

Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as spectrum analyzers, signal generators, oscilloscopes, power meters, logic analysers etc from all the major suppliers such as Agilent, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 2 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, covering the cost of warranty returns BOTH ways (plus supplying a loan unit, if available) and supplying a free business tool with every order.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based near Heathrow Airport in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

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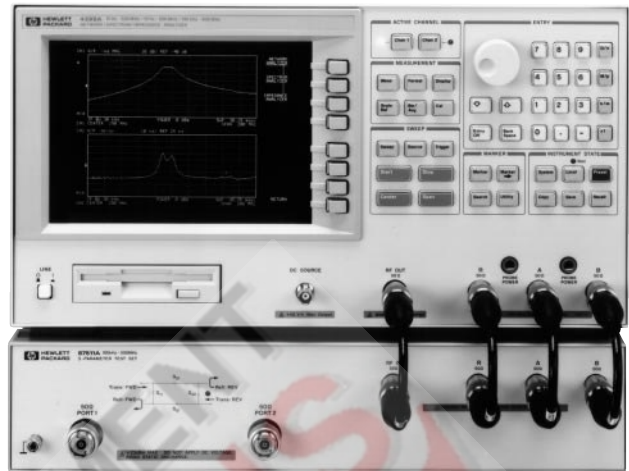
Network/Spectrum Analyzers

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Baseband, IF Network/Spectrum/Impedance Analyzer, 10 Hz to 500 MHz/10 Hz to 500 MHz/100 kHz to 500 MHz

HP 4395A

- Full-vector network and spectrum measurement and analysis
- Wide dynamic range network measurement with fast sweep speeds
- ± 0.05 dB/ $\pm 0.3^\circ$ dynamic magnitude/phase accuracy
- Extremely fast narrowband spectrum measurement
- Impedance analysis option and test kit available
- -145 dBm/Hz sensitivity for spectrum analysis
- Built-in HP Instrument BASIC for easy test automation
- Time-gated spectrum analysis option
- Color TFT display and built-in disk drive/RAM disk



HP 4395A with HP 87511A

HP 4395A Network/Spectrum/Impedance Analyzer

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The HP 4395A provides excellent vector network, spectrum and optional impedance measurements for audio, baseband, HF, VHF, and IF applications. Gain, phase, group delay, distortion, spurious, CN ratio, and noise measurements often required for evaluating components and circuits can be measured using one instrument. When combined with a test set, the HP 4395A provides reflection measurements, such as return loss, and SWR, and S parameters. As a vector network analyzer, the HP 4395A operates from 10 Hz to 500 MHz with 1 mHz resolution and its integrated synthesized source provides -50 to $+15$ 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 HP 4395A operates from 10 Hz to 500 MHz with resolution bandwidths (RBWs) spanning 1 Hz to 1 MHz in a 1-3-10 steps. A fully-synthesized local oscillator allows stable and accurate frequency analysis. Direct A/D conversion (no LOG amplifier is used) results in ± 0.8 dB level accuracy (@50 MHz, -20 dBm). Noise sidebands fall below -110 dBc/Hz @ 100 kHz offset from carriers, while sensitivity is -145 dBm/Hz at 10 MHz.

Extremely Fast Spectrum Measurement

The HP 4395A features 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 for all RBW settings. For example, with 100 Hz RBW and 100 kHz span, the HP 4395A has a sweep time of 300 ms, while swept-tuned spectrum analyzers take a few tens of seconds. The stepped FFT can greatly improve the efficiency of narrowband spectrum measurement.

Time-Gated Spectrum Analysis

With Option 1D6, the HP 4395A 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 6 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 HP 4395A by adding Option 010 and the HP 43961A RF impedance test kit. Covering from 100 kHz to 500 MHz, impedance parameters $|Z|$, θ , C, L, Q, D, and more, are directly measured and displayed on the TFT color display. The basic impedance measurement accuracy is 3%. An APC-7[®] connector is mounted on this kit for easy connection to an appropriate impedance test fixture. A wide variety of HP fixtures can be used with this test kit, including the surface-mount-device (SMD) fixtures used with the HP 4291A RF impedance/material analyzer. The Option 001 DC source is useful in applying DC voltage to the device up to 40 V.

HP 4395A Specifications Summary

Network Measurement

Frequency Characteristics

Range: 10 Hz to 500 MHz

Resolution: 1 mHz

Accuracy: ± 5.5 ppm (Option 1D5: ± 0.13 ppm)

Output Characteristics

Power Range: -50 to +15 dBm

Resolution: 0.1 dB

Level Accuracy: ± 1.0 dB @ 0 dBm, 50 MHz

Receiver Characteristics

Frequency Range: 10 Hz to 500 MHz

Noise Level (referenced to full scale input level, $23 \pm 5^\circ$ C):

-85 dB (typical) @ $10 \text{ Hz} \leq f < 100 \text{ Hz}$, IFBW=2 Hz

-85 dB @ $100 \text{ Hz} \leq f < 100 \text{ kHz}$, IFBW=10 Hz

$(-115 + f/100 \text{ MHz}) \text{ dB}$ @ $100 \text{ kHz} \leq f$, IFBW=10 Hz

IF Bandwidth (Hz): 2, 10, 30, 100, 300, 1k, 3k, 10k, 30k

Dynamic Accuracy

Input Level

(relative to full scale input level -10 dB)

Dynamic Accuracy
Frequency $\geq 100 \text{ Hz}$

Magnitude Dynamic Accuracy

0 dB \geq input level ≥ -10 dB

± 0.4 dB

-10 dB $>$ input level ≥ -60 dB

± 0.05 dB

-60 dB $>$ input level ≥ -80 dB

± 0.3 dB

-80 dB $>$ input level ≥ -100 dB

± 3 dB

Phase Dynamic Accuracy

0 dB \geq input level ≥ -10 dB

$\pm 3^\circ$

-10 dB $>$ input level ≥ -60 dB

$\pm 0.3^\circ$

-60 dB $>$ input level ≥ -80 dB

$\pm 1.8^\circ$

-80 dB $>$ input level ≥ -100 dB

$\pm 18^\circ$

@ R port input level=full scale input level -10 dB, IFBW=10 Hz, $23 \pm 5^\circ$ C

Spectrum Measurement

Frequency Characteristics

Frequency Range: 10 Hz to 500 MHz

Frequency Reference

Accuracy: ± 5.5 ppm (Option 1D5: ± 0.13 ppm)

Resolution Bandwidth (RBW)

Range: 1 Hz to 1 MHz, 1-3-10 step @ span > 0

3k, 5k, 10k, 20k, 40k, 100k, 200k, 400k, 800k, 1.5 M, 3 M, 5 MHz @ span=0

Selectivity (60 dB/3 dB): < 3 @ span > 0

Noise Sidebands

Offset

1 kHz -97 dBc/Hz

10 kHz -97 dBc/Hz

100 kHz -110 dBc/Hz

1 MHz -110 dBc/Hz

Displayed Average Noise Level

Frequency

1 kHz $\leq f < 100$ kHz -120 dBm/Hz

100 kHz $\leq f < 10$ MHz -133 dBm/Hz

10 MHz $\leq f$ $(-145 + f/100 \text{ MHz}) \text{ dBm/Hz}$

Spurious Response

Second Harmonic Distortion: -70 dBc @ -16 dB full scale

Third-Order Intermodulation Distortion: -70 dBc @ -16 dB full scale

Other Spurious: -70 dBc @ -16 dBc full scale

Scale Fidelity

± 0.05 dB @ 0 to -30 dB from full scale input level -10 dB

Impedance Measurement (Option 010)

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

Lp, Ls, Rp, Rs, D, Q, $|\Gamma|$, θ_γ , Γ_x , Γ_y

Frequency Range: 100 kHz to 500 MHz

Measurement Port: APC-7 on the HP 43961A Test Kit

Source Level at Measurement Port: -56 to +9 dBm @ 50 Ω

Calibration: OPEN/SHORT/LOAD calibration, OPEN/SHORT/LOAD compensation on test fixtures, port extension

Accuracy (Supplemental Performance Characteristics): $\pm 3\%$ basic accuracy @ $23 \pm 5^\circ$ C, after OPEN/SHORT/LOAD calibration

General Characteristics

Full Scale Input Level

Attenuator setting (dB)	Full Scale Input Level	
	Network	Spectrum
0	-10 dBm	-20 dBm
10	0 dBm	-10 dBm
20	+10 dBm	0 dBm
30	+20 dBm	+10 dBm
40	+30 dBm	+20 dBm
50	+30 dBm	+30 dBm

Option 001 DC Voltage/Current Source

Voltage Range: -40 V to +40 V

Current Range: -20 mA to -100 mA, 20 mA to 100 mA

Operating Temperature/Humidity

Disk Drive Non-Operating Condition: 0° to 40° C, 15% to 95% RH

Disk Drive Operating Condition: 10° to 40° C, 15% to 80% RH

Storage Temperature/Humidity: -20° to 60° C, 15% to 95% RH

Power Requirement: 100/120/220/240 V $\pm 10\%$, 47 to 66 Hz, 300 VA max.

Weight: 21 kg (typical)

Size: 425 mm W x 235 mm H x 553 mm D

Key Literature

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

HP 4395A Technical Data (Spec Sheet), p/n 5965-9340E

Ordering Information

HP 4395A Network/Spectrum/Impedance Analyzer

Opt 001 Add DC Source

Opt 010 Add Impedance Measurement Function

(Requires HP 43961A)

Opt 1A2 Delete Keyboard

Opt 1D5 Add High Stability Frequency Reference

Opt 1D6 Add Time-Gated Spectrum Analysis

Opt 1D7 50 Ω to 75 Ω Minimum Loss Pad

HP 87511A 50 Ω S-Parameter Test Sets

HP 87511B 75 Ω S-Parameter Test Sets

HP 87512A 50 Ω Transmission/Reflection Test Kits

HP 87512B 75 Ω Transmission/Reflection Test Kits

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

HP 16191A Side Electrode SMD Test Fixture

HP 16192A Parallel Electrode SMD Test Fixture

HP 16193A Small Side Electrode SMD Test Fixture

HP 16092A Spring Clip Test Fixture