Description

The HP 4195A is a high performance, cost effective and intelligent analyzer with combined vector network and spectrum analysis capabilities. The frequency is covered from 10Hz through 500MHz with an excellent 0.001 Hz resolution for audio, baseband, HF, VHF and IF applications. It directly measures amplitude ratio, phase, group delay and spectrum level needed for characterizing linear/non-linear analog circuits or components used in communications, telecommunications, consumer electronics and other equipment.

The HP 4195A's excellent accuracy and resolution meets the severe measurement requirements for developing advanced equipment. A color display allows you to readily differentiate between multiple traces. Convenient softkey operation and marker functions make deriving device parameters quick and easy. Measurement results can be directly copied to printer or plotter without an external computer. Furthermore, the HP 4195A has internal user functions for computing and self controlling capability. User Program, User Defined Function and User Math allows you to quickly customize the setups most suited to your application without using an external computer. A built-in 3.5 inch disc drive can save the instrument state, data and user functions.

Combined Vector Network and Spectrum Analysis

Network analyzers and spectrum analyzers have become essential tools for evaluating subsystems or components used in electronic equipment. Especially, the importance of phase and group delay measurements is rapidly increasing. The HP 4195A offers full network and spectrum analysis from 10Hz to 500MHz at half the price. It has very wide applications. Network analysis functions include characterizing the gain/group delay ripple of filters and amplifiers. Spectrum
High Accuracy and Resolution Measurement

The HP 4195A measures amplitude ratio and phase with an accuracy of ±0.05dB/±0.3 deg and a resolution of 0.001 dB/0.01 deg. The amplitude and phase distortion of transmission devices, such as filters, amplifiers, delay lines and cables, affect the quality of information and create bit errors in PSK or QAM systems. The HP 4195A can evaluate distortion with high accuracy and resolution. For accuracy enhancement, 1 Port Full Cal, 1 Port Partial Cal, Normalization and Port Extension capabilities are available. For spectrum analysis, high level accuracy of ±0.1 dB and fully synthesized pure local OSC, typically -100 dBc/Hz (100 Hz offset), allow you to obtain stable and reliable C/N, harmonic distortion or intermodulation distortion measurements. In addition the high shaped digital IF filter technique makes discrimination of closely spaced signals easy, so 50/60 Hz power-line sidebands can be measured using the 0Hz RBW.

User Functions for Easy Customized Operation

The HP 4195A has three user functions for customizing operations for your applications without using an external computer. The User Program gives you a one key solution for performing your application. You can program a sequence from measurement and marker control, computing, through printing a hard copying. This function is very useful and improves efficiency for C/N (Carrier Noise ratio), THD (Total Harmonic Distortion) measurements or automatic device parameter extraction, such as an amplifier's gain, group delay, gain compression or harmonic distortion. The User Math function helps you put the result in the form you need by using the built-in math operators and arithmetic functions. For example, you can display level in volt peak-to-peak instead of volts rms or perform differentiation of gain or max hold. The User Defined Function gives you the power to define functions which can be called with softkeys as you like, such as input of step size, signal tracking, transmis-sion/reflection alternate sweep or gain/level spectrum alternate sweep. In addition, the HP 4195A has the Program Sweep function which can arbitrarily sweep the points programmed in the table. This increases measurement efficiency by reducing excessive points in the Lin or Log sweep. Also, the resolution bandwidth can be independently set for each programmed point. The above user functions and program sweep table can be saved into the built-in 3.5 inch disc, so you can start your application at any time.

Advanced Marker Action on Color Graphics

The application oriented marker functions are very useful for both network and spectrum measurements. You can quickly obtain the desired results from the easy to see color graphics CRT. The Next Peak is convenient for searching harmonic or spurious signals. The marker target is used for extraction of SAW filter's 3dB bandwidth or an amplifier's —1 db gain compression point. The delta marker is used for C/N measurement, and the noise marker is used for noise measurements. A maximum of four traces can be simultaneously displayed on the CRT, so it is easy to compare the data. The Smith/polar chart is convenient for impedance matching in circuit design. In addition, the results can be directly copied to a compatible plotter or printer without an external computer.

Specifications

Network Measurement

Source
Frequency: 10Hz to 500MHz, 1mHz resolution
Power: -50 dBm to +15 dBm, 0.1 dB resolution
Sweep Parameters: Frequency, power and dc bias level
Sweep Types: Linear, log, cw, program and partial
Output: 2 outputs
DC bias level: ±40V, 10mV resolution
Receiver
Frequency: 10Hz to 500MHz
Input: 4 inputs, 50 nominal
Resolution Bandwidth: 3Hz to 300kHz, 1 or 3 step
Input Crosstalk: <-100dB
Magnitude Ratio
Dynamic Range: >100dB
Resolution: 0.001dB
Dynamic Accuracy (23 ± 5°C, -30dBm R input): ±0.05dB @ -70dBm to -50dBm T input.
Phase
Range: ±180°
Resolution: 0.01°
Dynamic Accuracy (23 ± 5°C, -30dBm input): ±0.3° @ -70 to -30dBm T input.
Delay
Range: 10ps to 500s
Resolution: 10ps @ 3.6 MHz aperture
Accuracy: depends on phase accuracy
Error Compensation
Mode: Normalization, 1 port partial cal, 1 port full cal and port extension.
Spectrum Measurement
Frequency Measurement Range: 10Hz to 500MHz
Resolution:
RBW: 3Hz to 300kHz, 1 or 3 step
Selectivity (60/3dB): 4.5 for 3Hz to 30Hz, 9 for 100 Hz to 10 kHz, 8.5 for 30 kHz to 300 kHz.
Noise Sideband: <-90 dBc/Hz @ 1 kHz offset
<-90 dBc/Hz @ 100 Hz offset
**Amplitude**
- Measurement Range: -135 dBm to +20 dBm
- Accuracy: ±1.0dB 50MHz
- Linearity (23 ±5°C): ±0.1 dB @ -40 to 0dB; ±0.2 dB @ -60 to -40dB
- Frequency Response: ±1.5dB
- Dynamic Range (23 ± 5°C)
  - Second Harmonic Distortion: <70dBc @ > 2MHz
  - T.O.I Distortion: < -80dBc @ > 2MHz
- Residual Response: -110dB © > 100kHz.
- Average Noise Level: typically -140dBm @ 10Hz RBW, ≥2MHz

**Sweep**
- Sweep Type: Linear, log, cw, program and partial
- Sweep Mode: Continuous, single and manual
- Sweep Time: approximately 3.5 sec 500 MHz span, 300 kHz RBW

**Input**
- Number of inputs: 4 inputs
- Impedance: 50 nominal
- Damage level: +30 dBm
- Attenuator: 0 to 50dB, 10dB step

**Display and Analysis**
- Display: 7.5 inch color CRT
- Display Format: Rectangulars, Table, Smith and Polar
- Traces: 4 traces max
- Scale Type: Linear, log
- Autoscale
- Phase Display Expansion: Display phase continuously more than ±180 deg.
- Video Filter: Digital video filtering reduces random noise
- Comment Entry: Display a comment used alphabet, numeral and special characters (,, %, etc).
- Marker: M KR -> Max (Min, Ref, Center, Start and Stop), Next Peak, Width and Delta reading mode.

**User Functions**
- User Math:
  - Puts the result in the form needed for your application by using built-in math operators, arithmetic functions and editing capability.
- User Defined Function:
  - Provides one-key solution for a specific application without an external computer. 6 user functions can be created and soft-keys can be labeled as you like.
- User Program (Auto Sequence Program):
  - Allows to program the control or measurement, analysis, copy and other sequence without an external computer.

**Remote programming**
- HP-IB interface operates according to IEEE 488-1987 and IEC 625 standards and IEEE 628-1982 recommended practices
- Interface Function: 5H1, AH1, T5, TEO, L4, LEO, SR1, RL1, PPO, DC1, DT1, CO, El
- Transfer Formats: ASCII
- 32/64 bit IEEE 754 floating point format

**General Characteristics:**
- Operating Conditions:
  - Temperature: 0°C to +45°C
  - Humidity: 95% RH at 40°C
- Non-Operating Conditions:
  - Temperature: -40°C to +70°C
- Safety: Based on IEC-348, UL-1244
- Power: 100, 120, 220V ±10%, 240V -10% +5%, 48Hz to 60Hz, 500VA (max)
- Dimensions: 425 (W) x 375 (H) x 620 (D) mm
- Weight: Approximately 41kg

**41951A Impedance Test Kit**
- The HP 4195A and HP 41951A Impedance Test Kit, which is designed to use with the 4195A, can be used to perform impedance analysis from 100kHz to 500MHz. The direct reading of impedance parameters, error compensation, variable test signal/dc bias level, and dedicated analysis functions are all convenient for evaluation of components, such as crystal/SAW resonators, coils, and varicap diodes. The equivalent circuit function is very useful for modeling and evaluating components under actual operating conditions to improve the quality and reliability of circuit design.
HP 41951A Impedance Test Kit
The HP 41951A can be used for impedance measurements from 100kHz to 500MHz when used with the HP 4195A.

Measured Parameters: |Z|, |Y|, 0, L, C, R, X, G, B, D, and Q
Error Compensation: 1 port cal, open/short offset and port extension
Equivalent Circuit Analysis: Circuit constants approximation and simulation of frequency characteristics
Available Accessories: Refer to page 283.

41952A/B Transmission/Reflection Test Sets
The HP 41952A/B Transmission/Reflection Test Sets provide a neat solution to the HP 4195A Network/Spectrum Analyzer to measure both transmission and reflection characteristics. The HP 41952A/B are directly connected to the HP 4195A and include a power splitter and a directional coupler in each compact box. Furthermore, two test sets of the HP 41952A or 41952B (opt. 009) allow the HP 4195A to perform full s parameters measurement without having to remove and reverse the device. The HP 41952A is used for 50 ohm application, and the HP 41952B is used for 75 ohm application.

41800A Active Probe
The HP 41800A Active Probe is a high input impedance probe which covers the frequency from 5Hz to 500MHz, and makes it easy to perform signal analysis of circuits in audio, video, HF and VHF band. For both spectrum and network analysis, the HP 41800A presents a great value by its low distortion and low noise characteristics. The HP 41800A is directly compatible with HP analyzers, such as the HP 4195A, HP 3577A, HP 3585A or HP 8568B, which supply probe power from the front panel.

Specifications
- Bandwidth: 5Hz to 500MHz
- Input R, C (nominal): 100k ohm, 3pF (probe alone)
- Average Noise Level (typical): 10nV/sqrt(Hz) 300kHz to 500MHz
- 2nd Harmonic Distortion: < -50dBc -20dBc input
- Output Connector: 50 ohm type N male

Accessories Available
HP 85044A/B Transmission/Reflection Test Set
Refer to page 232.
HP 85024A High Frequency Probe
Refer to page 230.

Ordering Information
4195A Nework/Spectrum Analyzer $25,000
Opt W30: 3-year hardware support $575
Opt 001: High Stability Frequency Reference Improve the stability of frequency for evaluation high Q devices such as crystal filter, oscillator or resonator.
Frequency Accuracy: ±1 ppm (23°C±5°C)
Frequency Stability: ±1 x 10^-8 (23°C±5°C)
Opt 907: Front Handle Kit $133
Opt 908: Rack Flange Kit $74
Opt 909: Rack and Handle Kit $189
Opt 910: Extra OP manual $30
41951A Impedance Test Kit $1500
41952A 50 Transmission/Reflection Test Set $2200
41952B 75 Transmission/Reflection Test Set $2700
Opt 009: Delete 50 N Cable and 11852B -$500
41800A Active Probe $1700