHz		-10 dBm, typical
2 GHz to 10 GHz		-10 dBm, typical
10 GHz to 20 GHz		-9.5 dBm, typical
20 GHZ to 30 GHz		-14 dBm, typical
30 GHZ to 40 GHz		-15.5 dBm, typical
E8364B:		
45 MHz to 500 MHz		- 14 dBm, typical
500 MHz to 2 GHz		- 10 dBm, typical
2 GHz to 10 GHz		- 10 dBm, typical
10 GHz to 20 GHz		- 9.5 dBm, typical
20 GHZ to 30 GHz		- 14 dBm, typical
30 GHZ to 40 GHz		- 15.5 dBm, typical
40 GHZ to 45 GHz		- 14 dBm, typical
45 GHZ to 50 GHz		- 15 dBm, typical
Damage Level		
E8362B		+ 15 dBm, typical
E8363B		+ 15 dBm, typical
E8364B		+ 15 dBm, typical
Maximum DC Level		
E8362B		+/- 15 V, typical
E8363B		+/- 15 V, typical
E8364B		+/- 15 V, typical

Table 47: Reference Receiver Inputs (Rcvr R1, Rcvr R2)

Description	Specification	Supplemental Information	
Maximum Output Level			
E8362B:			
45 MHz to 500 MHz		-24 dBm, typical	
500 MHz to 2 GHz		-23 dBm, typical	
2 GHz to 10 GHz		-23 dBm, typical	
10 GHz to 20 GHz		-26 dBm, typical	
E8363B:			
45 MHz to 500 MHz		-11.5 dBm, typical	
500 MHz to 2 GHz		-10.5 dBm, typical	
2 GHz to 10 GHz		-11 dBm, typical	
10 GHz to 20 GHz		-11 dBm, typical	
20 GHZ to 30 GHz		-11 dBm, typical	
30 GHZ to 40 GHz		-11 dBm, typical	
E8364B:			
45 MHz to 500 MHz		- 11.5 dBm, typical	
500 MHz to 2 GHz		- 10.5 dBm, typical	
2 GHz to 10 GHz		- 11 dBm, typical	
10 GHz to 20 GHz		- 11 dBm, typical	
20 GHZ to 30 GHz		- 11 dBm, typical	
30 GHZ to 40 GHz		- 11 dBm, typical	
40 GHZ to 45 GHz		- 11 dBm, typical	
45 GHZ to 50 GHz		- 15 dBm, typical	
Damage Level			
E8362B		+ 20 dBm, typical	
E8363B		+ 20 dBm, typical	
E8364B		+ 20 dBm, typical	
Maximum DC Level			
E8362B		+/- 15 V, typical	
E8363B		+/- 15 V, typical	
E8364B		+/- 15 V, typical	

 Table 48: Reference Outputs (Reference 1 Source Out, Reference 2 Source Out)

Description	Specification	Supplemental Information	
Maximum Output Level			
E8362B, Option 014:			
45 MHz to 500 MHz		6 dBm, typical	
500 MHz to 2 GHz		7 dBm, typical	
2 GHz to 10 GHz		7 dBm, typical	
10 GHz to 20 GHz		4 dBm, typical	
E8362B, Option 014 and UN	L:		
45 MHz to 500 MHz 500 MHz to 2 GHz		4 dBm, typical	
		5 dBm, typical	
2 GHz to 10 GHz 10 GHz to 20 GHz		5 dBm, typical	
		2 dBm, typical	
E8363B, Option 014: 45 MHz to 500 MHz		E E dBm traigal	
45 MHZ to 500 MHZ		5.5 dBm, typical	
2 GHz to 10 GHz		6.5 dBm, typical 6.5 dBm, typical	
10 GHz to 20 GHz		4 dBm, typical	
20 GHZ to 30 GHz		1- dBm, typical	
30 GHZ to 40 GHz		-2 dBm, typical	
E8363B, Option 014 and UN	1.	-2 dBm, typical	
45 MHz to 500 MHz	L.	3.5 dBm, typical	
500 MHz to 2 GHz		5 dBm, typical	
2 GHz to 10 GHz		5 dBm, typical	
10 GHz to 20 GHz		3.5- dBm, typical	
20 GHZ to 30 GHz		0 dBm, typical	
30 GHZ to 40 GHz		-2.5 dBm, typical	
E8364B, Option 014:			
45 MHz to 500 MHz		5.5 dBm, typical	
500 MHz to 2 GHz		6.5 dBm, typical	
2 GHz to 10 GHz		6.5 dBm, typical	
10 GHz to 20 GHz		4 dBm, typical	
20 GHZ to 30 GHz		1 dBm, typical	
30 GHZ to 40 GHz		-2 dBm, typical	
40 GHZ to 45 GHz		-3 dBm, typical	
45 GHZ to 50 GHz		-7.5 dBm, typical	
E8364B, Option 014 and UN	L:		
45 MHz to 500 MHz		3.5 dBm, typical	
500 MHz to 2 GHz		5 dBm, typical	
2 GHz to 10 GHz		5 dBm, typical	
10 GHz to 20 GHz		3.5 dBm, typical	
20 GHZ to 30 GHz		0 dBm, typical	
30 GHZ to 40 GHz		-2.5 dBm, typical	
40 GHZ to 45 GHz		-5 dBm, typical	
45 GHZ to 50 GHz		-10 dBm, typical	
Damage Level			
E8362B		20 dBm, typical	
E8363B		20 dBm, typical	
E8364B		20 dBm, typical	

Table 49: Source Outputs (Port 1 Source Out, Port 2 Source Out)

Maximum DC Level		
E8362B	0 V, typical	
E8363B	0 V, typical	
E8364B	0 V, typical	

Table 50: Coupler Inputs (Port 1 Cplr Thru, Port 2 Cplr Thru)

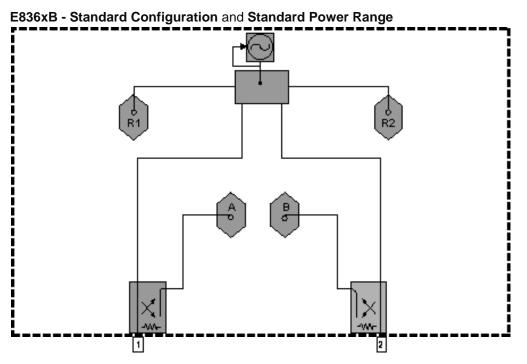
Description	Specification	Supplemental Information	on
Insertion Loss to Test Port			
E8362B, Option 014:			
45 MHz to 500 MHz		0.5 dB, typical	
500 MHz to 2 GHz		1.5 dB, typical	
2 GHz to 10 GHz		1.5 dB, typical	
10 GHz to 20 GHz		1.5 dB, typical	
E8362B, Option 014 and U	NL:		
45 MHz to 500 MHz		1 dB, typical	
500 MHz to 2 GHz		2 dB, typical	
2 GHz to 10 GHz		2 dB, typical	
10 GHz to 20 GHz		2 dB, typical	
E8363B, Option 014:			
45 MHz to 500 MHz		0.5 dB, typical	
500 MHz to 2 GHz		0.5 dB, typical	
2 GHz to 10 GHz		1.5 dB, typical	
10 GHz to 20 GHz		2 dB, typical	
20 GHZ to 30 GHz		3 dB, typical	
30 GHZ to 40 GHz		3.5 dB, typical	
E8363B, Option 014 and U	NL:		
45 MHz to 500 MHz		0.5 dB, typical	
500 MHz to 2 GHz		1 dB, typical	
2 GHz to 10 GHz		2 dB, typical	
10 GHz to 20 GHz		3 dB, typical	
20 GHZ to 30 GHz		4 dB, typical	
30 GHZ to 40 GHz		5 dB, typical	
E8364B, Option 014:			
45 MHz to 500 MHz			
500 MHz to 2 GHz		0.5 dB, typical	
2 GHz to 10 GHz		1.5 dB, typical	
10 GHz to 20 GHz		2 dB, typical	
20 GHZ to 30 GHz		3 dB, typical	
30 GHZ to 40 GHz		3.5 dB, typical	
40 GHZ to 45 GHz		3.5 dB, typical	
45 GHZ to 50 GHz		4 dB, typical	

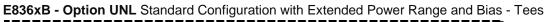
E8364B, Option 014 and UNL:			
45 MHz to 500 MHz	0.5 dB, typical		
500 MHz to 2 GHz	1 dB, typical		
2 GHz to 10 GHz	2 dB, typical		
10 GHz to 20 GHz	3 dB, typical		
20 GHZ to 30 GHz	4 dB, typical		
30 GHZ to 40 GHz	5 dB, typical		
40 GHZ to 45 GHz	5.5 dB, typical		
45 GHZ to 50 GHz	6 dB, typical		
Damage Level			
E8362B	+ 30 dBm, typical		
E8363B	+ 30 dBm, typical		
E8364B	+ 30 dBm, typical		
Maximum DC Level			
E8362B	+/- 40 V, typical		
E8363B	+/- 40 V, typical		
E8364B	+/- 40 V, typical		

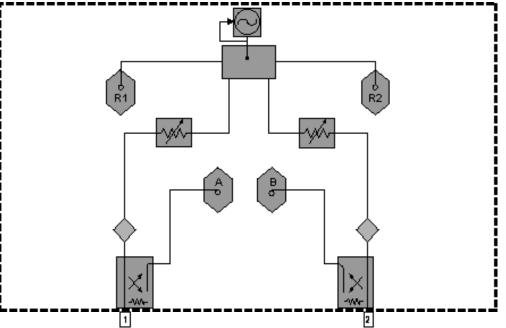
Table 51: Coupler Outputs (Port 1 Cplr Arm, Port 2 Cplr Arm)

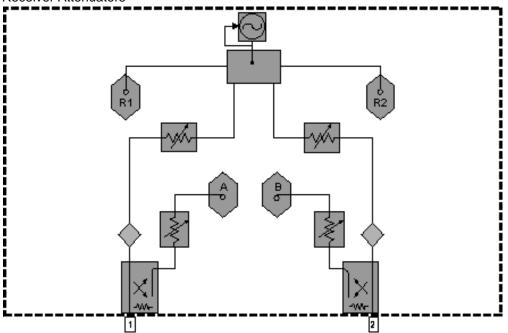
Description	Specification	Supplemental Information			
Damage Level	Damage Level				
E8362B		+ 30 dBm, typical			
E8363B		+ 30 dBm, typical			
E8364B		+ 30 dBm, typical			
Maximum DC Level					
E8362B		+/- 7 V, typical			
E8363B		+/- 7 V, typical			
E8364B		+/- 7 V, typical			

Test Set Block Diagrams



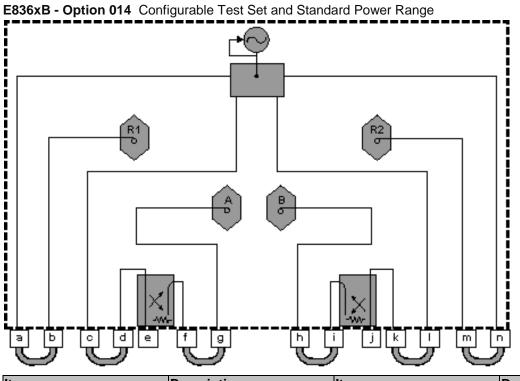




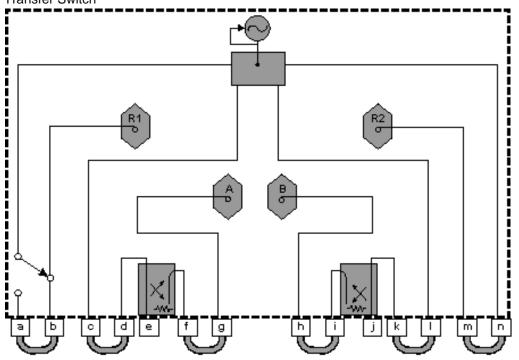


E836xB - Option UNL Standard Configuration with Extended Power Range and Bias - Tees, and Option 016, Receiver Attenuators

Test Set with Option 014 Block Diagrams

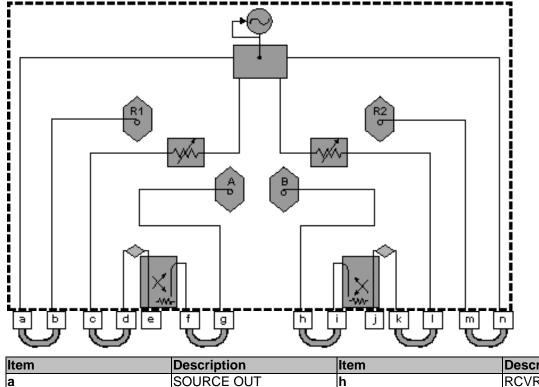


Item	Description	Item	Description
а	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
С	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
е	PORT 1	I	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT



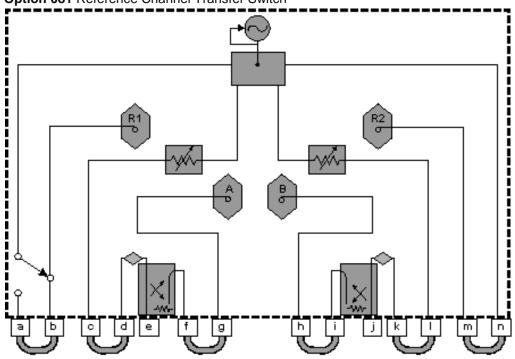
E836xB - Option 014 Configurable Test Set and Standard Power Range, and Option 081 Reference Channel Transfer Switch

ltem	Description	Item	Description
а	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
С	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
е	PORT 1	I	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT



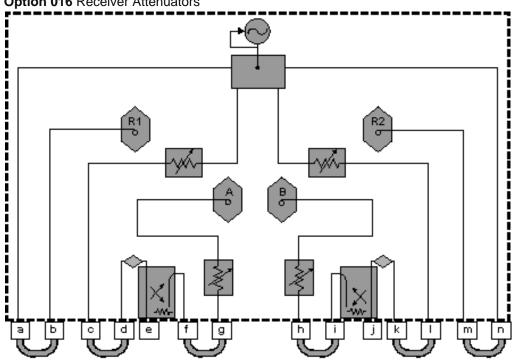
E836xB - Option 014 Configurable Test Set, and Option UNL Extended Power Range and Bias - Tees

Item	Description	Item	Description
а	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
С	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
е	PORT 1	I	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT



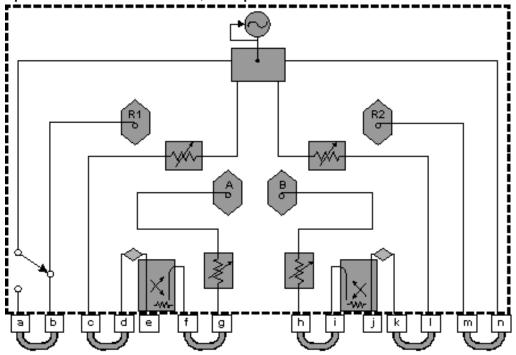
E836xB - Option 014 Configurable Test Set, and **Option UNL** Extended Power Range and Bias - Tees, and **Option 081** Reference Channel Transfer Switch

ltem	Description	Item	Description
а	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
C	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
е	PORT 1	I	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT



E836xB - Option 014 Configurable Test Set and **Option UNL**, Extended Power Range and Bias - Tees and **Option 016** Receiver Attenuators

ltem	Description	Item	Description
а	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
C	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
е	PORT 1	I	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT



E836xB - Option 014 Configurable Test Set, and **Option UNL** Extended Power Range and Bias - Tees, and **Option 016** Receiver Attenuators, and **Option 081** Reference Channel Transfer Switch

ltem	Description	Item	Description
а	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
C	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
е	PORT 1	I	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT

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This is a complete list of the E8361A network analyzer technical specifications.

- To view or print the Data Sheet (a condensed version of the specifications), visit our web site at http://www.agilent.com/find/pna, click "Library," and then click "PNA Series Microwave Network Analyzers Data Sheet."
- The uncertainty curves contained in this document apply only to the setup conditions listed. Please download our free Uncertainty Calculator from <u>http://www.agilent.com/find/na_calculator</u> to generate the curves for your PNA setup.

Definitions

All specifications and characteristics apply over a 25 °C ±5 °C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable) errors.

Corrected (residual): Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Corrected System Performance

The specifications in this section apply for measurements made with the E8361A analyzer with the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data ٠

Table 1 System Dynamic Range^a

Description	Specification (dB) at Test Port ^b	Typical (dB) at Direct Receiver Access Input ^c	Supplemental Information
Dynamic Range (in a 1	0 Hz BW)		
Standard Configuration	า		
(E8361A - Standard)			
10 MHz to 45 MHz ^d	63	NA	
45 MHz to 500 MHz ^e	87	NA	
500 MHz to 2 GHz	112	NA	
2 GHz to 10 GHz	112	NA	
10 GHz to 24 GHz	117	NA	
24 GHz to 30 GHz	106	NA	
30 GHz to 40 GHz	104	NA	
40 GHz to 45 GHz	98	NA	
45 GHz to 50 GHz	100	NA	
50 GHz to 60 GHz	97	NA	
60 GHz to 67 GHz	94	NA	
67 GHz to 70 GHz ^d	94	NA	
Configurable Test Set			
(E8361A - Option 014 o	or Option 014 and	080)	
10 MHz to 45 MHz ^d	63	99	
45 MHz to 500 MHz ^e	87	102	
500 MHz to 2 GHz	112	125.5	
2 GHz to 10 GHz	112	125	
10 GHz to 24 GHz	115	128	
24 GHz to 30 GHz	104	117.5	
30 GHz to 40 GHz	102	115	
40 GHz to 45 GHz	96	109	
45 GHz to 50 GHz	98	110.5	
50 GHz to 60 GHz	95	107	
60 GHz to 67 GHz	90	101	
67 GHz to 70 GHz ^d	90	100	

^a The system dynamic range is calculated as the difference between the noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.

The test port system dynamic range is calculated as the difference between the test port noise floor and the source maximum output

power. The effective dynamic range must take measurement uncertainties and interfering signals into account. ^c The direct receiver access input system dynamic range is calculated as the difference between the receiver access input noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its damage level. When the analyzer is in segment sweep mode, the analyzer can have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with high insertion loss), and reduced power when receiver damage may occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

^a Typical performance.

^e May be limited to 100 dB at particular frequencies below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

Note: This E8361A document does NOT provide technical specifications for Receiver Dynamic Range.

Note: This E8361A document provides technical specifications for the following calibration kits only: 85056A, 85056D, 85056K, 85052B, 85052C, 85052D, 85050B, 85050C, 85050D, 85054B, 85054D, 85058B, 85058E, K11644A, P11644A, R11644A, and the X11644A.

E8361A Corrected System Performance with 1.85mm Connectors

- To view or print the Corrected System Performance with 1.85mm Connectors, see the Data Sheet (a condensed version of the specifications) at http://www.agilent.com/find/pna. Click "Library," and then click "PNA Series Microwave Network Analyzers Data Sheet."
- Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup.

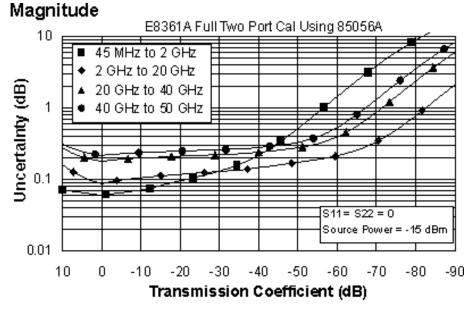
E8361A Corrected System Performance with 2.4mm Connectors

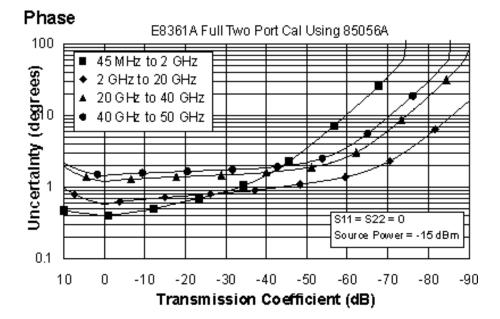
Table 2. 85056A Calibration Kit

E8361A - Standard Configuration and Standard Power Range

Applies to the E8361A analyzers, 85056A (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification	(dB)		
	45 MHz to	2 to	20 to	40 to
	2 GHz	20 GHz	40 GHz	50 GHz
Directivity	42	42	38	36
Source Match	41	38	33	31
Load Match	42	42	37	35
Reflection Tracking	±0.001	±0.008	±0.020	±0.027
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.035	±0.060	±0.146	±0.181
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C





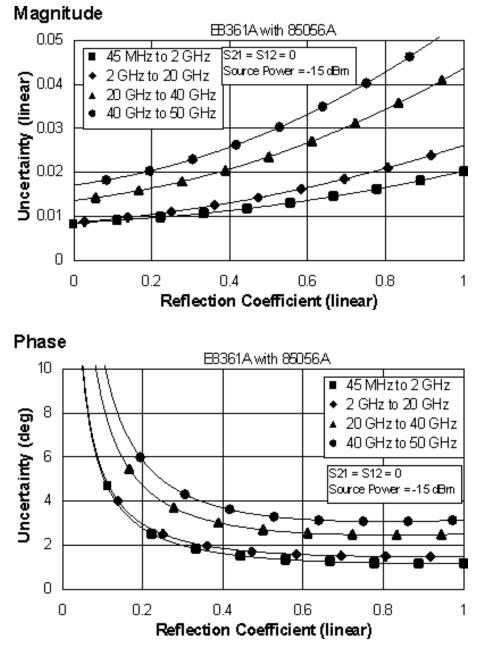
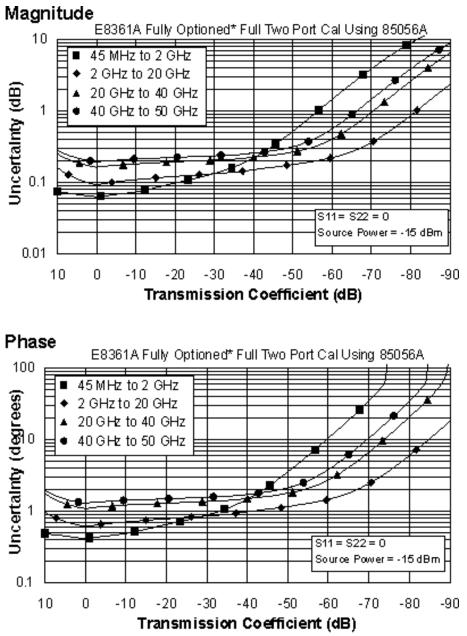


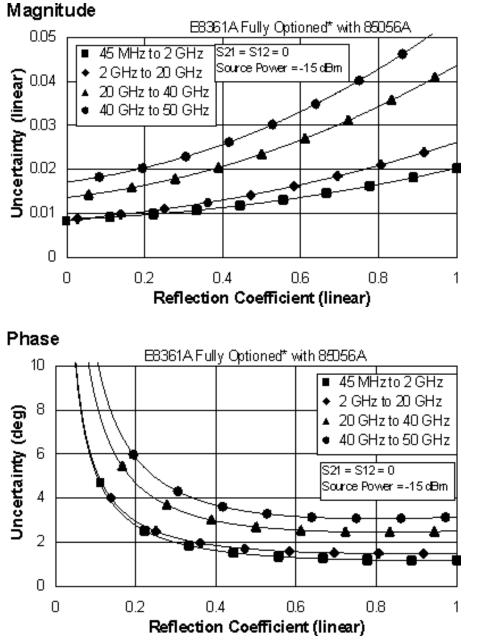
Table 3. 85056A Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, 85056A (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)			
	45 MHz to	2 to	20 to	40 to
	2 GHz	20 GHz	40 GHz	50 GHz
Directivity	42	42	38	36
Source Match	41	38	33	31
Load Match	42	42	37	35
Reflection Tracking	±0.001	±0.008	±0.020	±0.027
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.038	±0.064	±0.130	±0.157
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C



* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)



* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

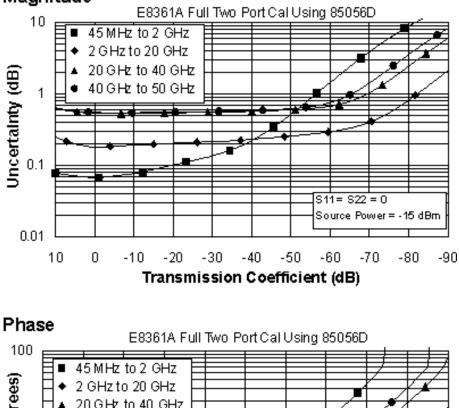
Table 4. 85056D Calibration Kit

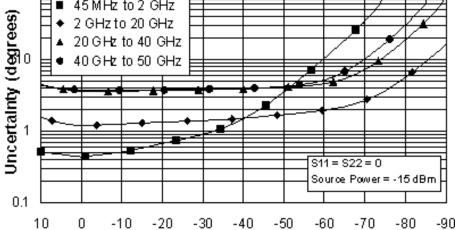
E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, 85056D (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)			
	45 MHz to	2 to	20 to	40 to
	2 GHz	20 GHz	40 GHz	50 GHz
Directivity	42	34	26	26
Source Match	40	30	24	23
Load Match	42	33	25	25
Reflection Tracking	±0.002	±0.029	±0.079	±0.075
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.041	±0.146	±0.480	±0.489
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C







Transmission Coefficient (dB)

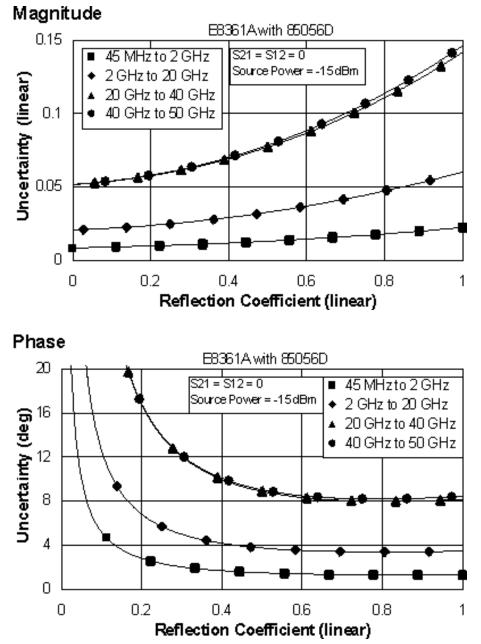
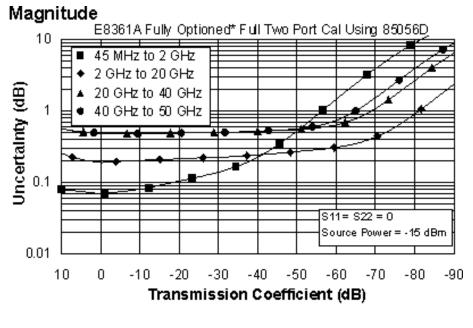


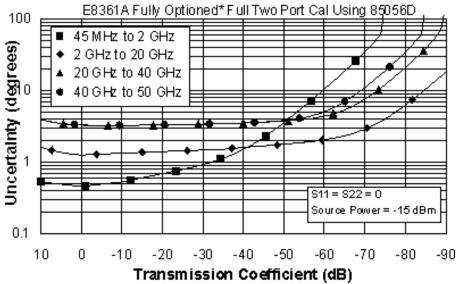
Table 5. 85056D Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, 85056D (2.4mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

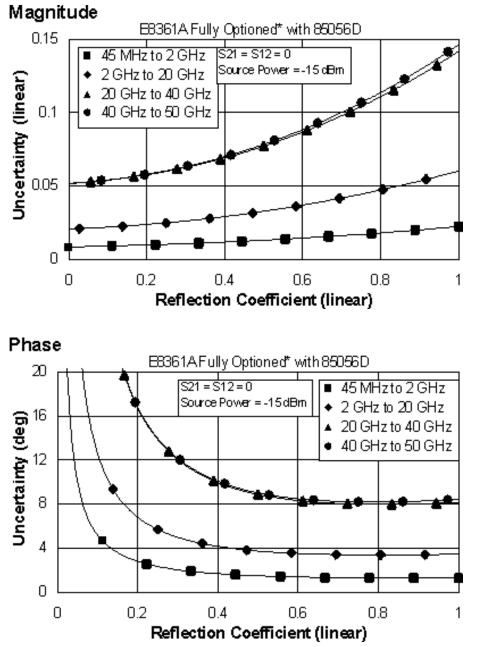
Description	Specification (dB)			
	45 MHz to	2 to	20 to	40 to
	2 GHz	20 GHz	40 GHz	50 GHz
Directivity	42	34	26	26
Source Match	40	30	24	23
Load Match	42	33	25	25
Reflection Tracking	±0.002	±0.029	±0.079	±0.075
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.044	±0.158	±0.428	±0.426
	+0.02/°C	+0.02/°C	+0.02/°C	+0.03/°C







* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)



* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

E8361A Corrected System Performance with 2.92mm Connectors

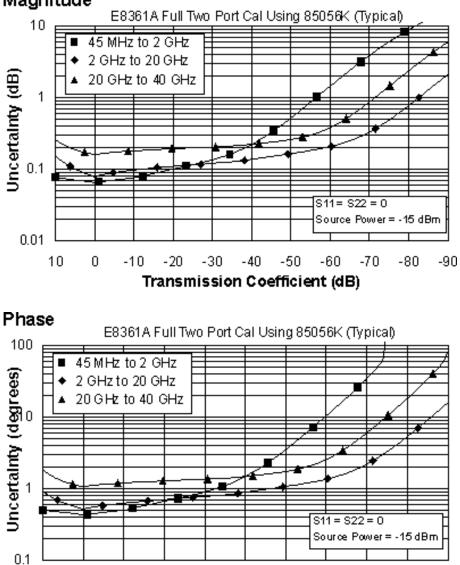
Table 6. 85056K Calibration Kit

E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, 85056K (2.92mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 2	23° ±3 °C. with < 1 °C	C deviation from calibration temperature
Entrionital temperature	$10 \pm 0 0$, mai $1 c$	

Description	Specification (dB)		
	0.045 to	2 to	20 to
	2 GHz	20 GHz	40 GHz
Directivity	42	42	40
Source Match	40	40	35
Load Match	41	41	37
Reflection Tracking	±0.018	±0.018	±0.067
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.040	±0.052	±0.127
	+0.02/°C	+0.02/°C	+0.03/°C



10

0

-10

-20

-30

-50

-40 Transmission Coefficient (dB)

-60

-70

-80

-90

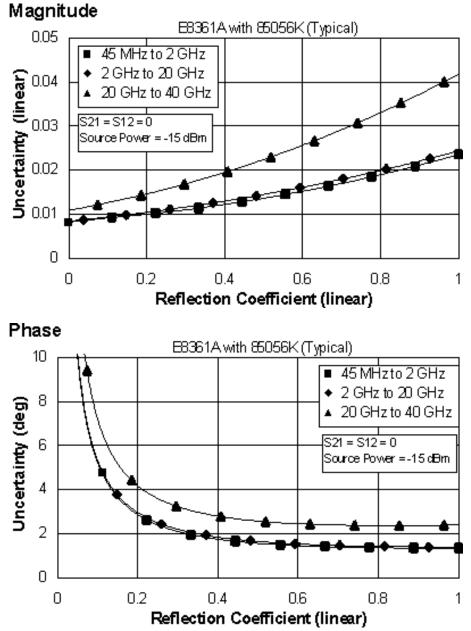
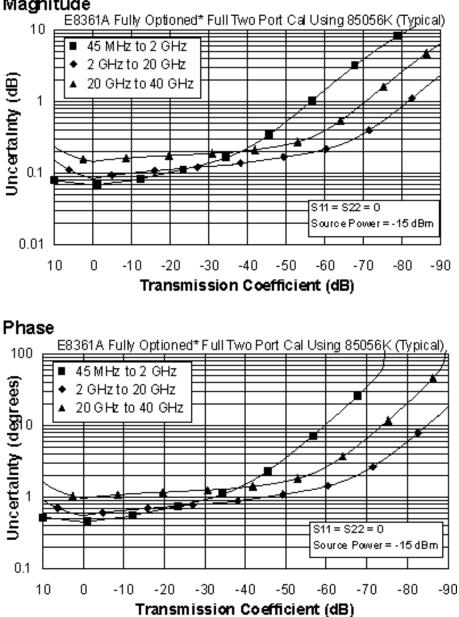


Table 7. 85056K Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

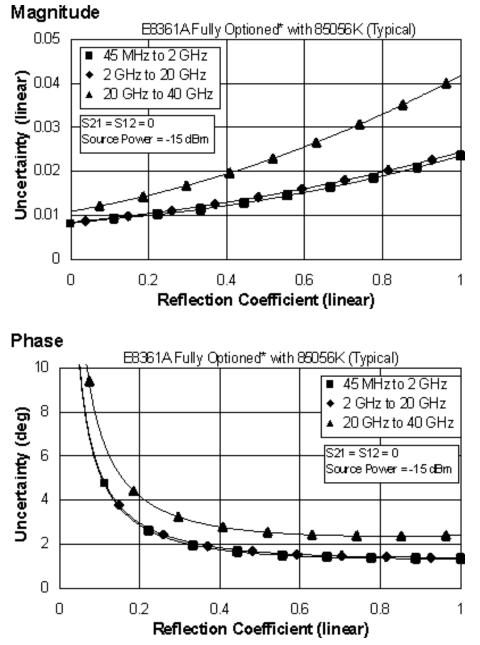
Applies to the, E8361A analyzers, 85056K (2.92mm) calibration kit, 85133F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)		
	0.045 to	2 to	20 to
	2 GHz	20 GHz	40 GHz
Directivity	42	42	40
Source Match	40	40	35
Load Match	41	41	37
Reflection Tracking	±0.018	±0.018	±0.067
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.043	±0.056	±0.112
	+0.02/°C	+0.02/°C	+0.03/°C

Transmission Uncertainty (Specifications Magnitude



* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)



* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

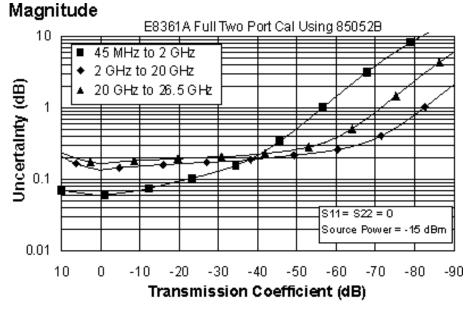
E8361A Corrected System Performance with 3.5mm Connectors

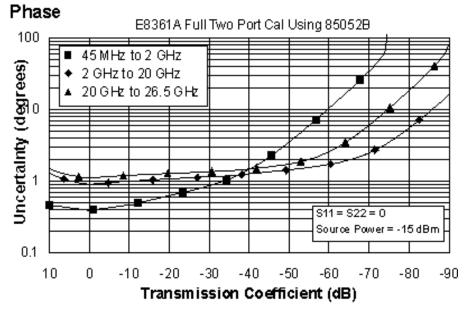
Table 8. 85052B Calibration Kit

E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, 85052B (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)		
	45 MHz to	2 to	20 to
	2 GHz	20 GHz	26.5 GHz
Directivity	48	44	44
Source Match	40	31	31
Load Match	48	44	44
Reflection Tracking	±0.003	±0.006	±0.006
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.035	±0.106	±0.131
	+0.02/°C	+0.02/°C	+0.03/°C





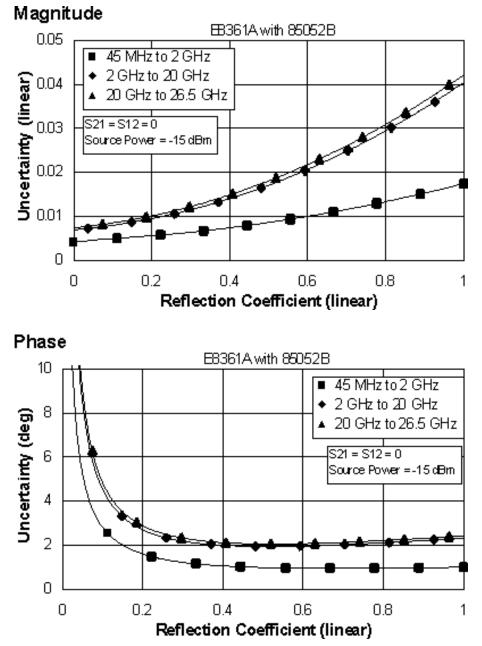
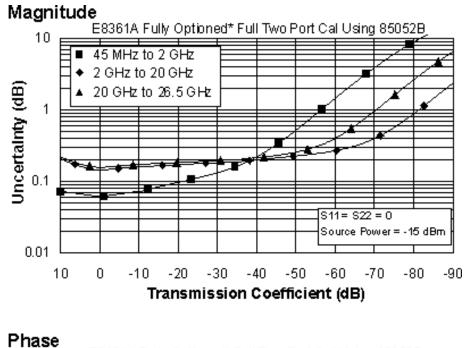
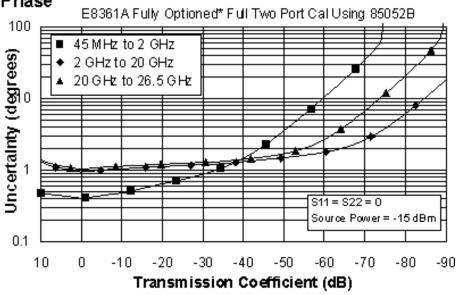


Table 9. 85052B Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

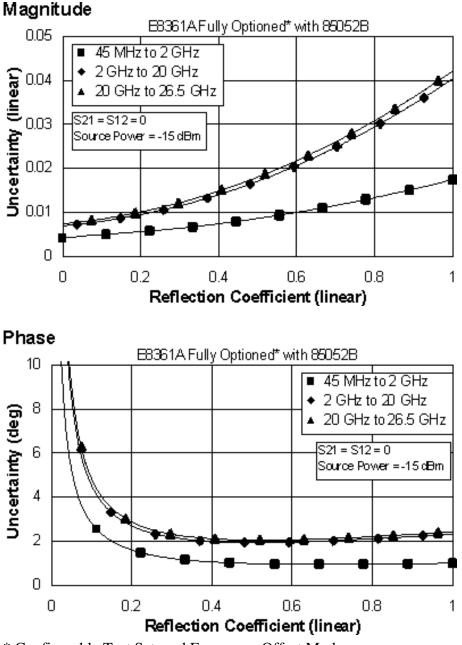
Applies to the, E8361A analyzers, 85052B (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)		
	45 MHz to	2 to	20 to
	2 GHz	20 GHz	26.5 GHz
Directivity	48	44	44
Source Match	40	31	31
Load Match	48	44	44
Reflection Tracking	±0.003	±0.006	±0.006
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.038	±0.113	±0.121
	+0.02/°C	+0.02/°C	+0.03/°C





* Configurable Test Set, and Frequency Offset Mode ((E8361A - Option 014, and 080)



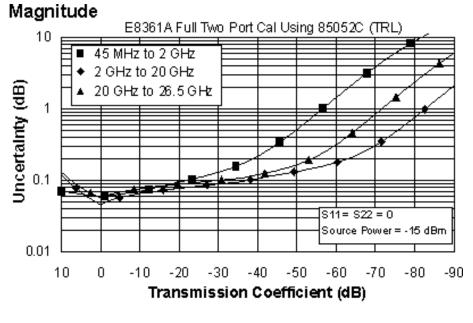
* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

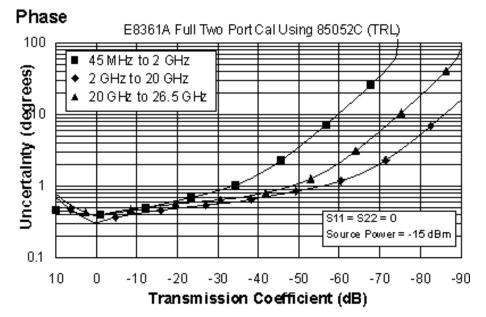
Table 10. 85052C Calibration Kit

E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, 85052C (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description		Specification (dB)	
	45 MHz to	2 to	20 to
	2 GHz	20 GHz	26.5 GHz
Directivity	48	50	50
Source Match	40	50	50
Load Match	48	50	50
Reflection Tracking	±0.003	±0.000	±0.000
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.035	±0.017	±0.023
	+0.02/°C	+0.02/°C	+0.03/°C





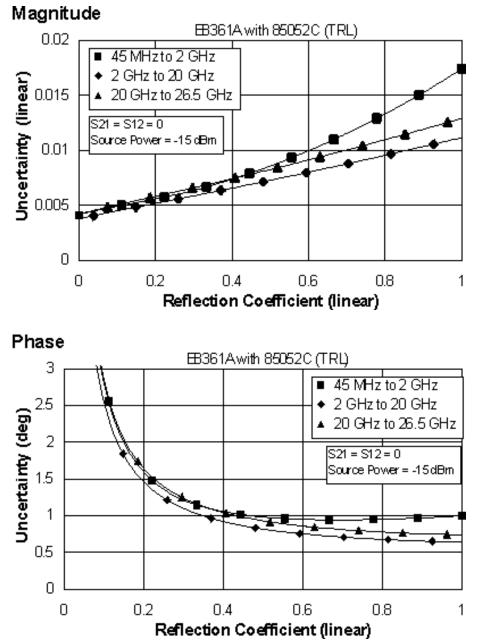
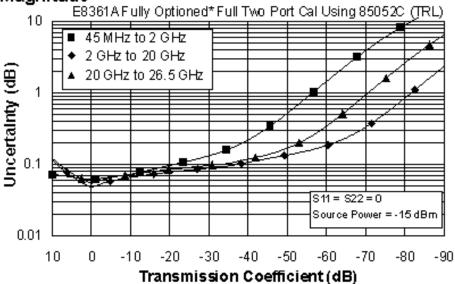


Table 11. 85052C Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set and Frequency Offset Mode

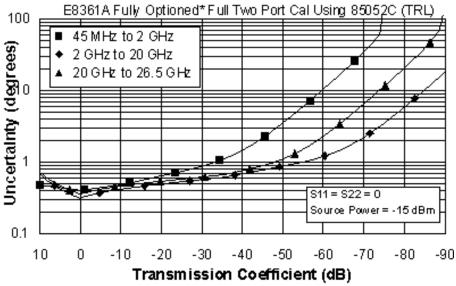
Applies to the, E8361A analyzers, 85052C (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description		Specification (dB)	
	45 MHz to	2 to	20 to
	2 GHz	20 GHz	26.5 GHz
Directivity	48	50	50
Source Match	40	50	50
Load Match	48	50	50
Reflection Tracking	±0.003	±0.000	±0.000
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.038	±0.019	±0.020
	+0.02/°C	+0.02/°C	+0.03/°C

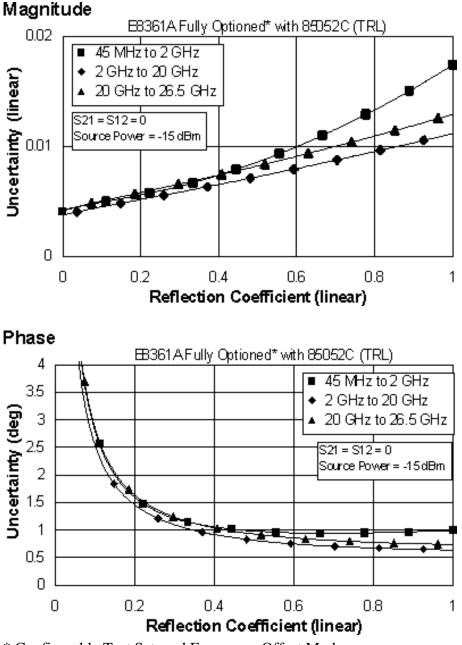
Magnitude



Phase



* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)



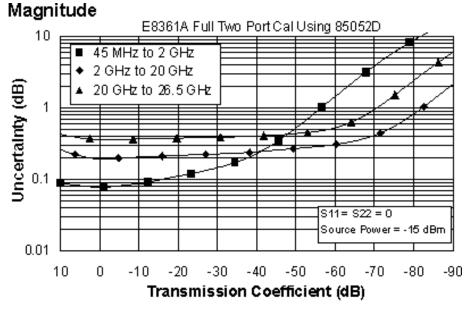
* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

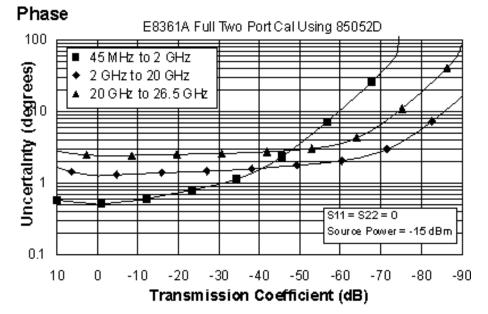
Table 12. 85052D Calibration Kit

E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, 85052D (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description		Specification (dB)	
	45 MHz to	2 to	20 to
	2 GHz	20 GHz	26.5 GHz
Directivity	42	36	30
Source Match	37	28	25
Load Match	42	36	30
Reflection Tracking	±0.003	±0.008	±0.011
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.052	±0.158	±0.314
	+0.02/°C	+0.02/°C	+0.03/°C





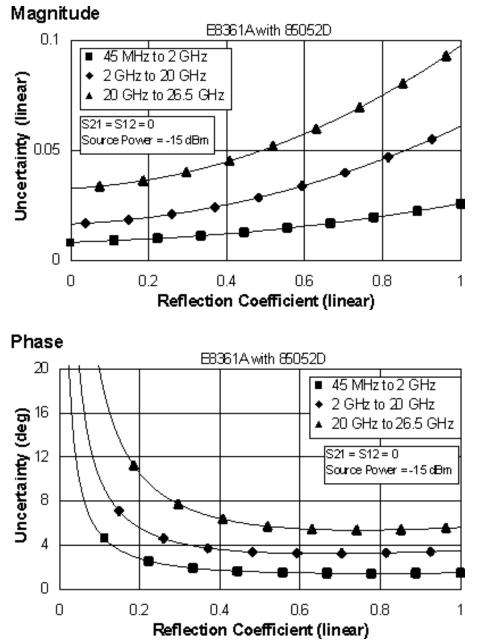
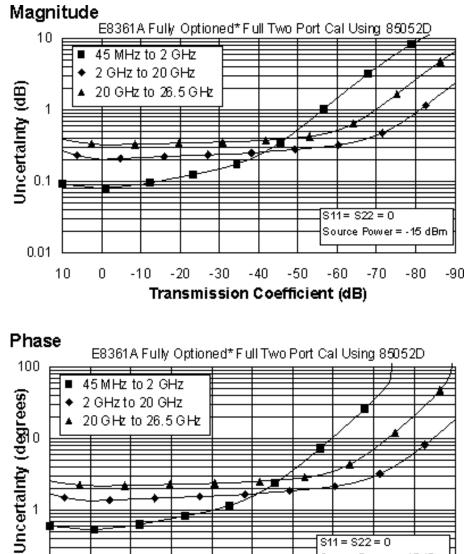
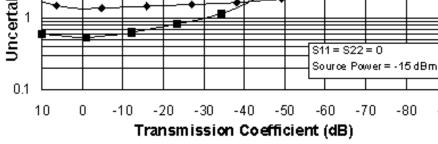


Table 13. 85052D Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, 85052D (3.5mm) calibration kit, 85131F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description		Specification (dB)	
	45 MHz to	2 to	20 to
	2 GHz	20 GHz	26.5 GHz
Directivity	42	36	30
Source Match	37	28	25
Load Match	42	36	30
Reflection Tracking	±0.003	±0.008	±0.011
	+0.02/°C	+0.02/°C	+0.03/°C
Transmission Tracking	±0.056	±0.169	±0.281
	+0.02/°C	+0.02/°C	+0.03/°C

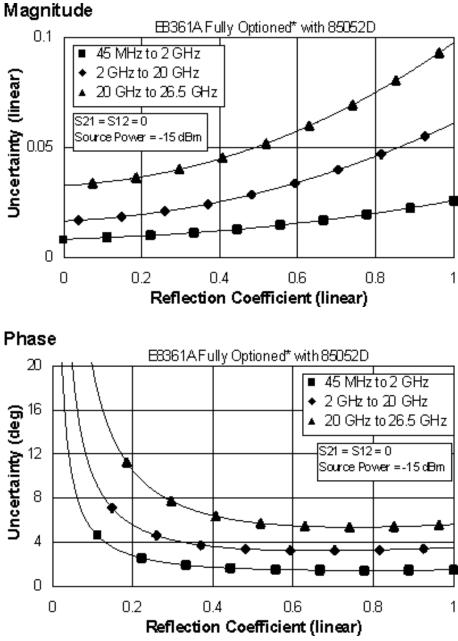




-80

-90

* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)



* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

E8361A Corrected System Performance with 7mm Connectors

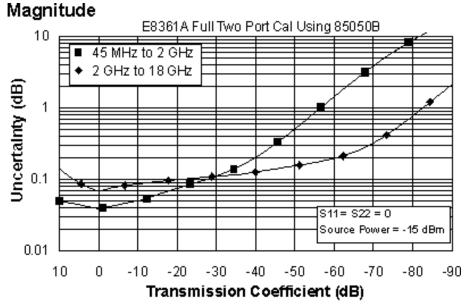
Table 14. 85050B Calibration Kit

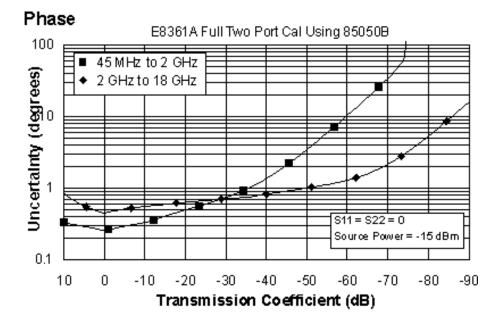
E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, 85050B (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 2	$3^{\circ} \pm 3^{\circ}$ C, with < 1 °C deviation	from calibration temperature
Environmental temperature 2	$0 \pm 0 0$, with $< 1 0 00$ matrix	

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	52	52
Source Match	48	41
Load Match	52	47
Reflection Tracking	±0.003	±0.047
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.015	±0.039
	+0.02/°C	+0.02/°C





Magnitude

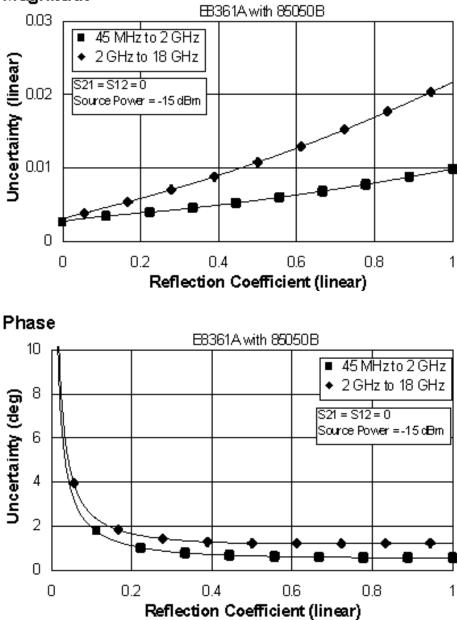


Table 15. 85050B Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, 85050B (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

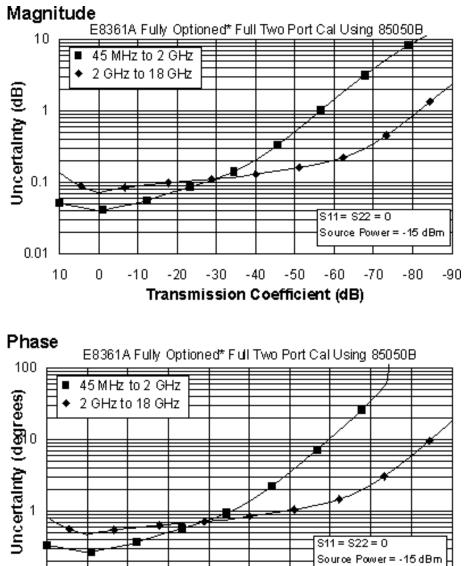
Description	Specification (dB)	
	0.045 to 2 to	
	2 GHz	18 GHz
Directivity	52	52
Source Match	48	41
Load Match	52	47
Reflection Tracking	±0.003	±0.047
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.016	±0.042
	+0.02/°C	+0.02/°C

0.1

10

0

-10



Transmission Coefficient (dB)

-40

-20

-30

*Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

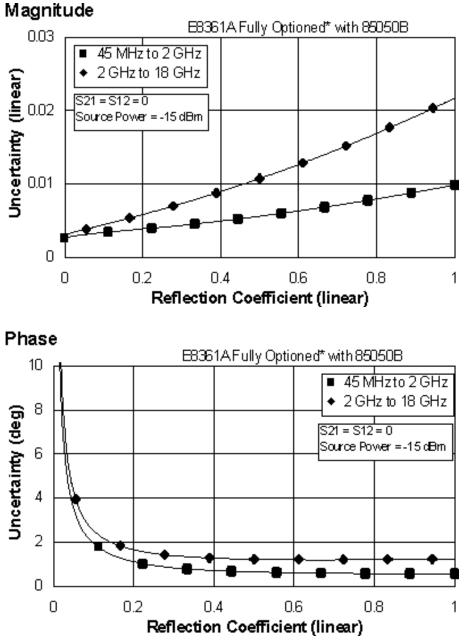
-50

-60

-70

-80

-90



*Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

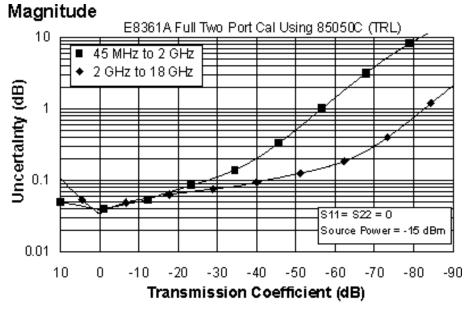
Table 16. 85050C Calibration Kit

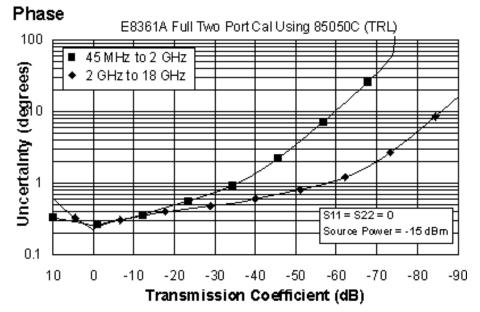
E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, 85050C (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)	
vironmental temperature 23°	\pm 3 °C, with < 1 °C deviation from calibr	ation temperature

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	52	60
Source Match	48	60
Load Match	52	60
Reflection Tracking	±0.003	±0.000
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.015	±0.005
	+0.02/°C	+0.02/°C





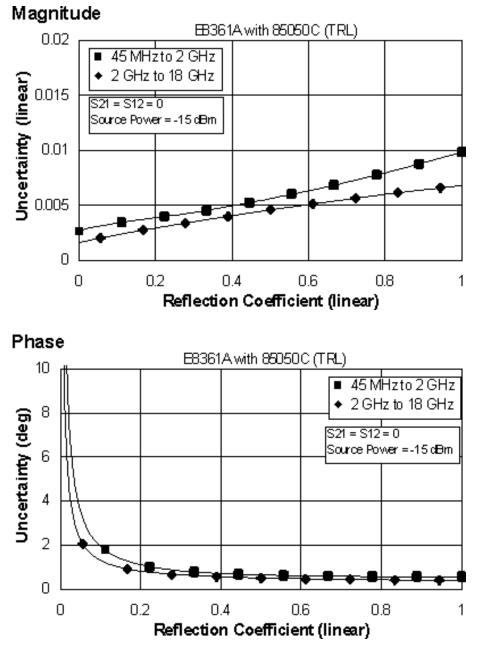
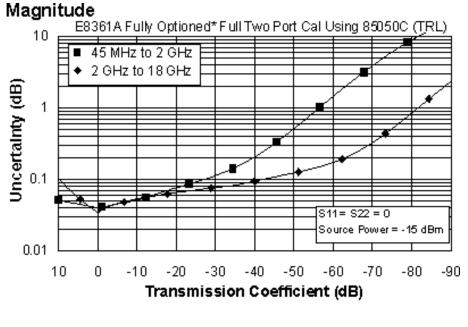


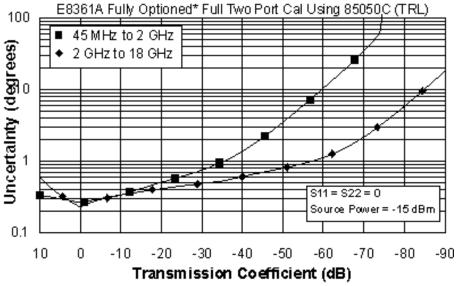
Table 17. 85050C Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, 85050C (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

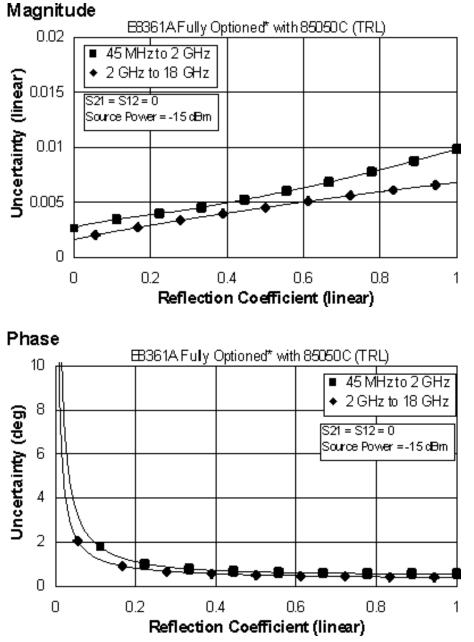
Description	Specification (dB)	
	0.045 to 2 to	
	2 GHz	18 GHz
Directivity	52	60
Source Match	48	60
Load Match	52	60
Reflection Tracking	±0.003	±0.000
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.016	±0.006
	+0.02/°C	+0.02/°C







*Configurable Test Set, and Frequency Offset Mode(E8361A - Option 014, and 080)



*Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

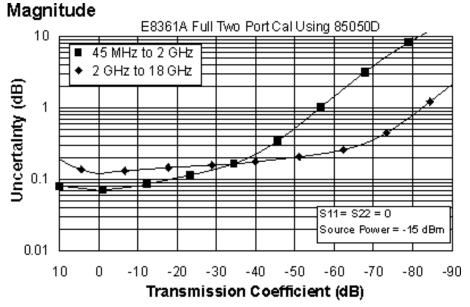
Table 18. 85050D Calibration Kit

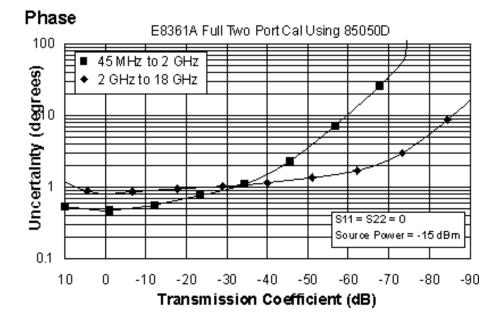
E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, 85050D (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Environmental temperature 23°	\pm 3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	40	40
Source Match	39	35
Load Match	40	37
Reflection Tracking	±0.010	±0.100
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.046	±0.089
	+0.02/°C	+0.02/°C





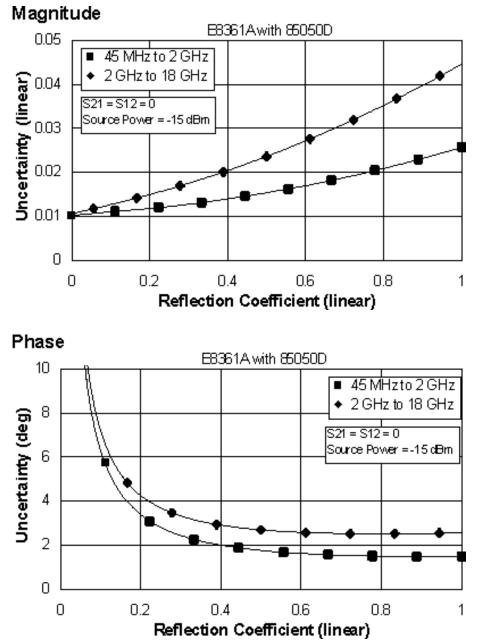
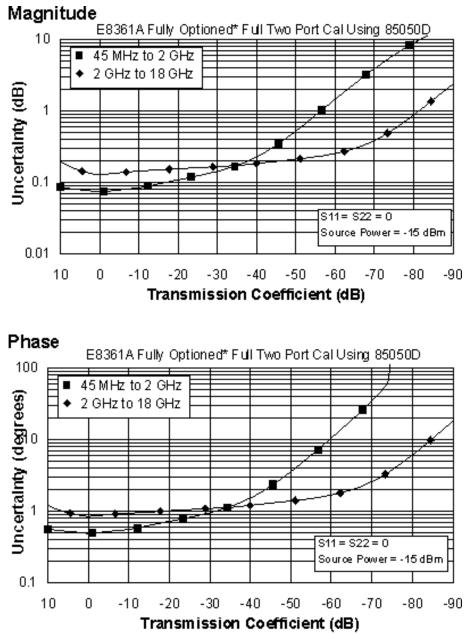


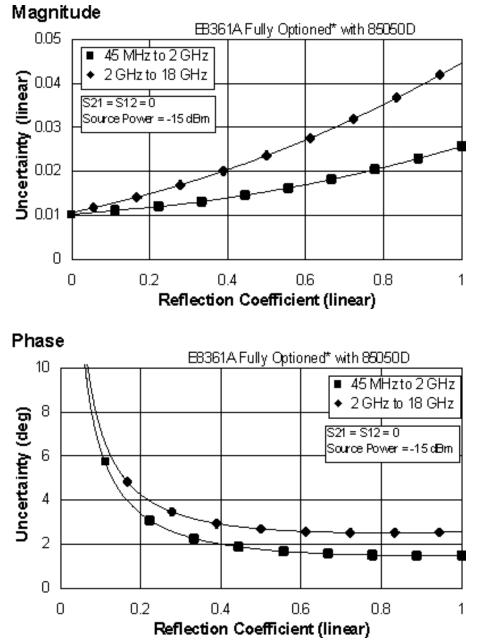
Table 19. 85050D Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, 85050D (7mm) calibration kit, 85132F flexible test port cable set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)	
	0.045 to 2 to	
	2 GHz	18 GHz
Directivity	40	40
Source Match	39	35
Load Match	40	37
Reflection Tracking	±0.010	±0.100
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.049	±0.097
	+0.02/°C	+0.02/°C



*Configurable Test Set, and Frequency Offset Mode(E8361A - Option 014, and 080)



*Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

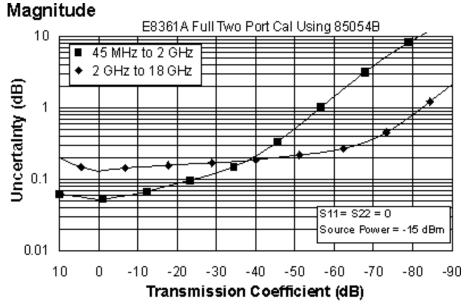
E8361A Corrected System Performance with Type-N Connectors

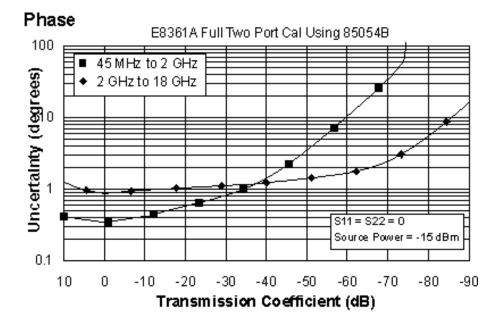
Table 20. 85054B Calibration Kit

E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, 85054B (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	48	42
Source Match	45	33
Load Match	48	41
Reflection Tracking	±0.001	±0.015
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.022	±0.096
	+0.02/°C	+0.02/°C





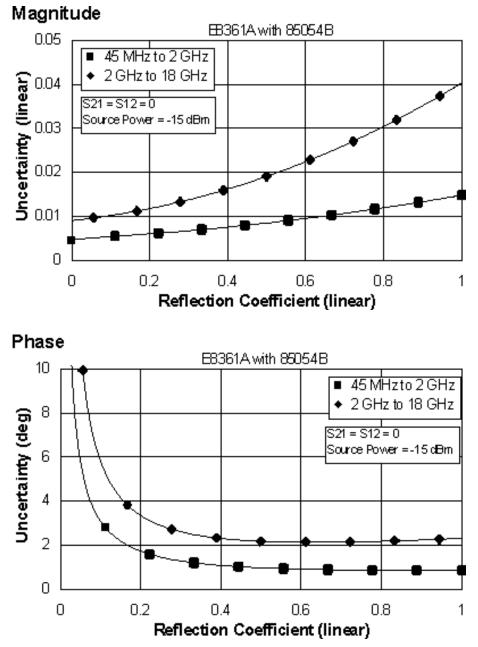
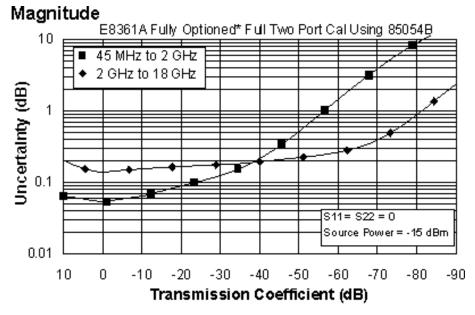


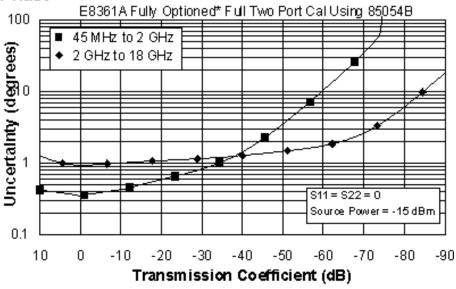
Table 21. 85054B Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, 85054B (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

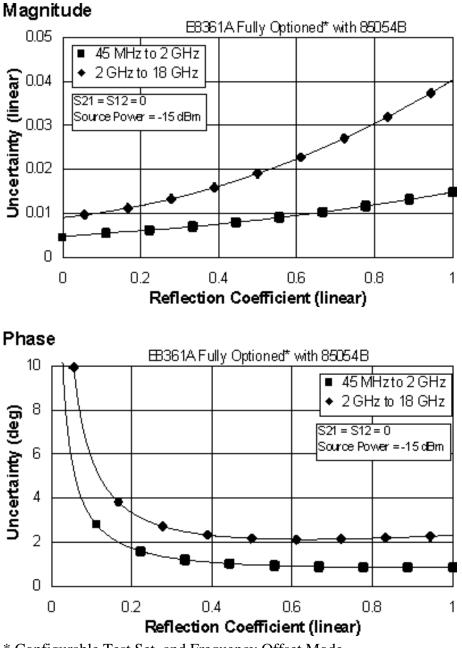
Description	Specification (dB)		
	0.045 to	2 to	
	2 GHz	18 GHz	
Directivity	48	42	
Source Match	45	33	
Load Match	48	41	
Reflection Tracking	±0.001	±0.015	
	+0.02/°C	+0.02/°C	
Transmission Tracking	±0.024	±0.102	
	+0.02/°C	+0.02/°C	







* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)



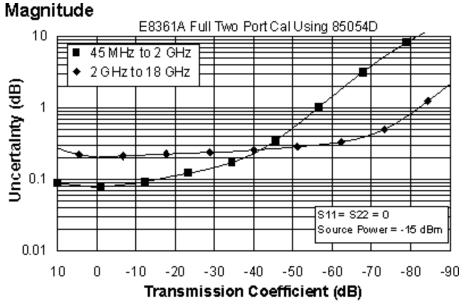
* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

Table 22. 85054D Calibration Kit

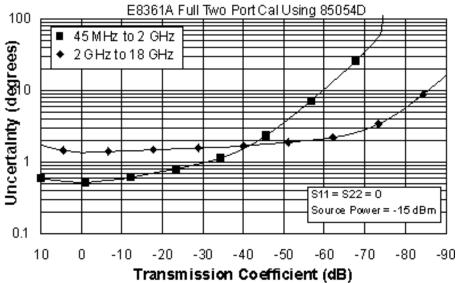
E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, 85054D (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)	
	0.045 to	2 to
	2 GHz	18 GHz
Directivity	40	34
Source Match	39	29
Load Match	40	34
Reflection Tracking	±0.003	±0.027
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.048	±0.164
	+0.02/°C	+0.02/°C







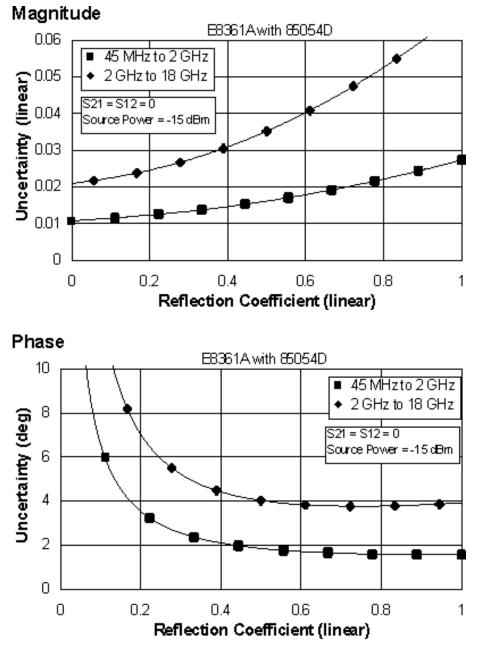
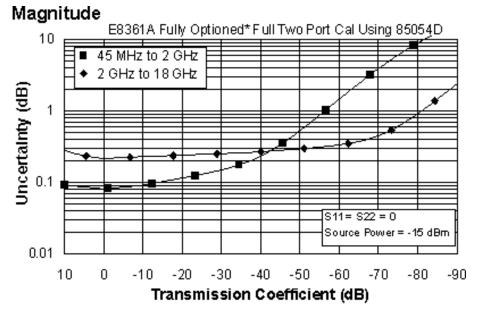


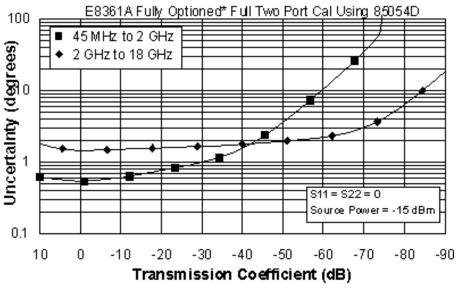
Table 23. 85054D Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, 85054D (Type-N) calibration kit, 85132F flexible test port cable set with 85130C adapter set, and a full 2-port calibration. Also applies to the following condition:

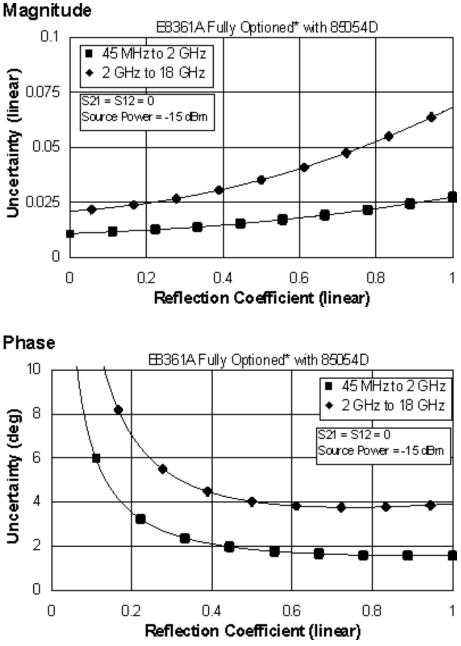
Description	Specification (dB)		
	0.045 to	2 to	
	2 GHz	18 GHz	
Directivity	40	34	
Source Match	39	29	
Load Match	40	33	
Reflection Tracking	±0.003	±0.027	
	+0.02/°C	+0.02/°C	
Transmission Tracking	±0.051	±0.177	
	+0.02/°C	+0.02/°C	







* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)



* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

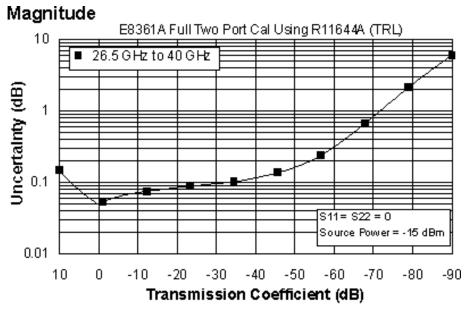
E8361A Corrected System Performance with WR-28 Connectors

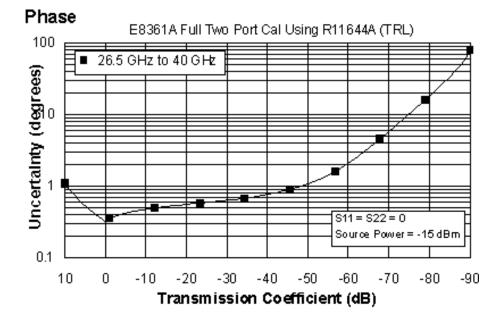
Table 24. R11644A Calibration Kit

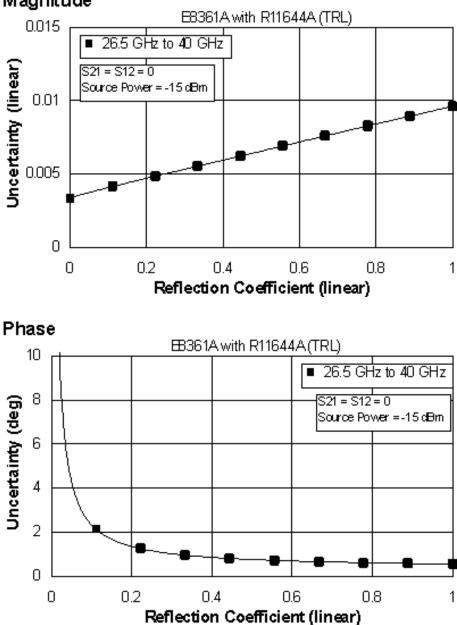
E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, R11644A (WR-28) calibration kit, 85133F flexible test port cable set with the R281A and R281B launch sets, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)
	26.5 to
	40 GHz
Directivity	50
Source Match	50
Load Match	50
Reflection Tracking	±0.000
	+0.03/°C
Transmission	±0.025
Tracking	+0.03/°C





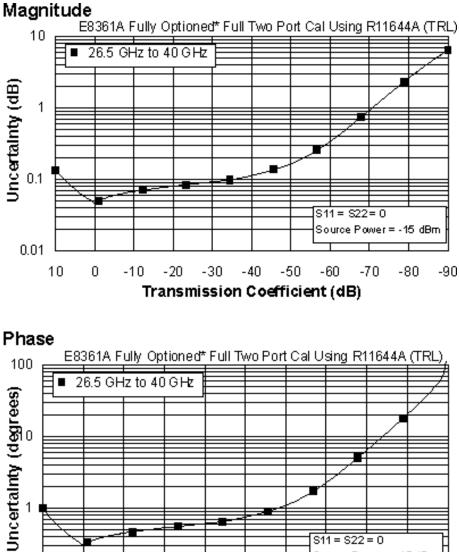


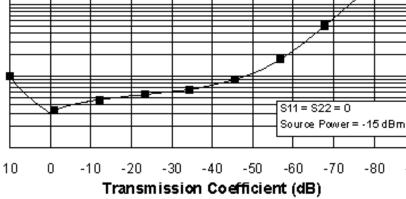
Magnitude

Table 25. R11644A Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, R11644A (WR-28) calibration kit, 85133F flexible test port cable set with the R281A and R281B launch sets, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)
	26.5 to
	40 GHz
Directivity	50
Source Match	50
Load Match	50
Reflection Tracking	±0.000
	+0.03/°C
Transmission Tracking	±0.023
	+0.03/°C

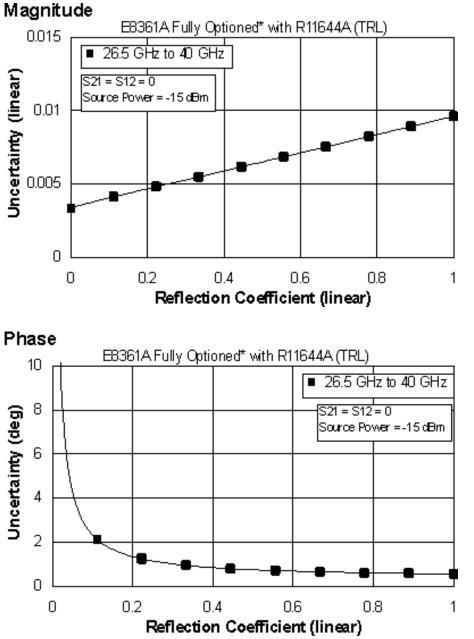




0.1

* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

-90



* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

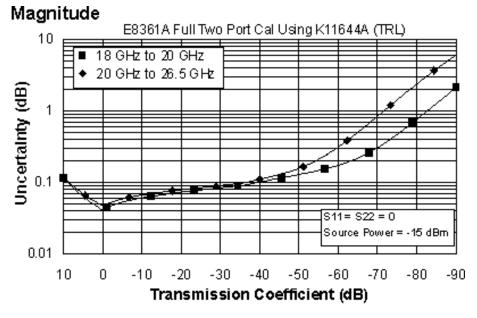
E8361A Corrected System Performance with WR-42 Connectors

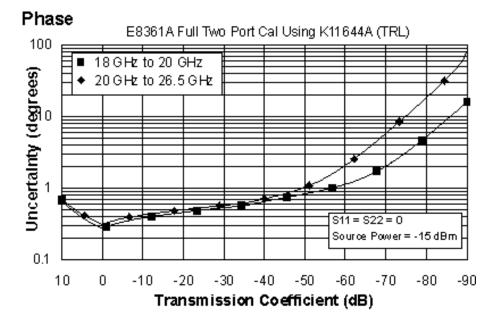
 Table 26.
 K11644A
 Calibration Kit

E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, K11644A (WR-42) calibration kit, 85134F flexible test port cable set with the K281C launch set,, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)		
	18 to	20 to	
	20 GHz	26.5 GHz	
Directivity	50	50	
Source Match	50	50	
Load Match	50	50	
Reflection Tracking	±0.000	±0.000	
	+0.02/°C	+0.02/°C	
Transmission Tracking	±0.017	±0.023	
	+0.02/°C	+0.02/°C	





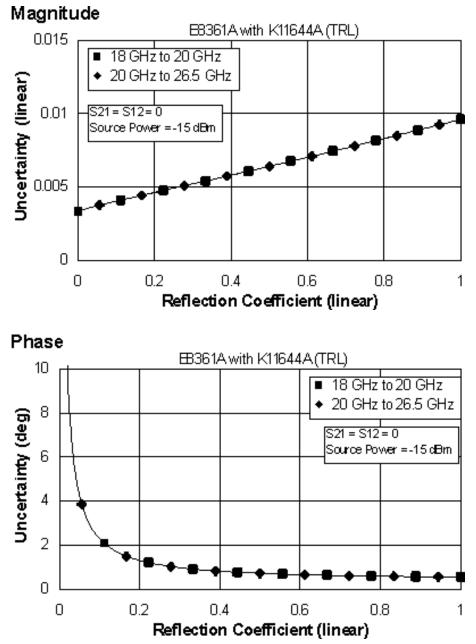
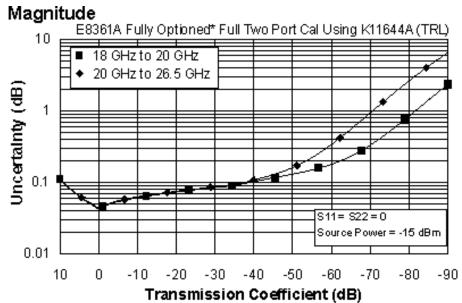


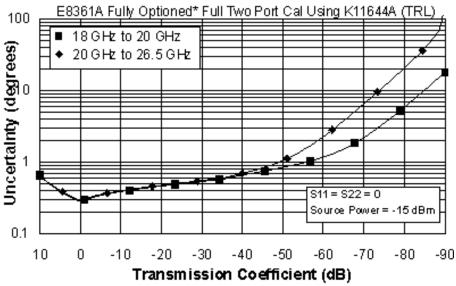
Table 27. K11644A Calibration KitE8361A - Fully Optioned (Option 014,and 080)Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, K11644A (WR-42) calibration kit, 85134F flexible test port cable set with the K281C launch set,, and a full 2-port calibration. Also applies to the following condition:

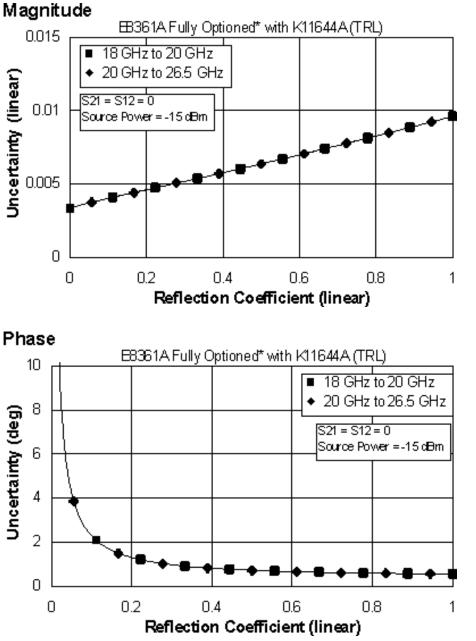
Description	Specification (dB)	
	18 to	20 to
	20 GHz	26.5 GHz
Directivity	50	50
Source Match	50	50
Load Match	50	50
Reflection Tracking	±0.000	±0.000
	+0.02/°C	+0.02/°C
Transmission Tracking	±0.019	±0.020
	+0.02/°C	+0.02/°C







* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)



* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)

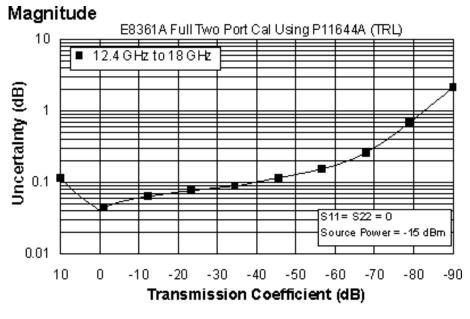
E8361A Corrected System Performance with WR-62 Connectors

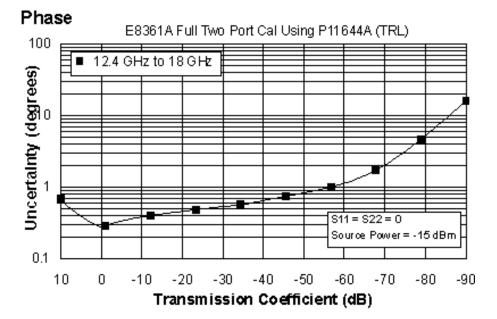
 Table 28.
 P11644A
 Calibration Kit

E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, P11644A (WR-62) calibration kit, 85132F flexible test port cable set with the P281B and P281C launch sets, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)
	12.4 to
	18 GHz
Directivity	50
Source Match	50
Load Match	50
Reflection Tracking	±0.000
	+0.02/°C
Transmission Tracking	±0.017
	+0.02/°C





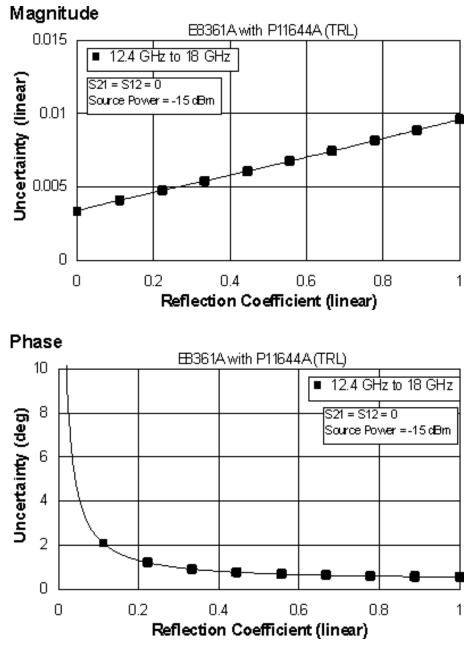
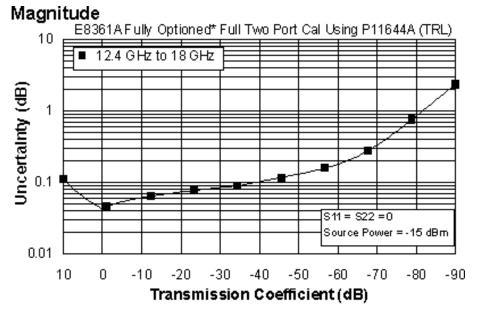


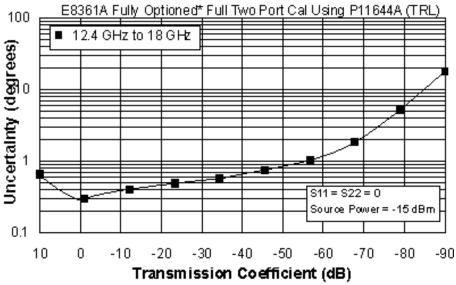
Table 29. P11644A Calibration KitE8361A - Fully Optioned (Option 014, and 080)Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, P11644A (WR-62) calibration kit, 85132F flexible test port cable set with the P281B and P281C launch sets, and a full 2-port calibration. Also applies to the following condition:

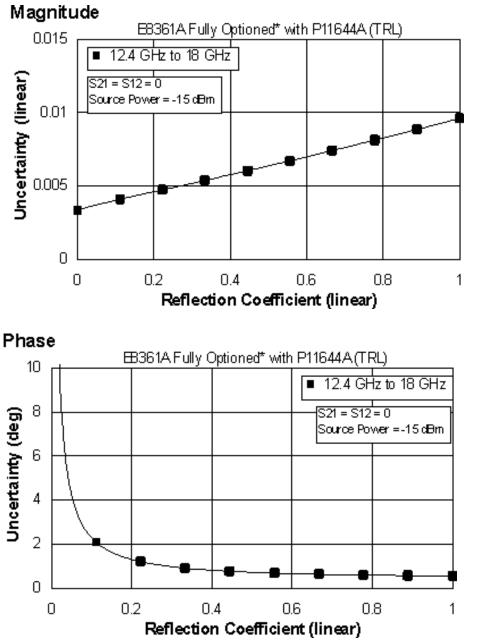
Description	Specification (dB)
	12.4 to
	18 GHz
Directivity	50
Source Match	50
Load Match	50
Reflection Tracking	±0.000
	+0.02/°C
Transmission Tracking	±0.019
	+0.02/°C







* Configurable Test Set and Frequency Offset Mode (E8361A - Option 014, and 080)



* Configurable Test Set and Frequency Offset Mode (E8361A - Option 014, and 080)

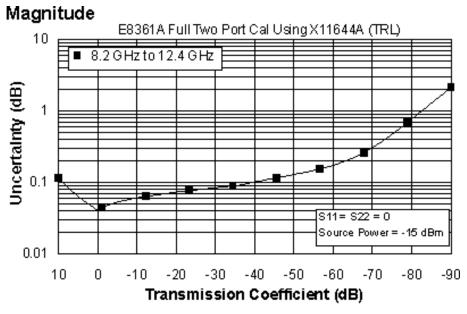
E8361A Corrected System Performance with WR-90 Connectors

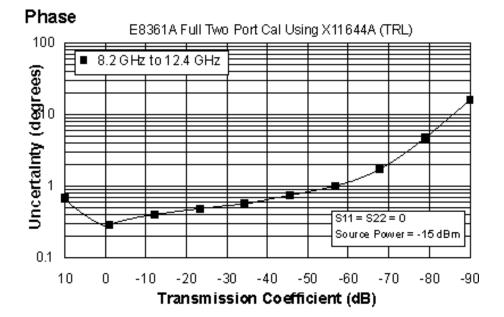
Table 30. X11644A Calibration Kit

E8361A - Standard Configuration and Standard Power Range

Applies to the, E8361A analyzers, X11644A (WR-90) calibration kit, 85133F flexible test port cable set with the X281A and X281C launch sets, and a full 2-port calibration. Also applies to the following condition:

Description	Specification (dB)	
	8.2 to	
	12.4 GHz	
Directivity	50	
Source Match	50	
Load Match	50	
Reflection Tracking	±0.000	
	+0.02/°C	
Transmission Tracking	±0.017	
	+0.02/°C	





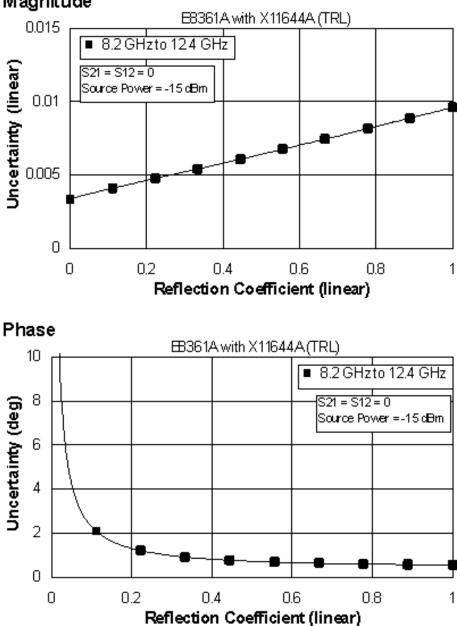
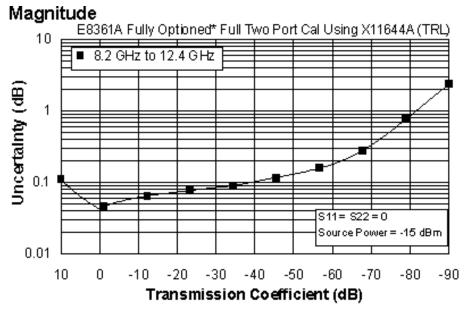


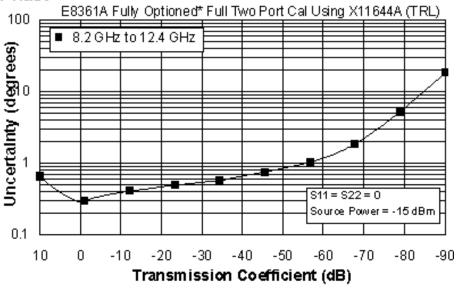
Table 31. X11644A Calibration Kit E8361A - Fully Optioned (Option 014, and 080) Configurable Test Set, and Frequency Offset Mode

Applies to the, E8361A analyzers, X11644A (WR-90) calibration kit, 85133F flexible test port cable set with the X281A and X281C launch sets, and a full 2-port calibration. Also applies to the following condition:

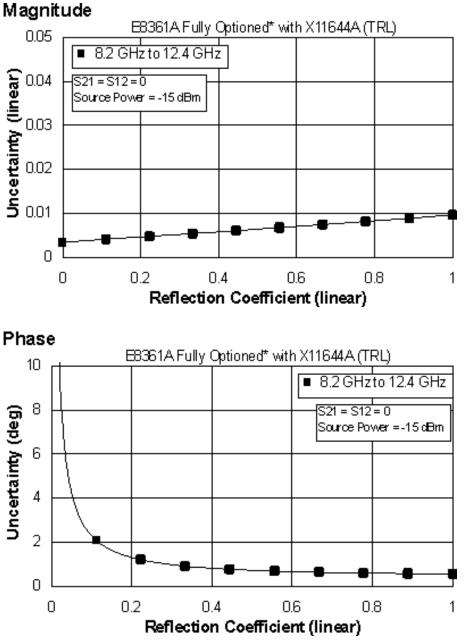
Description	Specification (dB)
	8.2 to
	12.4 GHz
Directivity	50
Source Match	50
Load Match	50
Reflection Tracking	±0.000
	+0.02/°C
Transmission Tracking	±0.019
	+0.02/°C







* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080)



* Configurable Test Set, and Frequency Offset Mode (E8361A - Option 014, and 080

Table 32. Uncorrected System Performance^a

Specifications apply over environmental temperature of 23° ±3 °C, with < 1 °C deviation from the calibration temperature

Description	Specification	Supplemental Information	
Directivity			
		typical:	
10 MHz to 45 MHz ^b	22 dB	22 dB	
45 MHz to 2 GHz	24 dB	27 dB	
2 GHz to 10 GHz	20 dB	24 dB	
10 GHz to 20 GHz	16 dB	20 dB	
20 GHz to 30 GHz	14 dB	17 dB	
30 GHz to 50 GHz	13 dB	17 dB	
50 GHz to 60 GHz	13 dB	17 dB	
60 GHz to 67 GHz	10 dB	18 dB	
67 GHz to 70 GHz ^b	14 dB	14 dB	
Source Match - Standard			
		typical:	
10 MHz to 45 MHz ^b	7 dB	7 dB	
45 MHz to 2 GHz	18 dB	23 dB	
2 GHz to 10 GHz	14 dB	18 dB	
10 GHz to 20 GHz	12 dB	15 dB	
20 GHz to 30 GHz	8 dB	11.5 dB	
30 GHz to 40 GHz	7.5 dB	10 dB	
40 GHz to 45 GHz	8 dB	11 dB	
45 GHz to 50 GHz	7 dB	10 dB	
50 GHz to 60 GHz	6 dB	8.5 dB	
60 GHz to 67 GHz	5.5 dB	7.5 dB	
67 GHz to 70 GHz ^b	7.5 dB	7.5	
Source Match - Option 014	7.5 00	1.5	
		typical:	
10 MHz to 45 MHz ^b	7 dB	7 dB	
45 MHz to 2 GHz	17 dB	21 dB	
2 GHz to 10 GHz	12 dB	17 dB	
10 GHz to 20 GHz	11 dB	14 dB	
20 GHz to 30 GHz	10 dB	13 dB	
30 GHz to 40 GHz	8.5 dB	11 dB	
40 GHz to 45 GHz	8.5 dB	11 dB	
45 GHz to 50 GHz	8.5 dB	11.5 dB	
50 GHz to 60 GHz	6.5 dB	9 dB	
60 GHz to 67 GHz	6 dB	8.5 dB	
67 GHz to 70 GHz ^b	8.5 dB	8.5 dB	
Load Match - Standard	0.5 UB	0.5 UB	
Load Match - Standard		typical	
		typical:	
10 MHz to 45 MHz ^b	5.5 dB	5.5 dB	
45 MHz to 2 GHz	9 dB	10 dB	
2 GHz to 10 GHz	9 dB	11 dB	
10 GHz to 20 GHz	8.5 dB	10 dB	
20 GHz to 30 GHz	7 dB	9 dB	
30 GHz to 40 GHz	6 dB	8 dB	
40 GHz to 45 GHz	6.5 dB	9 dB	
45 GHz to 50 GHz	6.5 dB	8.5 dB	
50 GHz to 60 GHz	5.5 dB	7.5 dB	
60 GHz to 67 GHz	5.5 dB	7.5 dB	
67 GHz to 70 GHz ^b	5 dB	5 dB	

Load Match - Option 014		
•		typical:
10 MHz to 45 MHz ^b	5.5 dB	5.5 dB
45 MHz to 2 GHz	8.5 dB	10 dB
2 GHz to 10 GHz	8 dB	10 dB
10 GHz to 20 GHz	8 dB	10 dB
20 GHz to 30 GHz	7.5 dB	10 dB
30 GHz to 40 GHz	7 dB	9.5 dB
40 GHz to 45 GHz	7.5 dB	9.5 dB
45 GHz to 50 GHz	7.5 dB	10 dB
50 GHz to 60 GHz	6 dB	8.5 dB
60 GHz to 67 GHz	6 dB	8.5 dB
67 GHz to 70 GHz ^b	5 dB	5 dB
Reflection Tracking	1	
		typical:
10 MHz to 45 MHz		±1.5 dB
45 MHz to 20 GHz		±1.5 dB
20 GHz to 40 GHz		±2.0 dB
40 GHz to 50 GHz		±2.0 dB
50 GHz to 67 GHz		±3.0 dB
67 GHz to 70 GHz		±4.5 dB
Transmission Tracking ^c		
		typical:
10 MHz to 45 MHz		±1.5 dB
45 MHz to 20 GHz		±1.5 dB
20 GHz to 40 GHz		±2.0 dB
40 GHz to 50 GHz		±2.0 dB
50 GHz to 67 GHz 67 GHz to 70 GHz		±3.0 dB
Crosstalk ^d - Standard		±4.5 dB
10 MHz to 45 MHz ^b	-63 dB	
45 MHz to 500 MHz	-87 dB	
500 MHz to 2 GHz	-110 dB	
2 GHz to 10 GHz	-105 dB	
10 GHz to 24 GHz	-111 dB	
24 GHz to 30 GHz	-106 dB	
30 GHz to 40 GHz	-104 dB	
40 GHz to 45 GHz	-98 dB	
45 GHz to 50 GHz	-100 dB	
50 GHz to 60 GHz	-97 dB	
60 GHz to 67 GHz	-94 dB	
67 GHz to 70 GHz ^b	-94 dB	
Crosstalk ^d - Option 014		
10 MHz to 45 MHz ^b	-63 dB	
45 MHz to 500 MHz	-87 dB	
500 MHz to 2 GHz	-110 dB	
2 GHz to 10 GHz	-105 dB	
10 GHz to 24 GHz	-111 dB	
24 GHz to 30 GHz	-104 dB	
30 GHz to 40 GHz	-102 dB	
40 GHz to 45 GHz	-96 dB	
45 GHz to 50 GHz	-98 dB	
50 GHz to 60 GHz	-95 dB	
60 GHz to 67 GHz	-90 dB	
67 GHz to 70 GHz ^b	-90 dB	

Crosstalk - Option 014 and Option 080 enabled ^e		
	typical:	
10 MHz to 45 MHz ^b	-63 dB	
45 MHz to 500 MHz	-87 dB	
500 MHz to 2 GHz	-110 dB	
2 GHz to 10 GHz	-105 dB	
10 GHz to 24 GHz	-111 dB	
24 GHz to 30 GHz	-104 dB	
30 GHz to 40 GHz	-102 dB	
40 GHz to 45 GHz	-96 dB	
45 GHz to 50 GHz	-98 dB	
50 GHz to 60 GHz	-95 dB	
60 GHz to 67 GHz	-90 dB	
67 GHz to 70 GHz ^b	-90 dB	

^a Specifications apply over environment temperature of 23°C +/- 3°C, with less than 1°C deviation from the calibration temperature.

^b Typical performance.

^cTransmission tracking performance noted here is normalized to the insertion loss characteristics of the cable used so that the indicated performance is independent of the cable used.

^d Measurement conditions: normalized to a thru, measured with two shorts, 10 Hz IF bandwidth, averaging factor of 8, alternate mode, source power set to the lesser of the maximum power out or the maximum receiver power.

^e 0 Hz offset.

Table 33. Test Port Output

Description	Specification		Supplemental
Frequency Rai	nge		
	Standard	Opt 014	
E8361A	10 MHz to 67 G	Hz	
	(Operates up to	70 GHz)	
Nominal Powe	r ³		
E8361A	-15 dBm		
Frequency Res	solution		
	1 Hz		
CW Accuracy	CW Accuracy		
	+/-1 ppm		
Frequency Stability			
			+/-1 ppm. 0° to 40° C, typical +/-
			0.2 ppm/yr, typical

Power Level Accuracy ¹				
	Standard	Opt 014		
10 MHz to 45 MHz ²	+/-1.5 dB	+/-1.5 dB	Variation from nominal power in range 0	
45 MHz to 10 GHz	+/-1.5 dB	+/-1.5 dB		
10 GHz to 20 GHz	+/-1.5 dB	+/-1.5 dB		
20 GHz to 40 GHz	+/-2.0 dB	+/-2.0 dB		
40 GHz to 45 GHz	+/-3.0 dB	+/-3.0 dB		
45 GHz to 50 GHz	+/-3.5 dB	+/-3.5 dB		
50 GHz to 60 GHz	+/-4.0 dB	+/-4.0 dB		
60 GHz to 67 GHz	+/-4.0 dB	+/-4.0 dB		
67 GHz to 70 GHz ²	+/-4.0 dB	+/-4.0 dB		
Power Level L	inearity⁴			
	Standard	Opt 014		
			Test reference is at the nominal power level	
10 MHz to 45 MHz ²	+/-1.0 dB for power<-5 dBm ⁷			
45 MHz to 67 GHz	+/-1.0 dB for power<-5 dBm ⁷			
67 GHz to 70 GHz ²	+/-1.0 dB for power<-5 dBm ⁷			

Power Range ^{1,}	5, 6		
	Standard	Opt 014	
10 MHz to 45	-25 to	-25 to	
MHz ²	-7 dBm	-7 dBm	
45 MHz to	-25 to	-25 to	
500 MHz	-3 dBm	-3 dBm	
500 MHz to	-25 to	-25 to	
750 MHz	0 dBm	0 dBm	
750 MHz to	-27 to	-27 to	
10 GHz	0 dBm	0 dBm	
10 GHz to 30	-27 to	-27 to	
GHz	+1 dBm	0 dBm	
30 GHz to 40	-27 to	-27 to	
GHz	-1 dBm	-2 dBm	
40 GHz to 45	-27 to	-27 to	
GHz	-5 dBm	-27 to -6 dBm	
45 GHz to 50	-27 to		
GHz	-27 to -1 dBm	-27 to -2 dBm	
50 GHz to 60	-		
GHz	-27 to	-27 to	
60 GHz to 67	-3 dBm	-4 dBm	
GHz	-27 to	-27 to	
67 GHz to 70	-5 dBm	-7 dBm	
GHz^2	-27 to	-27 to	
	-5 dBm	-7 dBm	
Power Sweep	Standard	Opt 014	
10 MHz to 45	18 dB	18 dB	ALC range starts at maximum
MHz ²			leveled output power and goes
45 MHz to	22 dB	22 dB	down to power level indicated by
500 MHz			dB amount specified.
500 MHz to 750 MHz	25 dB	25 dB	
750 MHz to	27 dB	27 dB	-
10 GHz			
10 GHz to 30	28 dB	27 dB	
GHz			4
30 GHz to 40 GHz	26 dB	25 dB	
40 GHz to 45	22 dB	21 dB	-
GHz			
45 GHz to 50	26 dB	25 dB	7
GHz			4
50 GHz to 60	24 dB	23 dB	
GHz 60 GHz to 67	22 dB	20 dB	-
GHz			
67 GHz to 70	22 dB	20 dB	1
GHz ²			
Power Resolut	ion		
	0.01 dB		

Standard Opt 014 10 kHz offset from center frequency, nominal power at test port 10 kHz to 45 MHz -80 dBc 10 KHz to 10 GHz -70 dBc 10 GHz to 24 GHz -60 dBc 24 GHz to 70 GHz -55 dBc 10 kHz offset from center frequency, nominal power at test port - Option 080 enabled -70 dBc 10 kHz offset from center frequency, nominal power at test port - Option 080 enabled -70 dBc 10 kHz offset from center frequency, nominal power at test port - Option 080 enabled -70 dBc 10 kHz offset from center frequency, nominal power at test port - Option 080 enabled -80 dBc 45 MHz to 10 GHz -70 dBc -80 dBc 10 GHz to 24 GHz -60 dBc -80 dBc 24 GHz to 70 GHz -90 dBc -80 dBc 10 GHz to 24 GHz -90 dBc -85 dBc 10 GHz to 24 GHz -85 dBc -85 dBc 10 GHz to 24 GHz -85 dBc -85 dBc 10 GHz to 24 GHz -75 dBc -85 dBc 10 GHz to 24 GHz -85 dBc -85 dBc 10 GHz to 24 GHz -85 dBc -85 dBc 10 GHz to 24 GHz	Phase Noise				
Image: matrix index and the second secon		Standard	Opt 014		
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MHz Image: Constraint of the second sec				typical:	
45 MHz to 10 -70 dBc GHz -60 dBc 10 GHz to 24 -60 dBc GHz -55 dBc 10 kHz offset from center frequency, nominal power at test port - Option 080 enabled -70 dBc 10 kHz offset from center frequency, nominal power at test port - Option 080 enabled -80 dBc 10 kHz offset from center frequency, nominal power at test port - Option 080 enabled -70 dBc GHz -70 dBc 10 GHz to 24 -60 dBc GHz -70 dBc GHz -60 dBc 24 GHz to 70 -55 dBc GHz -90 dBc GHz -90 dBc MHz -90 dBc MHz -90 dBc GHz -90 dBc GHz -90 dBc GHz -75 dBc 10 GHz to 24 -75 dBc GHz -85 dBc GHz -90 dBc GHz -75 dBc 10 GHz to 70 -85 dBc GHz -76 dBc 10 GHz to 74 -85 dBc GHz -7	10 MHz to 45			-80 dBc	
GHz Image: Constraint of the second sec	MHz				
10 GHz to 24 GHz -60 dBc 24 GHz to 70 GHz -55 dBc 10 kHz offset from center frequency, nominal power at test port - Option 080 enabled -55 dBc 10 kHz offset from center frequency, nominal power at test port - Option 080 enabled -70 dBc 10 kHz offset from center frequency, nominal power at test port -70 dBc 10 GHz to 24 GHz -60 dBc 24 GHz to 70 GHz -70 dBc 10 GHz to 24 GHz -90 dBc 100 kHz offset from center frequency, nominal power at test port -90 dBc 100 kHz offset from center frequency, nominal power at test port -90 dBc 10 GHz to 24 GHz -90 dBc 10 GHz to 24 GHz -90 dBc 10 GHz to 70 GHz -90 dBc 10 GHz to 70 GHz -90 dBc 100 kHz offset from center frequency, nominal power at test port - Option 080 enabled 100 kHz offset from center frequency, nominal power at test port - Option 080 enabled 100 kHz offset from center frequency, nominal power at test port - Option 080 enabled 100 KHz offset from center frequency, nominal power at test port 100 KHz offset from center frequency, nominal power at test port 100 KHz offset from center frequency, nominal power at test port 100 KHz offset from center frequency, nomi				-70 dBc	
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10 GHz to 24 -60 dBc GHz -55 dBc 24 GHz to 70 -55 dBc 100 kHz offset from center frequency, nominal power at test port typical: 100 kHz offset from center frequency, nominal power at test port -90 dBc MHz -90 dBc 45 MHz to 10 -90 dBc GHz -90 dBc 10 GHz to 24 -90 dBc GHz -90 dBc 10 GHz to 70 -75 dBc GHz -75 dBc I00 kHz offset from center frequency, nominal power at test port - Option 080 enabled -75 dBc I00 kHz to 45 -85 dBc GHz -80 dBc GHz -80 dBc GHz -70 dBc GHz -70 dBc GHz -70 dBc GHz -115 dBc MHz to 45 -115 dBc MHz -115 dBc GHz -110 dBc GHz -105 dBc GHz -105 dBc GHz -105 dBc					
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45 MHz to 10 GHz-90 dBc10 GHz to 24 GHz-85 dBc24 GHz to 70 GHz-75 dBc24 GHz to 70 GHz-75 dBc100 kHz offset from center frequency, nominal power at test port - Option 080 enabled10 MHz to 45 MHz-85 dBc10 MHz to 45 MHz-85 dBc10 GHz to 24 GHz-80 dBc10 GHz to 24 GHz-70 dBc10 GHz to 24 GHz-60 dBc10 MHz to 45 MHz-115 dBc10 GHz to 24 GHz-110 dBc10 GHz to 24 GHz-110 dBc10 GHz to 24 GHz-110 dBc10 GHz to 45 MHz-110 dBc10 GHz to 45 MHz-110 dBc24 GHz to 70 GHz-105 dBc					
GHz Image: Constraint of Constra				-90 dBc	
GHz Image: Constraint of the sector of the sec					
24 GHz to 70 -75 dBc GHz 100 kHz offset from center frequency, nominal power at test port - Option 080 enabled 100 kHz offset from center frequency, nominal power at test port - Option 080 enabled 10 MHz to 45 -85 dBc MHz -80 dBc 45 MHz to 10 -80 dBc GHz -70 dBc 10 GHz to 24 -70 dBc GHz -60 dBc 10 MHz offset from center frequency, nominal power at test port typical: 10 MHz to 45 -115 dBc MHz -110 dBc GHz -110 dBc GHz -105 dBc	10 GHz to 24			-85 dBc	
GHz Image: Constraint of the section of t	GHz				
100 kHz offset from center frequency, nominal power at test port - Option 080 enabledIn OMHz to 45 MHz10 MHz to 45 MHz-85 dBcMHz-80 dBc45 MHz to 10 GHz-70 dBc10 GHz to 24 GHz-70 dBc24 GHz to 70 GHz-60 dBctypical:1 MHz offset from center frequency, nominal power at test port10 MHz to 45 MHz-115 dBc10 MHz to 45 MHz-110 dBc10 GHz to 24 GHz-110 dBc24 GHz to 70 GHz-105 dBc	24 GHz to 70			-75 dBc	
enabled typical: 10 MHz to 45 MHz -85 dBc 10 MHz to 10 GHz -80 dBc 10 GHz to 24 GHz -70 dBc 10 GHz to 70 GHz -70 dBc 10 GHz to 70 GHz -60 dBc 10 MHz to 70 GHz -60 dBc 10 MHz to 70 GHz -60 dBc 10 MHz to 70 GHz -115 dBc 10 MHz to 45 MHz -110 dBc 10 MHz to 45 MHz -110 dBc 10 GHz to 24 GHz -105 dBc					
Image: Mile of the second se		from center freq	uency, nominal p	ower at test port - Option 080	
10 MHz to 45 MHz -85 dBc 45 MHz to 10 GHz -80 dBc 10 GHz to 24 GHz -70 dBc 24 GHz to 70 GHz -60 dBc 1 MHz offset frequency, nominal power at test port 1 MHz to 45 MHz -115 dBc 10 MHz to 45 MHz -110 dBc 10 GHz to 24 GHz -110 dBc 10 GHz to 24 GHz -110 dBc 45 MHz to 10 GHz -110 dBc 24 GHz to 70 -105 dBc	enabled	r	ГГ		
MHz Image: MHz to 10 GHz to 10 GHz Image: Filter Stress of the stre					
45 MHz to 10 GHz -80 dBc 10 GHz to 24 GHz -70 dBc 24 GHz to 70 GHz -60 dBc 1 MHz offset from center frequency, nominal power at test port 1 MHz to 45 MHz -115 dBc 10 MHz to 45 MHz -110 dBc 10 GHz to 24 GHz -110 dBc 24 GHz to 70 -105 dBc 24 GHz to 70 -95 dBc				-85 dBc	
GHzImage: GHzImag					
10 GHz to 24 GHz-70 dBc24 GHz to 70 GHz-60 dBc21 MHz offset from center frequency, nominal power at test port1 MHz offset from center frequency, nominal power at test port10 MHz to 45 MHz-115 dBc10 MHz to 45 MHz-115 dBc10 GHz to 24 GHz-110 dBc24 GHz to 70-95 dBc				-80 gRC	
GHzImage: Constraint of Constrain					
24 GHz to 70 GHz-60 dBc1 MHz offset from center frequency, nominal power at test port10 MHz to 45 MHz-115 dBc10 MHz to 45 MHz-110 dBc45 MHz to 10 GHz-110 dBc10 GHz to 24 GHz-105 dBc24 GHz to 70-95 dBc				-70 abc	
GHz Image: Center frequency, nominal per at test port 1 MHz offset requency, nominal per at test port typical: 10 MHz to 45 -115 dBc MHz -115 dBc 45 MHz to 10 -110 dBc GHz -110 dBc 10 GHz to 24 -105 dBc GHz -105 dBc				60 dBo	
1 MHz offset from center frequency, nominal power at test porttypical:10 MHz to 45 MHz-115 dBc10 Fraction-110 dBc45 MHz to 10 GHz-110 dBc10 GHz to 24 GHz-105 dBc24 GHz to 70-95 dBc					
typical: 10 MHz to 45 MHz -115 dBc 45 MHz to 10 GHz -110 dBc 10 GHz to 24 GHz -105 dBc 24 GHz to 70 -95 dBc		om center frogue	ancy nominal no	wer at test nort	
10 MHz to 45 MHz-115 dBc45 MHz to 10 GHz-110 dBc10 GHz to 24 GHz-105 dBc24 GHz to 70-95 dBc					
MHz Image: MHz to 10 GHz -110 dBc 10 GHz to 24 GHz -105 dBc -105 dBc 24 GHz to 70 -95 dBc -95 dBc	10 MHz to 45				
45 MHz to 10 -110 dBc GHz -105 dBc 10 GHz to 24 -105 dBc GHz -95 dBc					
GHzImage: GHzImage: Height and H				-110 dBc	
10 GHz to 24 -105 dBc GHz -95 dBc					
GHz -95 dBc				-105 dBc	
24 GHz to 70 -95 dBc					
				-95 dBc	

om center freq	uency, nomina	I power at test port - Option 080
	1	
		typical:
		-110 dBc
		-105 dBc
		-95 dBc
		-85 dBc
d or 3rd)		
Standard	Opt 014	
		typical:
		-10 dBc
		-15 dBc
		-23 dBc
		-16 dBc
		-13 dBc
		-19 dBc
Spurious (at N	ominal Output	Power)
Standard	Opt 014	
	1.	-50 dBc typical, for offset
		frequency > 1 kHz
		-30 dBc typical, for offset
		frequency > 1 kHz
	d or 3rd) Standard	d or 3rd) Standard Opt 014 Standard Opt 014 Standard Opt 014

¹ Performance specified on Port 1 only. Port 2 output performance is a characteristic.

² Typical performance.

³ Preset power.

⁴ Power Level Linearity specified on Port 1 only; Port 2 performance is typical.

⁵ Test port power is specified into nominal 50 ohms.

⁶ Power to which the source can be set and phase lock is assured.

 7 +/-1.6 dBm for power>=-5 dBm

Table 34: Test Port Input

Description	Specification		Supplemental
Description		Supplemental	
Test Port Noise Flo	Standard	Opt 014	
10 Hz IF Bandwidth			
10 MHz to 45 MHz ^b	<-70 dBm	<-70 dBm	
45 MHz to 500	<-70 dBm	<-90 dBm	
MHz ^c	<-90 ubiii	<-90 ubiii	
500 MHz to 2 GHz	<-112 dBm	<-112 dBm	
2 GHz to 10 GHz	<-112 dBm	<-112 dBm	
10 GHz to 24 GHz	<-116 dBm	<-115 dBm	
24 GHz to 30 GHz	<-105 dBm	<-104 dBm	
30 GHz to 40 GHz	<-105 dBm	<-104 dBm	
40 GHz to 45 GHz	<-103 dBm	<-102 dBm	
45 GHz to 50 GHz	<-101 dBm	<-100 dBm	
50 GHz to 60 GHz	<-100 dBm	<-99 dBm	
60 GHz to 67 GHz	<-99 dBm	<-97 dBm	
67 GHz to 70 GHz ^b	<-99 dBm	<-97 dBm	
1 KHz IF Bandwidth			
10 MHz to 45 MHz ^b	<-50 dBm	<-50 dBm	
45 MHz to 500	<-70 dBm	<-70 dBm	
MHz ^c			
500 MHz to 2 GHz	<-92 dBm	<-92 dBm	
2 GHz to 10 GHz	<-92 dBm	<-92 dBm	
10 GHz to 24 GHz	<-96 dBm	<-95 dBm	
24 GHz to 30 GHz	<-85 dBm	<-84 dBm	
30 GHz to 40 GHz	<-85 dBm	<-84 dBm	
40 GHz to 45 GHz	<-83 dBm	<-82 dBm	
45 GHz to 50 GHz	<-81 dBm	<-80 dBm	
50 GHz to 60 GHz	<-80 dBm	<-79 dBm	
60 GHz to 67 GHz	<-79 dBm	<-77 dBm	
67 GHz to 70 GHz ^b	<-79 dBm	<-77 dBm	
Test Port Noise Flo	or ^a Option 080 ena	abled ^a	
	Standard	Option 014	
10 Hz IF Bandwidth			
			typical:
10 MHz to 45 MHz			<-70 dBm
45 MHz to 500			<-90 dBm
MHz ^c			
500 MHz to 2 GHz			<-112 dBm
2 GHz to 10 GHz			<-112 dBm
10 GHz to 24 GHz			<-115 dBm
24 GHz to 30 GHz			<-104 dBm
30 GHz to 40 GHz			<-104 dBm
40 GHz to 45 GHz			<-102 dBm
45 GHz to 50 GHz			<-100 dBm
50 GHz to 60 GHz			<-99 dBm
60 GHz to 67 GHz			<-97 dBm
67 GHz to 70 GHz			<-97 dBm

1 KHz IF Bandwidth			
			typical:
10 MHz to 45 MHz			<-50 dBm
45 MHz to 500			<-70 dBm
MHz ^c			
500 MHz to 2 GHz			<-92 dBm
2 GHz to 10 GHz			<-92 dBm
10 GHz to 24 GHz			<-95 dBm
24 GHz to 30 GHz			<-84 dBm
30 GHz to 40 GHz			<-84 dBm
40 GHz to 45 GHz			<-82 dBm
45 GHz to 50 GHz			<-80 dBm
50 GHz to 60 GHz			<-79 dBm
60 GHz to 67 GHz			<-77 dBm
67 GHz to 70 GHz			<-77 dBm
Direct Receiver Acc	ess Input Noise	Floor ^a	
	Standard	Option 014	
10 Hz IF Bandwidth			
10 MHz to 45 MHz ^b		<-106 dBm	
45 MHz to 500		<-105 dBm	
MHz ^d			
500 MHz to 2 GHz		<-125.5 dBm	
2 GHz to 10 GHz		<-125 dBm	
10 GHz to 24 GHz		<-128 dBm	
24 GHz to 30 GHz		<-117.5 dBm	
30 GHz to 40 GHz		<-117 dBm	
40 GHz to 45 GHz		<-115 dBm	
45 GHz to 50 GHz		<-112.5 dBm	
50 GHz to 60 GHz		<-111 dBm	
60 GHz to 67 GHz		<-108 dBm	
67 GHz to 70 GHz ^b		<-107 dBm	
1 KHz IF Bandwidth	<u> </u>		
10 MHz to 45 MHz ^b		<-86 dBm	
45 MHz to 500		<-85 dBm	
MHz ^d			
500 MHz to 2 GHz		<-105.5 dBm	
2 GHz to 10 GHz		<-105 dBm	
10 GHz to 24 GHz		<-108 dBm	
24 GHz to 30 GHz		<-97.5 dBm	
30 GHz to 40 GHz		<-97 dBm	
40 GHz to 45 GHz		<-95 dBm	
45 GHz to 50 GHz		<-92.5 dBm	
50 GHz to 60 GHz		<-91 dBm	
60 GHz to 67 GHz		<-88 dBm	
67 GHz to 70 GHz ^b		<-87 dBm	

Direct Receiver Access Input Noise Floor ^a - Option 080 enabled ^d				
	Standard	Option 014		
10 Hz IF Bandwidth			-	
			typical:	
10 MHz to 45 MHz			<-106 dBm	
45 MHz to 500			<-105 dBm	
MHz ^d				
500 MHz to 2 GHz			<-125.5 dBm	
2 GHz to 10 GHz			<-125 dBm	
10 GHz to 24 GHz			<-128 dBm	
24 GHz to 30 GHz			<-117.5 dBm	
30 GHz to 40 GHz			<-117 dBm	
40 GHz to 45 GHz			<-115 dBm	
45 GHz to 50 GHz			<-112.5 dBm	
50 GHz to 60 GHz			<-111 dBm	
60 GHz to 67 GHz			<-108 dBm	
67 GHz to 70 GHz			<-107 dBm	
1 KHz IF Bandwidth				
			typical:	
10 MHz to 45 MHz			<-86 dBm	
45 MHz to 500			<-85 dBm	
MHz ^d				
500 MHz to 2 GHz			<-105.5 dBm	
2 GHz to 10 GHz			<-105 dBm	
10 GHz to 24 GHz			<-108 dBm	
24 GHz to 30 GHz			<-97.5 dBm	
30 GHz to 40 GHz			<-97.5 dBm	
40 GHz to 45 GHz			<-95 dBm	
45 GHz to 50 GHz			<-92.5 dBm	
50 GHz to 60 GHz			<-92.5 dBm	
60 GHz to 67 GHz			<-88 dBm	
67 GHz to 70 GHz				
Receiver Compress	ion Loval		<-87 dBm	
Receiver Compress		Option 014		
	Standard	Option 014		
10 MHz to 45 MHz ^{b, h}	negligible			
45 MHz to 500 MHz ^h	<0.25 dB compression at -3 dBm			
500 MHz to	<0.25 dB compression at 0 dBm			
30 GHz				
30 GHz to	<0.15 dB	<0.15 dB		
	compression at -5	compression at -7		
67 GHz	dBm	dBm		
67 GHz to	<0.15 dB	<0.15 dB		
70 GHz ^b	compression at -5	compression at -7		
	dBm	dBm		
System Compression Level				
	Standard	Option 014		
	maximum leveled ou		See dynamic	
			accuracy table	

Third Order Interce	ept ^g - Tone spacing	from 100 kHz - 5 M	Hz
	Standard	Option 014	
		-	typical
10 MHz to 500			+30 dBm
MHz			
500 MHz to 24			+24 dBm
GHz			
24 GHz to 40 GHz			+23 dBm
40 to 50 GHz			+24 dBm
50 to 67 GHz			+26 dBm
Third Order Interce	ept ^g - Tone spacing		Hz
	Standard	Option 014	
(0.14) (- 00			typical
10 MHz to 500			NA
MHz			
500 MHz to 24 GHz			+20 dBm
24 GHz to 40 GHz			+20 dBm
40 to 50 GHz			+22 dBm
50 to 67 GHz			+24 dBm
Third Order Interce	ept ^g - Tone spacing	from 20 MHz - 50 N	1Hz
	Standard	Option 014	
			typical
10 MHz to 500 MHz			NA
500 MHz to 24			+26 dBm
GHz			
24 to 40 GHz			+24 dBm
40 to 50 GHz			+25 dBm
50 to 67 GHz			+27 dBm
Trace Noise Magni	tude		
-	Ratio measurement	. nominal power at te	est port.
	Standard	Option 014	
10 MHz to	<0.100 dB rms		
45 MHz ^b			
	<0.010 dP rmo		
45 MHz to	<0.010 dB rms		
500 MHz ^e			
500 MHz to	<0.006 dB rms		
24 GHz			
24 GHz to	<0.006 dB rms		
67 GHz			
67 GHz to	<0.006 dB rms		
70 GHz ^b			

Traca Naisa Magnié	uda Ontian 090 a	nchlod ^{b,d}	
Trace Noise Magnit			
1 kHz IF bandwidth.	Standard	Option 014	est port.
	Stanuaru		typical:
10 MHz to			<0.100 dB rms
45 MHz			
45 MHz to			<0.010 dB rms
500 MHz ^e			
500 MHz to			<0.006 dB rms
24 GHz			
24 GHz to			<0.009 dB rms
67 GHz			
67 GHz to			<0.009 dB rms
70 GHz	<u> </u>		
Trace Noise Phase	Datio magazine		
1 kHz IF bandwidth.	Standard	Option 014	est port.
10 MHz to	<0.500° rms		
45 MHz ^b			
45 MHz to	<0.100° rms		
500 MHz			
500 MHz to	<0.060° rms		
24 GHz			
24 GHz to	<0.100° rms		
67 GHz			
67 GHz to	<0.100° rms		
70 GHz ^b			
	Option 000 anabl	b,d	
Trace Noise Phase 1 kHz IF bandwidth.			act part
	Standard	Option 014	
	Otaridard		typical:
10 MHz to			<0.500° rms
45 MHz			
45 MHz to			<0.100° rms
500 MHz			
500 MHz to			<0.060° rms
24 GHz			
24 GHz to			<0.100° rms
67 GHz			
67 GHz to			<0.100° rms
70 GHz			
Reference Level Ma	gnitude		
Range	+/-500 dB		
Resolution	0.001 dB		

Reference Level P	hase		
Range	+/-500°		
Resolution	0.01°		
Stability Magnitude			
	Standard	Option 014	
Typical ratio measu	rement, made at th	ne test port.	
10 MHz to			+/-0.01 dB/°C
20 GHz			
20 GHz to			+/-0.02 dB/°C
70 GHz			
Stability Phase ^t			
	Standard	Option 014	
Typical ratio measu	rement, measured	at the test port.	
10 MHz to			+/-0.2°/°C
20 GHz			
20 GHz to			+/-0.5°/°C
40 GHz			
40 GHz to			+/-0.8°/°C
70 GHz			
Damage Input Leve			
	Standard	Option 014	
			typical:
Test Port 1			+27 dBm or
and 2			+/-40 VDC
R1, R2 in			+15 dBm or
			+/-15 VDC
A, B in			+15 dBm or
			+/-15 VDC
Coupler Thru			+27 dBm or
(Option 014)			+/-40 VDC
Coupler Arm			+30 dBm or
(Option 014			+/-7 VDC

^aTotal average (rms) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.

^bTypical performance.

^cNoise floor may be degraded by 10 dB at particular frequencies (multiples of 5 MHz) due to spurious receiver residuals.

^d0 Hz offset

^eTrace noise magnitude may be degraded to 20 mdB rms at harmonic frequencies of the first IF (8.33 MHz) below 80 MHz.

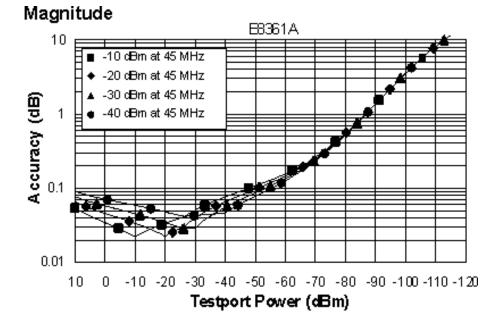
^fStability is defined as a ratio measurement made at the test port.

⁹ TOI is a typical specification that applies while the network analyzer receiver is in its linear range.

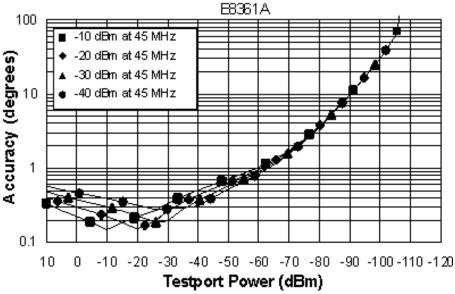
^h Coupler roll-off will reduce compression to a negligible level below 500 MHz.

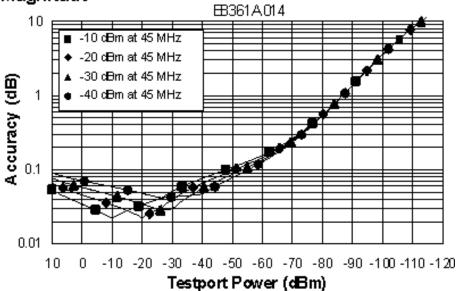
Table 35. Dynamic Accuracy (Specification^a)

Accuracy of the test port input power reading relative to the reference input power level.

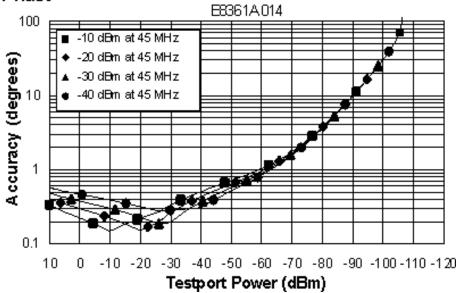


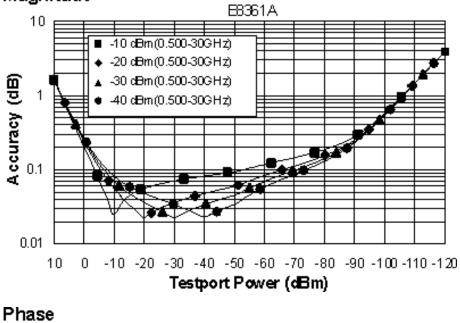


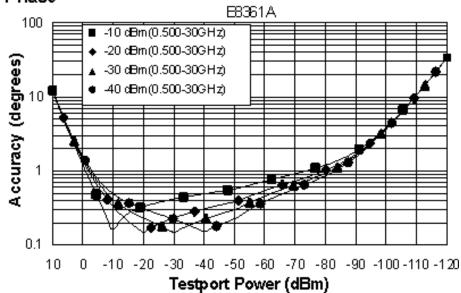


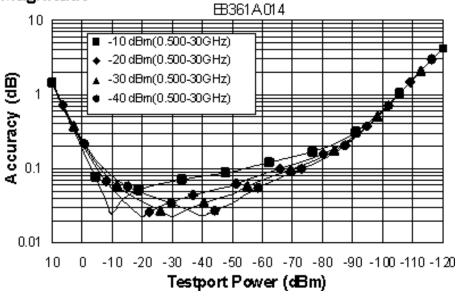




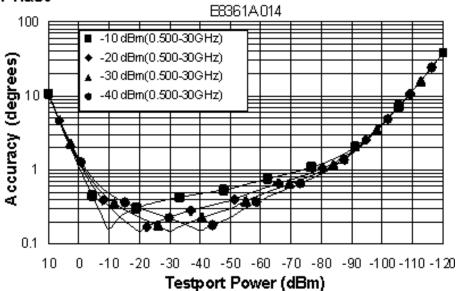


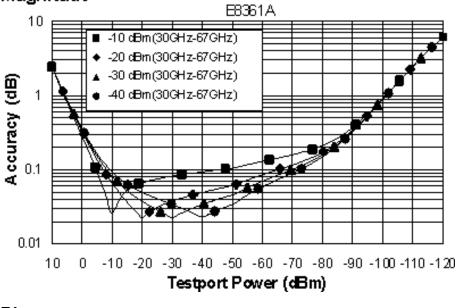


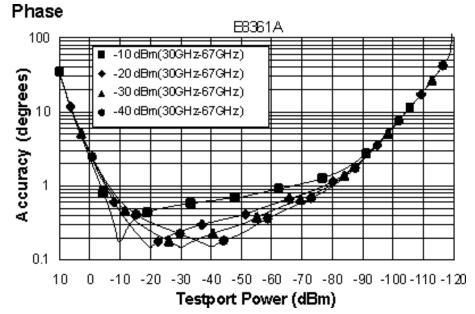


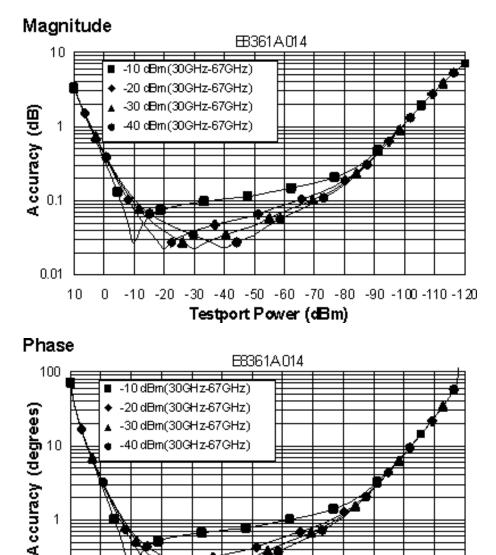












Testport Power (dBm) ^a Dynamic accuracy is verified with the following measurements:

compression over frequency •

1

0.1

10

0

IF linearity at a single frequency of 1.195 GHz and a reference level of -20 dBm ٠

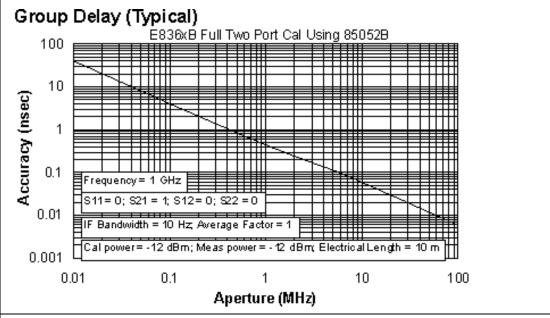
4.1

-10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120

Table 36. Test Port Input (Group Delay)^a

Description	Specification	Supplemental Information
Aperture (selectable)	(frequency span)/(number of points -1)	
Maximum Aperture	20% of frequency span	
Range	0.5 x (1/minimum aperture)	
Maximum Delay		Limited to measuring no more than 180° of phase change within the minimum aperture.)
Accuracy		See graph below. Char.

The following graph shows characteristic group delay accuracy with full 2-port calibration and a 10 Hz IF bandwidth. Insertion loss is assumed to be < 2 dB and electrical length to be ten meters.



In general, the following formula can be used to determine the accuracy, in seconds, of specific group delay measurement:

±Phase Accuracy (deg)/[360 × Aperture (Hz)]

Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst case phase accuracy.

^a Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and the number of points per sweep).

General Information

Table 37. Miscellaneous Information

Description	Specification	Supplemental Information
System IF Bandwidth Range		1 Hz to 40 kHz, nominal
CPU		Intel® 500 MHz Pentium® III

 Table 38.
 Front Panel Information

Table 38. Front Panel Information		
Description	Supplemental Information	
RF Connectors		
E8361A		
Туре	1.85 mm (male), 50 ohm, (nominal)	
Center Pin Recession	0.002 in. (characteristic)	
Display		
Size	21.3 cm (8.4 in) diagonal color active matrix LCD; 640 (horizontal) X 480 (vertical) resolution	
Refresh Rate	Vertical 59.83 Hz; Horizontal 31.41 Hz	

Display Range	
Magnitude	±500 dB (at 20 dB/div), max
Phase	±500°, max
Polar	10 pUnits, min
	1000 Units, max
Display Resolution	
Magnitude	0.001 dB/div, min
Phase	0.01°/div, min
Marker Resolution	
Magnitude	0.001 dB, min
Phase	0.01°, min
Polar	0.01 mUnit, min; 0.01°,min
Table 39. Rear Panel Info	
Description	Supplemental Information
10 MHz Reference In	
Connector	BNC, female
Input Frequency	10 MHz ± 10 ppm, typical
Input Level	-15 dBm to +20 dBm, typical
Input Impedance	200 Ω, nom.
10 MHz Reference Ou	
Connector	BNC, female
Output Frequency	10 MHz ± 1 ppm, typical
Signal Type	Sine Wave, typical
Output Level	+10 dBm \pm 4 dB into 50 Ω , typical
Output Impedance	50 Ω, nominal
Harmonics	<-40 dBc, typical
VGA Video Output	
Connector	15-pin mini D-Sub; Drives VGA compatible monitors
Devices Supported:	
	Resolutions:
Flat Panel (TFT)	1024 X 768, 800 X 600, 640 X 480
Flat Panel (DSTN)	800 X 600, 640 X 480
CRT Monitor	1280 X 1024, 1024 X 768, 800 X 600, 640 X 480
	Simultaneous operation of the internal and external displays is allowed, but
	with 640 X 480 resolution only. If you change resolution, you can only view the external display (internal display will "white out").
Test Set IO	The external display (internal display will write out).
	25-pin D-Sub connector, available for external test set control
Aux IO	
	25-pin D-Sub connector, male, analog and digital IO
Handler IO	
	36-pin parallel I/O port; all input/output signals are default set to negative
	logic; can be reset to positive logic via GPIB command
GPIB	
	24-pin D-sub (Type D-24), female; compatible with IEEE-488.
Parallel Port (LPT1)	
	25-pin D-Sub miniature connector, female; provides connection to printers or
	any other parallel port peripherals
Serial Port (COM 1)	
	9-pin D-Sub, male; compatible with RS-232

USB Port	
	One port on front panel and five ports on rear panel. Universal Serial Bus jack, Type A configuration (4 contacts inline, contact 1 on left); female
Contact 1	Vcc: 4.75 to 5.25 VDC, 500 mA, maximum
Contact 2	-Data
Contact 3	+Data
Contact 4	Ground
LAN	
	10/100BaseT Ethernet, 8-pin configuration; auto selects between the two data rates
Line Power ^a	
Frequency	48 Hz to 66 Hz
Voltage at 115 V Setting	90 to 132 VAC; 120 VAC, nominal
Voltage at 220 V Setting	198 to 264 VAC; 240 VAC, nominal
VA Max	600 VA maximum

^a A third-wire ground is required.

Table 40. Analyzer Environment and Dimensions

242 mm

9.5 in

Description	Supplemental Infor	rmation	
General Environmental			
RFI/EMI Susceptibility	Defined by CISPR F	Pub. 11, Group 1, Class A	, and IEC 50082-1
ESD			nd an antistatic bench mat
Dust	Minimize for optimu		
Operating Environment			
Temperature	0 °C to +40 °C		
	within this temperate message that may c	ip, phase locks, and displate ure range (except for "soun occur at temperatures outs rature range of 25 +/- 5°C	rce unleveled" error side the specified
Error-Corrected	23°C ± 3°C	Ŧ	
Temperature Range	with less than 1°C o	deviation from calibration	temp.
Humidity	5% to 95% at +40 °C	0	•
Altitude	0 to 4500 m (14,760	(ft.)	
Non-Operating Storage	Environment		
Temperature	-40 °C to +70 °C		
Humidity	0% to 90% at +65 °C	0% to 90% at +65 °C (non-condensing)	
Altitude	0 to 15,240 m (50,000 ft.)		
Cabinet Dimensions			
	Height	Width	Depth
Excluding front and rear	222 mm	425 mm	426 mm
panel hardware and feet	8.75 in	16.75 in	16.8 in
As shipped - includes	242 mm	425 mm	472 mm
front panel connectors,	9.5 in	16.75 in	18.6 in
rear panel bumpers, and feet.			
As shipped plus handles	242 mm	458 mm	453 mm
	9.5 in	18 in	17.8 in
As shipped plus rack-	242 mm	483 mm	472 mm
mount flanges	9.5 in	19 in	18.6 in
As shipped plus handles	242 mm	192 mm	450 mm

19 in

483 mm

453 mm

17.8 in

As shipped plus handles and rack-mount flanges

Weight				
Net				
E8361A	29	kg (64 lb), nominal		
Shipping				
E8361A	36.	3 kg (80 lb), nominal		
Measurement T	hroughput S	Summary		
Table 41 Typical Cyc	cle Time ^{a,b} (ms)	for Measurement Completion		
	Number	of Points		
	201	401	1601	16,001
Start 28 GHz, Sto	op 30 GHz, 35	5 kHz IF bandwidth		
Uncorrected,	12	19	55	503
1-port cal				
2-Port cal	29	44	124	1112
Start 10 MHz, St	op 10 GHz, 3	5 kHz IF bandwidth	·	
Uncorrected,	86	93	121	583
1-port cal				
2-Port cal	179	199	267	1301
Start 10 MHz, St	op 20 GHz, 3	5 kHz IF bandwidth		
Uncorrected,	126	130	153	597
1-port cal				
2-Port cal	264	275	335	1321
	op 40 GHz, 3	5 kHz IF bandwidth		
Uncorrected,	185	190	213	621
1-port cal				
2-Port cal	382	401	459	1374
		5 kHz IF bandwidth		
Uncorrected,	210	216	243	643
1-port cal				
2-Port cal	436	450	522	1405
		5 kHz IF bandwidth		1
Uncorrected	244	254	300	645
Corrected	502	524	591	1423

^a Typical performance.
 ^b Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S11) measurement.

Table 42. Cycle Time vs IF Bandwidth^a

Applies to the <u>Preset condition</u> (201 points, correction off) except for the following changes:

- CF = 28 GHz •
- Span = 100 MHz
- Display off (add 21 ms for display on) ٠

IF Bandwidth (Hz)	Cycle Time (ms) ^b	Cycle Time (ms) Option 080 enabled
40,000	11	100
35,000	12	101
30,000	13	102
20,000	16	106
10,000	30	127
7000	38	138
5000	50	152
3000	74	182
1000	274	326
300	694	782
100	1905	2054
30	6091	6355
10	17916	18372

^a Typical performance. ^b Cycle time includes sweep and retrace time.

Table 43. Cycle Time vs Number of Points^a

Applies to the Preset condition (35 kHz IF bandwidth, correction off) except for the following changes:

- CF = 28 GHz •
- Span = 100 MHz •
- Display off (add 21 ms for display on) ٠

Numbe r of	Cycle Time (ms) ^b
Points	
3	6
11	6
51	7
101	9
201	12
401	18
801	30
1601	55
16,001	497

^a Typical performance. ^b Cycle time includes sweep and retrace time.

Table 44. Data Transfer Time (ms)^a

	Numbe	er of Poin	ts	
	201	401	1601	16,001
SCPI over GPIB				
(program executed or	n externa	al PC)		
32-bit floating point	7	12	43	435
64-bit floating point	12	22	84	856
ASCII	64	124	489	5054
SCPI				
(program executed in	the ana	lyzer)		
32-bit floating point	1	2	3	30
64-bit floating point	2	2	4	40
ASCII	29	56	222	2220
COM (program executed in the analyzer)				
32-bit floating point	1	1	1	6
Variant type	1	2	6	68
DCOM over LAN				
(program executed or	n externa	al PC)		
32-bit floating point	1	1	2	121
Variant type	3	6	19	939
^a Typical performance				

Note: Specifications for Recall & Sweep Speed are not provided for the E8361A analyzers.

Specifications: Front-Panel Jumpers

Model E8361A Option 014

NOTE: The standard E8361A has no front-panel jumpers.

 Table 45: Measurement Receiver Inputs (Rcvr A In, Rcvr B In)

Description	Specification	Supplemental Information
Maximum Input Level		
E8361A:		
		typical:
10 MHz to 45 MHz		- 20 dBm
45 MHz to 500 MHz		- 18 dBm
500 MHz to 2 GHz		- 13.5 dBm
2 GHz to 10 GHz		- 13 dBm
10 GHz to 24 GHz		- 13 dBm
24 GHZ to 30 GHz		- 13.5 dBm
30 GHZ to 40 GHz		- 15 dBm
40 GHZ to 45 GHz		- 19 dBm
45 GHZ to 50 GHz		- 14.5 dBm
50 GHZ to 60 GHz		- 16 dBm
60 GHZ to 67 GHz		- 18 dBm
67 GHZ to 70 GHz		- 17 dBm
Damage Level		
E8361A		+ 15 dBm
Maximum DC Level		
E8361A		+ 15 V

Table 46: Reference Receiver Inputs (Rcvr R1, Rcvr R2)

Description	Specification	Supplemental Information	-
Maximum Input Level			
E8361A:			
		typical:	
10 MHz to 45 MHz		- 20 dBm	
45 MHz to 500 MHz		- 17.5 dBm	
500 MHz to 2 GHz		- 12.5 dBm	
2 GHz to 10 GHz		- 10.5 dBm	
10 GHz to 24 GHz		- 10 dBm	
24 GHZ to 30 GHz		- 9 dBm	
30 GHZ to 40 GHz		- 10 dBm	
40 GHZ to 45 GHz		- 13.5 dBm	
45 GHZ to 50 GHz		- 8.5 dBm	
50 GHZ to 60 GHz		- 9.5 dBm	
60 GHZ to 67 GHz		- 11 dBm	
67 GHZ to 70 GHz		- 9.5 dBm	
Damage Level			
E8361A		+ 15 dBm	
Maximum DC Level			
E8361A		+/- 15 V	

Table 47: Reference Outputs (Reference 1 Source Out, Reference 2 Source Out)

Description	Specification	Supplemental Information	
Maximum Output Level			
E8361A:			
		typical:	
10 MHz to 45 MHz		- 43 dBm	
45 MHz to 500 MHz		- 17.5 dBm	
500 MHz to 2 GHz		- 12.5 dBm	
2 GHz to 10 GHz		- 10.5 dBm	
10 GHz to 24 GHz		- 9.5 dBm	
24 GHZ to 30 GHz		- 9 dBm	
30 GHZ to 40 GHz		- 9.5 dBm	
40 GHZ to 45 GHz		- 13 dBm	
45 GHZ to 50 GHz		- 8.5 dBm	
50 GHZ to 60 GHz		- 9 dBm	
60 GHZ to 67 GHz		- 10.5 dBm	
67 GHZ to 70 GHz		- 9 dBm	
Damage Level			
E8361A		+ 20 dBm	
Maximum DC Level			
E8361A		+/- 15 V	

Table 48: Source Outputs (Port 1 Source Out, Port 2 Source Out)

Description	Specification	Supplemental Information	
Maximum Output Level			
E8361A			
		typical:	
10 MHz to 45 MHz		-6.5 dBm	
45 MHz to 500 MHz		-2.5 dBm	
500 MHz to 2 GHz		-1 dBm	
2 GHz to 10 GHz		-1.5 dBm	
10 GHz to 24 GHz		-2 dBm	
24 GHZ to 30 GHz		-3 dBm	
30 GHZ to 40 GHz		-1 dBm	
40 GHZ to 45 GHz		-2.5 dBm	
45 GHZ to 50 GHz		-2 dBm	
50 GHZ to 60 GHz		0 dBm	
60 GHZ to 67 GHz		-2 dBm	
67 GHZ to 70 GHz		-0.5 dBm	
Damage Level			
E8361A		27 dBm	
Maximum DC Level			
E8361A		+/- 40 V	

Table 49: Coupler Inputs (Port 1 Cplr Thru, Port 2 Cplr Thru)

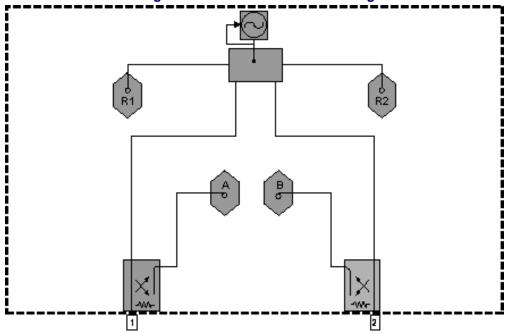
Description	Specification	Supplemental Information	
Insertion Loss to Test Port			
E8361A			
		typical:	
10 MHz to 45 MHz		0.5 dB	
45 MHz to 500 MHz		0.5 dB	
500 MHz to 2 GHz		0.5 dB	
2 GHz to 10 GHz		1.5 dB	
10 GHz to 24 GHz		2 dB	
24 GHZ to 30 GHz		2.5 dB	
30 GHZ to 40 GHz		3 dB	
40 GHZ to 45 GHz		3 dB	
45 GHZ to 50 GHz		3.5 dB	
50 GHZ to 60 GHz		4 dB	
60 GHZ to 67 GHz		4.5 dB	
67 GHZ to 70 GHz		6 dB	
Damage Level			
E8361A		+ 27 dBm	
Maximum DC Level			
E8361A		+/- 40 V	

Table 50: Coupler Outputs (Port 1 Cplr Arm, Port 2 Cplr Arm)

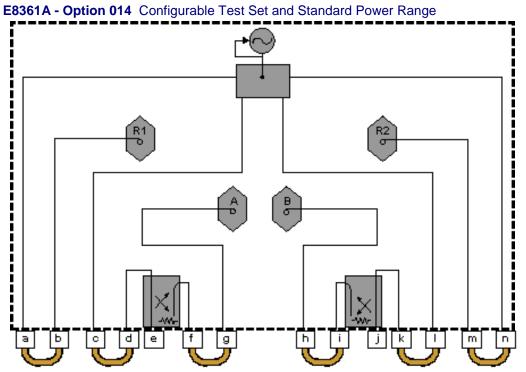
Description	Specification	Supplemental Information
Damage Level		
E8361A		+ 30 dBm
Maximum DC Level		
E8361A		+/- 7 V

Test Set Block Diagrams

E8361A - Standard Configuration and Standard Power Range



Test Set with Option 014 Block Diagrams



Item	Description	Item	Description
а	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
С	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
е	PORT 1	I	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT

7 Equations Used to Generate Uncertainty Curves

Measurement Uncertainty Equations	7-2
Forward Reflection Uncertainty	
Forward Transmission Uncertainty	
Reverse Reflection Uncertainty	
Reverse Transmission Uncertainty	
Sources of Systematic Errors	7-5
Sources of Random Errors	7-5
Determining Expected System Performance	7-6
Determining Cable Stability Terms (C _{R1} , C _{R2} , C _{TM1} , C _{TM2} , C _{TP1} , C _{TP2})	7-6

This topic contains the measurement uncertainty equations used to generate the uncertainty curves in the Specifications document. It also contains general information about determining system measurement uncertainties.

Learn about the following subjects:

- Measurement Uncertainty Equations
 - Forward Reflection Uncertainty
 - Forward Transmission Uncertainty
 - Reverse Reflection Uncertainty
 - Reverse Transmission Uncertainty
- Sources of Systematic Errors
- Sources of Random Errors
- Determining Expected System Performance
- Determining Cable Stability Terms (C_{R1}, C_{R2}, C_{TM1}, C_{TM2}, C_{TP1}, C_{TP2})
- Measurement Errors
- What is Measurement Calibration?
- Why is Calibration Necessary?

Measurement Uncertainty Equations

Any measurement result is the vector sum of the actual test device response plus all error terms. The precise effect of each error term depends on its magnitude and phase relationship to the actual test device response. When the phase of an error response is not known, phase is assumed to be worst case (-l80x° to +180°).

View the abbreviations for residual systematic errors used in the equations.

View the abbreviations for random errors used in the error models and equations.

Forward Reflection Uncertainty

Equation 1: Forward Reflection Magnitude Uncertainty

$$\Delta S_{11(mag)} = \sqrt{(Systematic + Stability)^2 + Noise^2}$$

Where:

$$\begin{split} &Systematic = E_{DF} + E_{RF}S_{11} + E_{SF}S_{11}^2 + E_{LF}S_{21}S_{12} + A_MS_{11} \\ &Stability = \sqrt{C^2 + R^2} \\ &C^2 = C_{RM1}^2(1 + S_{11}^4) + 4C_{TM1}^2S_{11}^2 + C_{RM2}^2S_{21}^2S_{12}^2 \\ &R^2 = (R_{R1}(1 + S_{11}^2) + 2R_{T1}S_{11})^2 + (R_{R2}S_{21}S_{12})^2 \\ &Noise^2 = (N_TS_{11})^2 + N_F^2 \end{split}$$

Equation 2: Forward Reflection Phase Uncertainty

$$\Delta S_{11(phase)} = \sin^{-1} \left(\frac{\sqrt{(Systematic + Stability)^2 + Noise^2}}{S_{11}} \right) + 2C_{TP1}$$

Where:

$$\begin{split} &Systematic = \ E_{DF} + E_{RF}S_{11} + E_{SF}S_{11}^2 + E_{LF}S_{21}S_{12} + \sin(A_P)S_{11} \\ &Stability = \sqrt{C^2 + R^2} \\ &C^2 = \ C_{RM1}^2(1 + S_{11}^4) + 4C_{IIM1}^2S_{11}^2 + C_{RM2}^2S_{21}^2S_{12}^2 \\ &R^2 = \left(R_{R1}(1 + S_{11}^2) + 2R_{F1}S_{11}\right)^2 + \left(R_{R2}S_{21}S_{12}\right)^2 \\ &Noise^2 = \left(N_TS_{11}\right)^2 + N_F^2 \end{split}$$

Forward Transmission Uncertainty Equation 3: Forward Transmission Magnitude Uncertainty

Where:

$$\begin{split} &Systematic= \ E_{XF} + S_{21}(E_{TF} + E_{SF}S_{11} + E_{LF}S_{22} + E_{SF}E_{LF}S_{21}S_{12} + A_{M}) \\ &Stability = \ \sqrt{C^2 + R^2} \\ &C^2 = \ S_{21}^2(C_{TM1}^2 + C_{TM2}^2 + (C_{R1}S_{11})^2 + (C_{R2}S_{22})^2) \\ &R^2 = \ S_{21}^2((R_{T1} + R_{R1}S_{11})^2 + (R_{T2} + R_{R2}S_{22})^2) \\ &Noise^2 = \ (N_{T}S_{21})^2 + N_{F}^2 \end{split}$$

Equation 4: Forward Transmission Phase Uncertainty

$$\Delta S_{21(phase)} = \sin^{-1} \left(\frac{\sqrt{(Systematic + Stability)^2 + Noise^2}}{S_{21}} \right) + C_{TP1} + C_{TP2}$$

Where:

$$\begin{split} &Systematic = E_{XF} + S_{21}(E_{TF} + E_{SF}S_{11} + E_{LF}S_{22} + E_{SF}E_{LF}S_{21}S_{12} + \sin(A_F)) \\ &Stability = \sqrt{C^2 + R^2} \\ &C^2 = S_{21}^2(C_{TM}^2 + C_{TM2}^2 + (C_{R1}S_{11})^2 + (C_{R2}S_{22})^2) \\ &R^2 = S_{21}^2((R_{T1} + R_{R1}S_{11})^2 + (R_{T2} + R_{R2}S_{22})^2) \\ &Noise^2 = (N_TS_{21})^2 + N_F^2 \end{split}$$

Reverse Reflection Uncertainty

Equation 5: Reverse Reflection Magnitude Uncertainty

$$\Delta S_{22(mag)} = \sqrt{(Systematic + Stability)^2 + Noise^2}$$

Where:

$$\begin{split} &Systematic = E_{DR} + E_{RR}S_{22} + E_{SR}S_{22}^{2} + E_{LR}S_{21}S_{12} + A_{M}S_{22} \\ &Stability = \sqrt{C^{2} + R^{2}} \\ &C^{2} = C_{RM2}^{2}(1 + S_{22}^{4}) + 4C_{TM2}^{2}S_{22}^{2} + C_{RM1}^{2}S_{21}^{2}S_{12}^{2} \\ &R^{2} = (R_{R2}(1 + S_{22}^{2}) + 2R_{T2}S_{22})^{2} + (R_{R1}S_{21}S_{12})^{2} \\ &Noise^{2} = (N_{T}S_{22})^{2} + N_{F}^{2} \end{split}$$

Equation 6: Reverse Reflection Phase Uncertainty

$$\Delta S_{22(phase)} = \sin^{-1} \left(\frac{\sqrt{(Systematic + Stability)^2 + Noise^2}}{S_{22}} \right) + 2C_{TP2}$$

Where:

$$\begin{split} &Systematic= \ E_{DR} + E_{RR}S_{22} + E_{SR}S_{22}^{2} + E_{LR}S_{21}S_{12} + \sin(A_{P})S_{22} \\ &Stability = \ \sqrt{C^{2} + R^{2}} \\ &C^{2} = \ C_{RM2}^{2}(1 + S_{22}^{4}) + 4C_{TM2}^{2}S_{22}^{2} + C_{RM1}^{2}S_{21}^{2}S_{12}^{2} \\ &R^{2} = \ (R_{R2}(1 + S_{22}^{2}) + 2R_{T2}S_{22})^{2} + (R_{R1}S_{21}S_{12})^{2} \\ &Noise^{2} = \ (N_{T}S_{22})^{2} + N_{F}^{2} \end{split}$$

Reverse Transmission Uncertainty

Equation 7: Reverse Transmission Magnitude Uncertainty

$$\Delta S_{12(mag)} = \sqrt{(Systematic + Stability)^2 + Noise^2}$$

Where:

$$\begin{split} &Sy \ stematic = \ E_{XR} + S_{12}(E_{TR} + E_{SR}S_{22} + E_{LR}S_{11} + E_{SR}E_{LR}S_{21}S_{12} + A_{M}) \\ &St \ ability \ = \ \sqrt{C^{2} + R^{2}} \\ &C^{2} \ = \ S_{12}^{2}(C_{TM1}^{2} + C_{TM2}^{2} + (C_{R1}S_{11})^{2} + (C_{R2}S_{22})^{2}) \\ &R^{2} \ = \ S_{12}^{2}((R_{T1} + R_{R1}S_{11})^{2} + (R_{T2} + R_{R2}S_{22})^{2}) \\ &Noise^{2} \ = \ (N_{T}S_{12})^{2} + N_{F}^{2} \end{split}$$

Equation 8: Reverse Transmission Phase Uncertainty

$$\Delta S_{12(phase)} = \sin^{-1} \left(\frac{\sqrt{(Systematic + Stability)^2 + Noise^2}}{S_{12}} \right) + C_{TP1} + C_{TP2}$$

Where:

$$\begin{split} &Systematic = E_{XR} + S_{12}(E_{TR} + E_{SR}S_{22} + E_{LR}S_{11} + E_{SR}E_{LR}S_{21}S_{12} + \sin(A_p)) \\ &Stability = \sqrt{C^2 + R^2} \\ &C^2 = S_{12}^2(C_{TM}^2 + C_{TM2}^2 + (C_{R1}S_{11})^2 + (C_{R2}S_{22})^2) \\ &R^2 = S_{12}^2((R_{T1} + R_{R1}S_{11})^2 + (R_{T2} + R_{R2}S_{22})^2) \\ &Noise^2 = (N_TS_{12})^2 + N_F^2 \end{split}$$

Sources of Systematic Errors

The residual (after measurement calibration) **systematic errors** result from imperfections in the calibration standards.

For reflection measurements, the associated residual errors are:

residual directivity	residual load match
residual source match	residual reflection tracking

For transmission measurements, the additional residual errors are:

residual crosstalk residual load match

residual source match residual transmission tracking

The listing below shows the **abbreviations** used for residual systematic errors that are in the uncertainty equations.

E _{DF} = forward residual directivity	E _{sR} = reverse residual source match
E _{SF} = forward residual source match	E _{RR} = reverse residual reflection tracking
\mathbf{E}_{RF} = forward residual reflection tracking	Exr = reverse crosstalk
E _{XF} = forward crosstalk	E _{LR} = reverse load match
E _{LF} = forward load match	E _{TR} = reverse transmission tracking
E _{TF} = forward transmission tracking	A_{M} = magnitude dynamic accuracy
E _{DR} = reverse residual directivity	A_{P} = phase dynamic accuracy

All measurements are affected by **dynamic accuracy**. Dynamic accuracy includes: errors during internal selfcalibration routines, gain compression in the microwave frequency converter (sampler) at high signal levels, errors generated in the synchronous detectors, localized non-linearities in the IF filter system, and from LO leakage into the IF signal paths.

Sources of Random Errors

The random error sources are

- noise
- connector repeatability
- interconnecting cable stability

There are two types of noise in any measurement system:

- 1. low level noise (noise floor)
- 2. high level noise (trace noise)

Low level noise is the broadband noise floor of the receiver which can be reduced through averaging or by changing the IF bandwidth.

High level noise or trace noise is due to the noise floor of the receiver, and the phase noise of the LO source inside the test set. It is worsened by reducing the IF bandwidth. Using a high stability 10 MHz time base can reduce high level noise.

A high stability time base is standard with PNA models E8356/7/8A and E8362/3/4A. It is available as Option 1E5 with PNA models E8801/2/3A and N3381/2/3A. Option 1E5 replaces a 10 ppm time base with a 1 ppm time base.

Connector repeatability is the random variation encountered when connecting a pair of RF connectors. Variations in both reflection and transmission can be observed.

Cable stability is dependent on the cable used and the amount of cable movement between calibration and measurement.

The listing below shows the **abbreviations** used for random errors in the error models and uncertainty equations.

N_F = noise floor	C _{TM2} = port 2 cable magnitude transmission stability
N _T = trace noise	C_{TP2} = port 2 cable phase transmission stability
C_{R1} = port 1 cable reflection stability	R_{R1} = port 1 connector reflection repeatability
C _{TM1} = port 1 cable magnitude transmission stability	\mathbf{R}_{T1} = port 1 connector transmission repeatability
C_{TP1} = port 1 cable phase transmission stability C_{R2} = port 2 cable reflection stability	R_{R2} = port 2 connector reflection repeatability R_{T2} = port 2 connector transmission repeatability

Determining Expected System Performance

Improper connection techniques and contact surfaces can degrade measurement accuracy.

Proper connection techniques include using a torque wrench with proper torque limits, ensuring that the connector pin depths meet specifications, ensuring that the center conductor of sliding loads is properly set, and observing proper handling procedures for beadless airlines.

Contact surface errors are caused by improper cleaning procedures, scratches, worn plating, and rough seating.

View more information on connector care

If proper connection techniques and connector care is observed, the following table provides an indication of connector repeatability.

Connector Repeatability (R _{R1} , R _{R2} , R _{T1} , and R _{T2})			
Connector Type		Connector Type	
Frequency Range	Repeatability	Frequency Range	Repeatability
2.4-mm		3.5-mm	
0 to 2 GHz	0.0002	0 to 2 GHz	0.0001
2 to 20 GHz	0.0004	2 to 8 GHz	0.0003
20 to 36 GHz	0.0006	8 to 20 GHz	0.0006
36 to 40 GHz	0.0008	20 to 26.5 GHz	0.0010
7-mm		Type-N	
0 to 2 GHz	0.0001	0 to 2 GHz	0.0006
2 to 8 GHz	0.0003	2 to 8 GHz	0.0006
8 to 18 GHz	0.0006	8 to 18 GHz	0.0010
Type-F		Waveguide	
0 to 3 GHz	0.0006	0 to 40 GHz	0.0002

Determining Cable Stability Terms

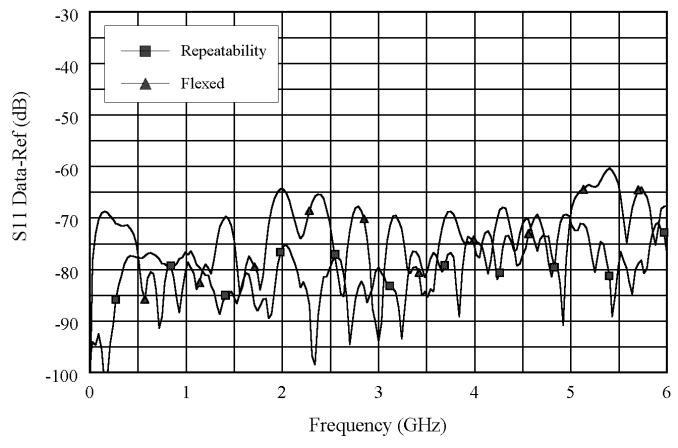
 $(C_{R1}, C_{R2}, C_{TM1}, C_{TM2}, C_{TP1}, C_{TP2})$

Cable stability is dependent on the cable used and the amount of cable movement between calibration and measurement. Values for **cable reflection stability** are determined by connecting a fixed load to the free end of

the cable and measuring the change in reflection coefficient after flexing the cable through the normal range of cable movement for a particular setup. **Cable transmission stability** is determined by connecting a short to the free end of the cable and measuring the change in reflection coefficient due to changes in cable position.

Graphics 1-3 demonstrate concepts useful in determining cable stability. In each case, a cable (part number 8120-4779) was connected to port 1, with a fixed load connected to the free end. A reference trace is obtained by measuring S_{11} with the free end held close to port 2 and storing the results in memory. Two additional S_{11} measurements are made; one with the cable flexed out to its straight position and the other with the cable positioned back to the same location as reference trace. As shown in Graphic 1, the flexed position demonstrates the effect of moving the cable after calibration. The repeatability trace demonstrates the stability of the cable when moved to its original position.

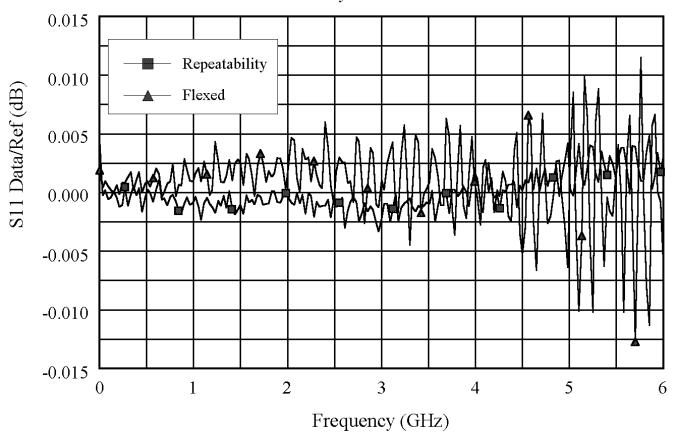
Graphic 1



Cable Stability with Fixed Load Connected

Graphic 1 demonstrates the concepts useful in determining cable reflection stability. A fixed load is connected to the free end. The DATA-MEM feature provides an indication of the cable reflection stability. A 60-dB peak on the chart yields a reflection stability estimated as $10^{(60/20)}$ or 0.001.

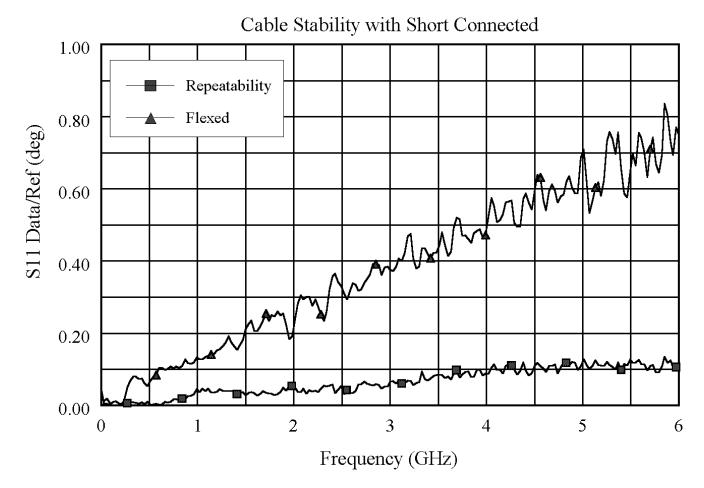
Graphic 2



Cable Stability with Short Connected

Graphic 2 and Graphic 3 demonstrate the concepts useful in determining cable transmission stability. A short is connected to the free end. The DATA/MEM feature provides an indication of the two-way cable transmission stability. The one-way transmission magnitude stability is determined by dividing the two-way magnitude measurement by two before it is converted to linear. A 0.013-dB peak on the chart yields transmission magnitude stability estimated as 10^(0.013/40) 1 or 0.00075. The one-way transmission phase stability is determined by dividing the two-way phase measurement by two.

Graphic 3



Cable movement often has a much larger effect on phase measurements than magnitude measurements.