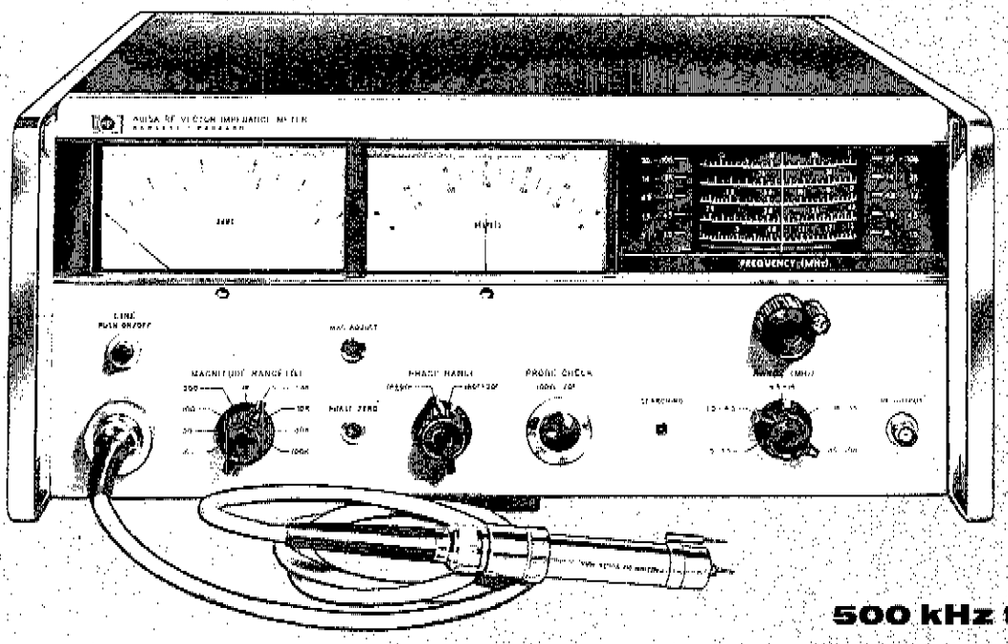
HEWLETT hp PACKARD

# RF VECTOR IMPEDANCE METER

model 4815A

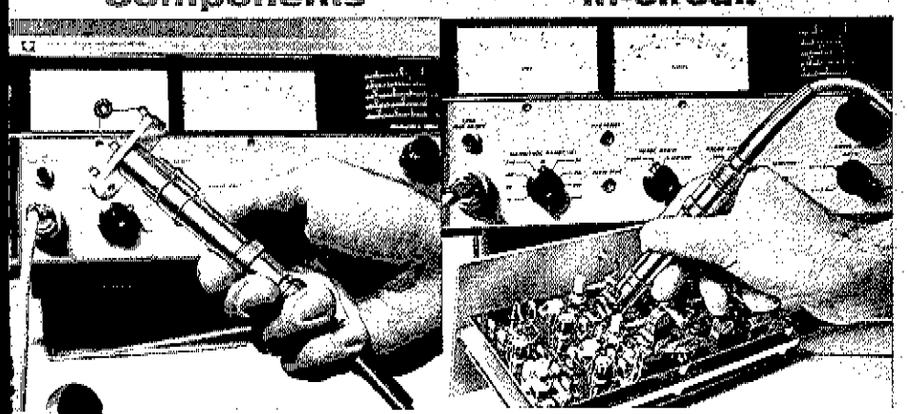
TECHNICAL DATA 1 MARCH 67

## Fast, Convenient, Direct Reading Measurements of Impedance Magnitude and Phase



**500 kHz to 108 MHz**

**Components** **in-circuit**



### Benefits

**Reads out directly** in impedance and phase angle, 10 ohms to 100K ohms, 0° ± 90°, 180° ±90°.

**Fast, continuous tuning** from 500 kHz to 108 MHz.

**Convenient probe** for in-circuit measurements.

**Self calibration check** provides measurement confidence.

**Analog outputs** permit permanent data recording.

**Low-level test signal** minimizes circuit disturbance.

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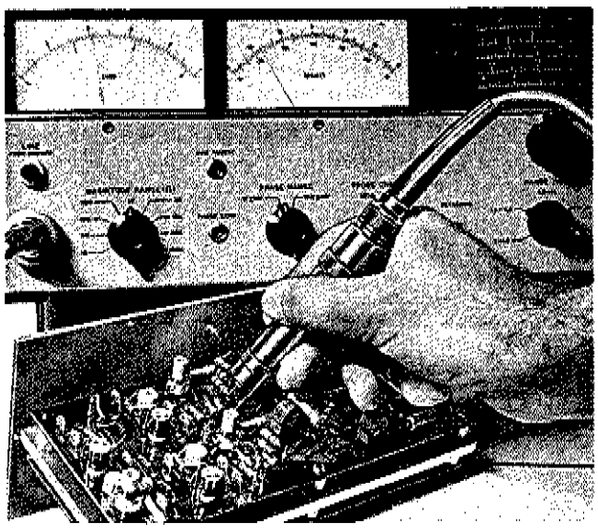
## Description

The Hewlett-Packard Model 4815A RF Vector Impedance Meter is a versatile instrument that provides fast, direct reading measurements of impedance and phase angle over the frequency range from 500 kHz to 108 MHz. It is continuous tuning over this frequency range and does not require balancing or data interpretation. Thus, it is an extremely useful tool for the evaluation of the complex impedance of both active circuits and components. The convenience of probe measurement, ease of operation, and direct reading features make the instrument equally useful for laboratory, receiving inspection, or production line applications.

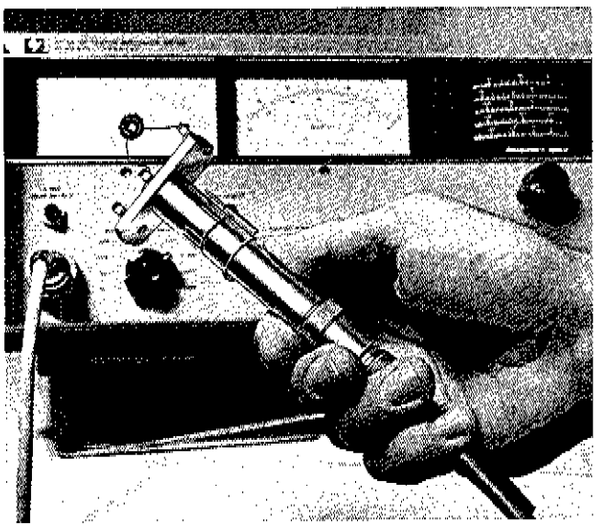
An internal LC oscillator, operating over the range from 500 kHz to 108 MHz, supplies a low-level excitation signal to the circuit under test through a convenient probe attached to a 5-foot cable. A unique sampling AGC loop maintains the excitation constant at 4 microamps. At the same time, the voltage response of the test circuit is sensed and converted by a second sampling channel, located within the same probe, to read out directly in impedance. A phase detector monitors the difference between the voltage and current channels to yield the phase angle of the impedance vector. One probe, then, excites the test circuit and measures its impedance and phase angle.

## Operation

The 4815A provides all of the convenience of "probe and read" measurements. In use, the probe is connected directly into the circuit to be evaluated, frequency is selected, and complex impedance is read. This type measurement allows a straightforward adaptation to various jigs and fixtures for special measurements. Where only component values are to be determined, a quick-mount adapter is provided to allow rapid measurements. For critical component applications, the unit to be evaluated may be mounted directly in its working circuit and its value determined in its actual environment, at the frequency of interest. Impedance measurements can be made, without auxiliary equipment, with fully-defined accuracy.



In-circuit measurements of both active and passive devices and circuits can be made and read out directly over a frequency range of 500 kHz to 108 MHz with the 4815A.



Components may be measured at high frequencies by clipping them to the component mounting adapter on the 4815A probe.

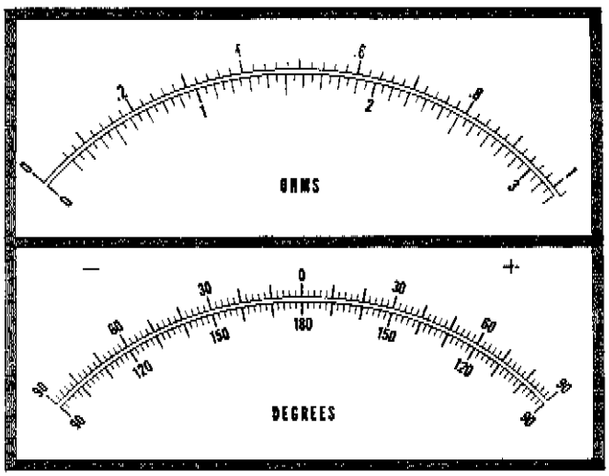
## Features

Where impedance must be determined over a band of frequency, the 4815A may be swept manually or electronically at rates up to 1 MHz per second by an external sweep oscillator. Analog output of frequency and phase angle are provided so that these values may be recorded on an X-Y recorder.

A front panel monitor output allows the internal 500 kHz to 108 MHz oscillator in the 4815A to be monitored with a frequency counter or other frequency measuring devices. This output may be also used as a general purpose oscillator, since it provides excellent stability, reasonable power output, and extremely low microphonism.

A convenient self-check feature at the front panel of the 4815A provides greater measuring confidence. To make this check, the probe is inserted into a front panel test point which yields a normalized impedance reading of 100 ohms at a phase angle of 0°.

For direct measurement of inductors and capacitors, the frequency dial may be accurately set to either the 1.592 or 15.92 MHz point. At these frequencies, the impedance magnitude meter reads directly in the numerical value of L or 1/C, with range and frequency determining the correct placement of the decimal point. Values of C ranging from 0.1 pF to 0.1 $\mu$F and L from 0.01 $\mu$H to 10 mH may be measured by this technique.




Individually calibrated taut-band meters assure maximum repeatability

Maximum repeatability of reading is assured through the use of individually calibrated, taut-band meters. Accuracy is further enhanced by the ability of the probe to directly read its residual values, or those of the accessory jigs, so that these values may be easily separated from the unknown being measured.

## Applications

The 4815A is a convenient and powerful measuring tool for any application involving measurements over a band of frequencies or in-circuit measurements. It may be used to determine the self-resonance point of capacitors, the series and parallel resonance points of crystals, or the characteristics of high-frequency transformers and transducers. Complete evaluation of the impedance characteristics, at the points of resonance, of extremely high Q circuits may be made by driving the 4815A with an external device, such as a frequency synthesizer.

## Additional Information

### RFI CHARACTERISTICS

Conducted and radiated leakage limits are below those specified for MIL-I-6181D, except for RF excitation and sampling pulses emitted from probe. The sampling pulses are approximately 75 mV peak to peak, from 25-ohm source, with a duration of 3 ns occurring at a maximum repetition rate of 1 MHz. Probe may be stored in front panel probe check socket to obtain full compliance with MIL-I-6181D.

### SELF-CONTAINED CALIBRATION

**Probe check:** 100 ohms ± .5% at phase angle of 0° ± 2°

### MEASURING TERMINAL CHARACTERISTICS

**Configuration:** Both excitation and measuring circuits are contained in a single sampling probe attached to instrument by a cable. Measurement is made between probe center pin and ground pin on probe case.

**Residuals:** indicated impedance includes approximately 0.5 ohm resistance and 8 nH inductance in series with the unknown, and 0.3 pF capacitance in parallel with the unknown.

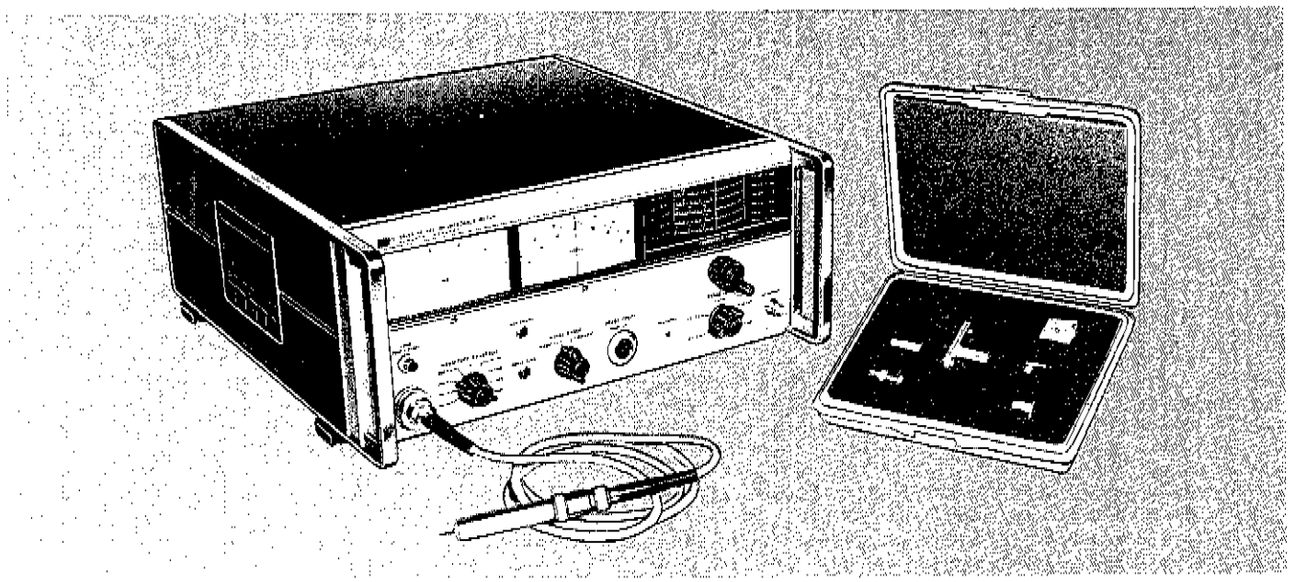
**Impedance:** 25 ohms in series with 0.01 μF, looking into probe. Probe is constant-current driving source to circuit being measured.

### TEST SIGNAL CHARACTERISTICS

**Waveshape:** sinusoidal.

**Level:** approximately 4 μA on all ranges except 10-ohm scale where it is approximately 13 μA.

**External oscillator input:** Rear BNC connector accepts excitation signal, 100 mV ± 10% into 50 ohms; maximum instantaneous rate of change 1 MHz/s.



Model 4815A RF Vector Impedance Meter with 00600A Probe Accessory Kit

# Specifications

## FREQUENCY

**Range:** 500 kHz to 108 MHz in five bands: 500 kHz to 1.5 MHz, 1.5 to 4.5 MHz, 4.5 to 14 MHz, 14 to 35 MHz, 35 to 108 MHz.

**Accuracy:** ±2% of reading, ± 1% of reading at 1.592 and 15.92 MHz.

**RF monitor output:** 100 mV minimum into 50 ohms.

## IMPEDANCE MAGNITUDE MEASUREMENT

**Range:** 1 ohm to 100K ohms; full-scale ranges: 10, 30, 100, 300, 1K, 3K, 10K, 30K, 100K ohms.

**Accuracy:** $\pm$ 4% of full scale $\pm$ $\left(\frac{f}{30\ MHz} + \frac{Z}{25K\Omega}\right)$ % of reading, where f = frequency in MHz and Z is in ohms; reading includes probe residual impedance.

**Calibration:** linear meter scale with increments 2% of full scale.

## PHASE ANGLE MEASUREMENT

**Range:** 0 to 360° in two ranges: 0 ± 90°, 180° ± 90°.

**Accuracy:** $\pm$ $\left(3 + \frac{f}{30\ MHz} + \frac{Z}{50K\Omega}\right)$ degrees; where f = frequency in MHz and Z is in ohms.

**Calibration:** increments of 2°.

**Adjustments:** front panel screwdriver adjustments for Magnitude and Phase Zero.

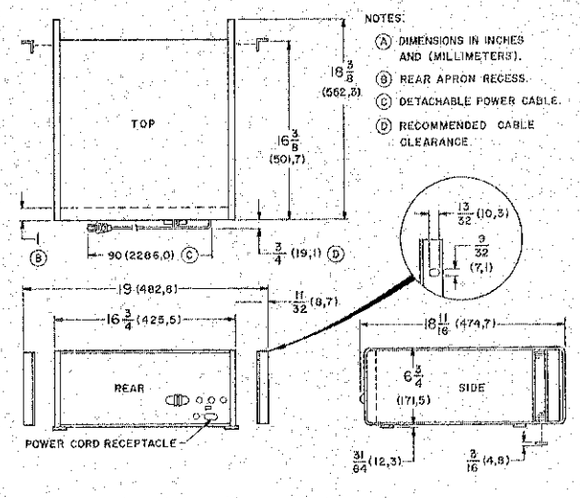
## RECORDER OUTPUTS

**Frequency:** 0 to 1 volt from 0 to 1K ohm source, proportional to dial rotation.

**Impedance magnitude:** 0 to 1 volt from 1K ohm source.

**Phase angle:** 0 ± 0.9 volt from 1K ohm source.

## DIMENSIONS:




**WEIGHT:** net 39 lbs. (17,6 kg), shipping 46 lbs. (22,5 kg).

**POWER:** 105 to 125 v or 210 to 250 v, 50 to 400 Hz, 50 w.

## ACCESSORIES FURNISHED:

1. 00600A Probe Kit: contains BNC and Type N probe adapters, probe socket, component mounting adapter, probe ground assembly, probe holder, and 6 spare probe center pins.
2. Circuit board extender — for servicing.
3. Rack mount kit.

**PRICE:** $2650.