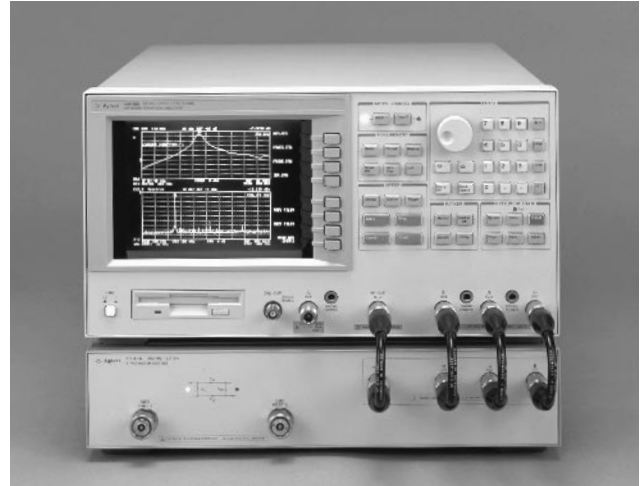


4396B

- Full-vector network and spectrum measurement and analysis
- Wide dynamic range network measurement with fast sweep speeds
- ± 0.05 dB/ $\pm 0.3^\circ$ C dynamic magnitude/phase accuracy
- Extremely fast narrowband spectrum measurement
- Impedance analysis option and test kit available
- ± 1.0 dB level accuracy for spectrum analysis
- -150 dBm/Hz sensitivity for spectrum analysis
- Built-in IBASIC for easy test automation
- Time-gated spectrum analysis option
- Color TFT display and built-in disk drive/RAM disk



4396B with 85046A

4396B RF Network/Spectrum Impedance Analyzer

5

The 4396B provides excellent RF vector network, spectrum, and optional impedance measurements for lab and production applications. Gain, phase, group delay, distortion, spurious, CN, and noise measurements often required for evaluating components and circuits can be measured using one instrument. When combined with a test set, the 4396B provides reflection measurements, such as return loss, and SWR, and S parameters. As a vector network analyzer, the 4396B operates from 100 kHz to 1.8 GHz with 1 mHz resolution and its integrated synthesized source provides -60 to $+20$ dBm of output power with 0.1 dB resolution. The dynamic magnitude and phase accuracy are ± 0.05 dB and $\pm 0.3^\circ$ so that it can accurately measure gain and group delay flatness, which are becoming more important in modern electronics systems.

As a spectrum analyzer, the 4396B operates from 2 Hz to 1.8 GHz with resolution bandwidths (RBWs) spanning 1 Hz to 3 MHz in a 1-3-10 sequence. A fully-synthesized local oscillator allows stable and accurate frequency analysis. Direct A/D conversion (no LOG amplifier is used) results in ± 1.0 dB overall level accuracy. Noise sidebands fall below -105 dBc/Hz offset 10 kHz from carriers below 1 GHz, while sensitivity is -150 dBm/Hz at 10 MHz and -147 dBm/Hz at 1 GHz. In addition, with two independent display channels available, you can simultaneously view network and spectrum (or transmission and reflection) characteristics of the device under test in split-screen format. For example, an amplifier's frequency response (network measurement) and distortion (spectrum measurement) can be shown at the same time.

Extremely Fast Spectrum Measurement

The 4396B features a stepped Fast Fourier Transform (FFT) digital-signal-processing (DSP) technique for 20 to 100 times faster narrowband spectrum measurement than swept-tuned spectrum analyzers. The stepped FFT is performed when the resolution bandwidth (RBW) is set at 3 kHz or below. For example, with a 30 Hz RBW and 10 kHz span, the 4396B has a sweep time of 400 ms, while swept-tuned spectrum analyzers take a few tens of seconds. The stepped FFT can greatly improve the speeds of narrowband spectrum measurement such as frequency tuning of a VCO or CN measurements.

Time-Gated Spectrum Analysis

With Option 1D6, the 4396B offers time-gated spectrum analysis capability to capture and measure repetitive burst signals in video, disk drives, communication equipment, and more. The minimum gate length is 2 μ sec so that even narrow-burst signals can be analyzed.

Impedance Measurement Function and RF Impedance Test Kit

A full-featured impedance measurement function (useful for quick-check general-purpose impedance applications) can be added to the 4396B by adding Option 010 and the 43961A RF impedance test kit. Covering from 100 kHz to 1.8 GHz, impedance parameters $|Z|$, θ , C, L, Q, D, and more, are directly measured and displayed. The basic impedance accuracy (typical value) is 3%. The 43961A RF impedance test kit is designed for the 4396B and is required to utilize the features of Option 010. A 7mm connector is mounted on this kit for easy connection to an appropriate impedance test figure.

A wide variety of Agilent test fixtures can be used with the test kit, including the surface-mount-device (SMD) fixtures. For higher frequency, more accurate and complete impedance analysis capabilities over the wider impedance ranges, the E4991A RF impedance/material analyzer is recommended. See pages 487 and 488.

4396B Specifications Summary

Network Measurement

Frequency Characteristics

Range: 100 kHz to 1.8 GHz

Resolution: 1 mHz

Accuracy: $\leq \pm 5.5$ ppm (Option 1D5: $\leq \pm 0.13$ ppm)

Output Characteristics

Power Range: -60 to +20 dBm

Resolution: 0.1 dB

Level Accuracy: $\leq \pm 0.5$ dB

Receiver Characteristics

Frequency Range: 100 kHz to 1.8 GHz

Noise Level (10 Hz IFBW, ≥ 10 MHz, f=frequency in GHz):

$< (-125 + 3 \times f)$ dBm (A, B inputs);

$< (-100 + 3 \times f)$ dBm (R input)

Full Scale Input Level: -5 dBm (A, B), +20 dBm (R)

IF Bandwidth (Hz): 10, 30, 100, 300, 1k, 3k, 10k, 40k

Dynamic Accuracy

Input level (relative to full scale input level)

Magnitude Dynamic Accuracy

0 dB	$\leq \pm 0.3$ dB
-10 to -70 dB	$\leq \pm 0.05$ dB
-80 dB	$\leq \pm 0.1$ dB
-90 dB	$\leq \pm 0.3$ dB
-100 dB	$\leq \pm 1.0$ dB
-110 dB	$\leq \pm 0.8$ dB typical
-120 dB	$\leq \pm 2.5$ dB typical

Phase Dynamic Accuracy

0 dB	$\leq \pm 3^\circ$
-10 dB	$\leq \pm 0.6^\circ$
-20 to -70 dB	$\leq \pm 0.3^\circ$
-80 dB	$\leq \pm 0.7^\circ$
-90 dB	$\leq \pm 2^\circ$
-100 dB	$\leq \pm 7^\circ$
-110 dB	$\leq \pm 8^\circ$ typical
-120 dB	$\leq \pm 25^\circ$ typical

@ 23 \pm 5° C, IFBW 10 Hz, R input = -35 dBm

Measurement Throughput Summary (IFBW 40 kHz, ms)

Measurement (with THRU Cal)	Number of points			
	51	201	401	801
(1) Magnitude	62	138	239	443
(2) Magnitude and phase	84	227	417	798

Spectrum Measurement

Frequency Characteristics

Frequency Range: 2 Hz to 1.8 GHz

Frequency Reference

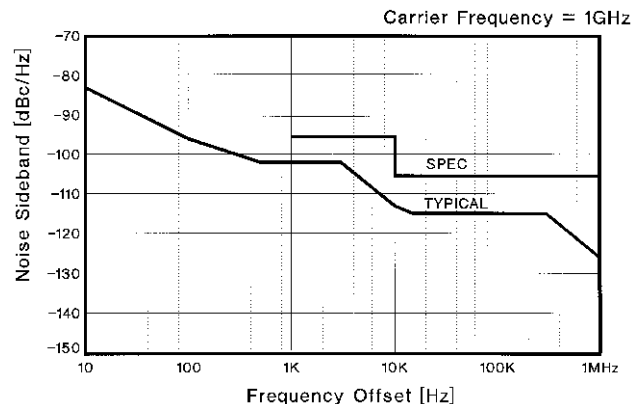
Accuracy: $\leq \pm 5.5$ ppm (Option 1D5: $\leq \pm 0.13$ ppm)

Resolution Bandwidth (RBW)

Range: 1 Hz to 3 MHz, 1-3-10 step

Selectivity (60 dB/3 dB): RBW ≥ 10 kHz: < 10 ; RBW ≤ 3 kHz: < 3

Noise Sidebands



Noise sidebands normalized to 1 Hz RBW versus offset from carrier (typical)

Displayed Average Noise Level

(@ frequency ≥ 10 MHz, ref. level ≤ -40 dBm, att.=0 dBm):

$< (-150 + 3f)$ (GHz) dBm/Hz

Spurious Response

Second Harmonic Distortion (@ ≥ 10 MHz, -35 dBm mixer input):

< -70 dBc

Third-Order Intermodulation Distortion (@ ≥ 10 MHz, -30 dBm,

separation > 20 kHz): < -75 dBc

Other Spurious (@ -30 dBm mixer input, offset ≥ 1 kHz): < -70 dBc

Scale Fidelity: ± 0.05 dB @ 0 to -30 dB from ref. level

Impedance Measurement (Option 010)

Measurement Parameters: $|Z|$, θ_z , $|Y|$, θ_y , R, X, G, B, Cp, Cs,

Lp, Ls, Rp, Rs, D, Q, $|T|$, θ_T , T_x , T_y

Frequency Range: 100 kHz to 1.8 GHz

Measurement Port: 7mm connector on the 43961A Test Kit

Source Level at RF out: -60 to +20 dBm (6 dB lower at 43961A port)

DC Bias: ± 40 V (20 mA maximum). A 2 k Ω $\pm 5\%$ internal resistor is used for dc bias current limitation. An external dc bias source is required.

Connector: BNC (f) on 43961A.

Calibration: OPEN(0 S)/SHORT(0 Ω)/LOAD(50 Ω) calibration, OPEN/SHORT/LOAD compensation on test fixtures, port extension compensation

Accuracy (Supplemental Performance Characteristics): 3% basic accuracy at 23° C \pm 5° C, after OPEN/SHORT/LOAD calibration

General Characteristics

Operating Temperature/Humidity: 0° C to 40° C, 15% < RH < 95%

Storage Temperature: -20° C to 60° C

Power Requirement: 90 V to 132 V, 198 V to 264 V, 47 Hz to 63 Hz, 300 VA max.

Weight: 21.5 kg (47.3 lb) typical

Size: 235 mm H x 425 mm W x 553 mm D (9.4 in x 17 in x 22.12 in)

Key Literature

4395A/96B Awareness Brochure, p/n 5965-9374E

4396B 1.8 GHz Network/Spectrum Analyzer Technical Data,

p/n 5965-6311E

Combining Network and Spectrum Analyses and IBASIC to improve

device characterization and test time, p/n 5965-7656E

Configuring the 4396B for O/E Testing, p/n 5965-7657E

Using the 4396B for Digital VTR Testing, p/n 5965-7658E

How to Characterize CATV Amplifiers Effectively, p/n 5965-9434E

Dramatic Speed Improvement for Narrow RBW Sweeps by

Audio/Video/IF/RF/Spectrum Analyzers, p/n 5966-4099E

Network, Spectrum, and Impedance Evaluation of Electronic Circuits

and Components, p/n 5967-5942E

How to Measure Noise Accurately Using the Combination Analyzers,

p/n 5966-2292E

4395A/4396B Special Option U01 (Education package), p/n 5968-2251E

Ordering Information

4396B RF Network/Spectrum/Impedance Analyzer

Opt 1A2 Delete keyboard

Opt 1D5 High-Stability Frequency Reference

Opt 1D6 Time-Gated Spectrum Analysis

Opt 1D7 50 Ω to 75 Ω Spectrum Input Impedance

Conversion

Opt 010 Impedance Measurement Function

(Requires 43961A)

85046A 50 Ω S-Parameter Test Sets

85046B 75 Ω S-Parameter Test Sets

87512A 50 Ω Transmission/Reflection Test Kits

87512B 75 Ω Transmission/Reflection Test Kits

43961A RF Impedance Test Kit (add test fixtures listed below)

16191A Side Electrode SMD fixture (dc to 2 GHz)

16192A Parallel Electrode SMD fixture (dc to 2 GHz)

16196A/B/C Parallel Electrode SMD Test Fixture

16197A Bottom Electrode SMD Test Fixture

16092A Spring-Clip Fixture (dc to 500 MHz)