

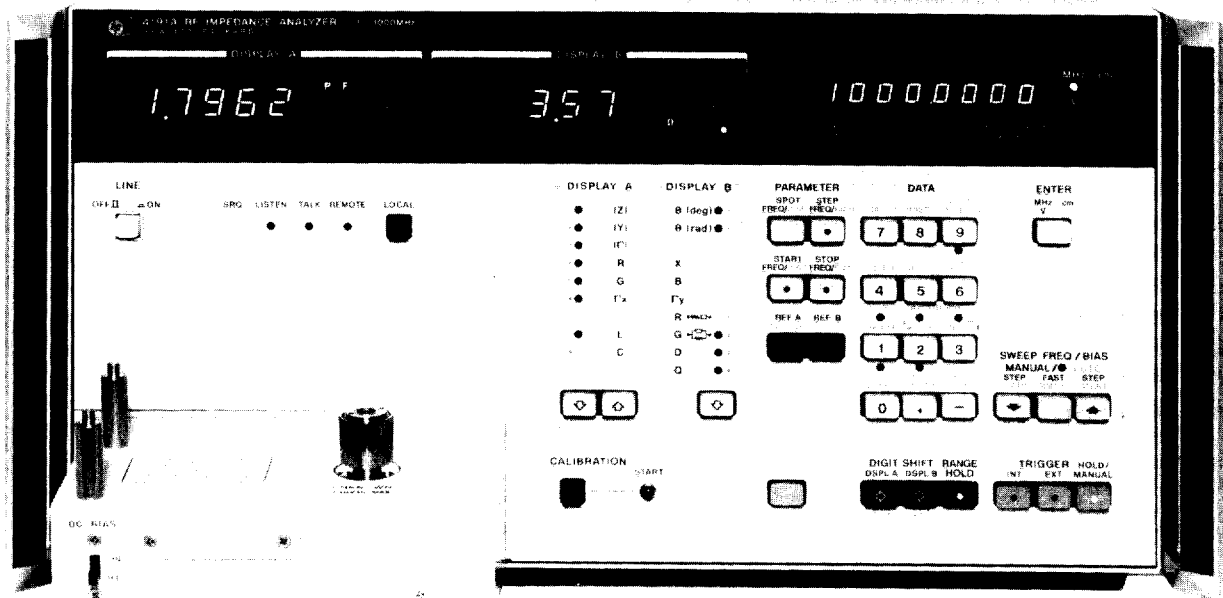


# COMPONENT & SEMICONDUCTOR MEASUREMENT

## RF Impedance Analyzer

Model 4191A

- 1-1000 MHz variable test frequency with sweep capability
- Direct reading of  $|Z| - \theta$ ,  $|Y| - \theta$ ,  $|\Gamma| - \theta$ ;  
L • C — R • G • D • Q  
R — X, G — B,  $\Gamma_x - \Gamma_y$
- High resolution—4½ digit max
- Wide measuring range—1 m $\Omega$  — 100 k $\Omega$  ( $|Z|$ )
- Versatile, easy-to-use test fixtures



HP 4191A (Shown with Opt 907 Handles)



### Description

The HP 4191A RF Impedance Analyzer measures 14 parameters with a maximum resolution of 4½ digits. The internal synthesizer provides variable frequencies from 1 MHz through 1000 MHz covering the UHF, VHF and video bands with automatic sweep capability. An internal dc bias supply with auto sweep function covers the voltage range of  $\pm 40$  V in 10 mV steps.

The HP 4191A permits reliable measurements over a wide measuring range. Its outstanding repeatability, frequency response and accuracy are made possible by unique error correction capability and specially designed test fixtures. These features allow the HP 4191A to be used in evaluation of electronic materials, components and circuitry.

The internal synthesizer provides a maximum resolution of 100 Hz (Opt 002) with an accuracy of 3 ppm, allowing small changes in the resonant frequency of the device under test to be easily detected. The swept frequency capability aids in the analysis of frequency characteristics of the device.

Two complete front panel settings (parameter selection and the sweep control) can be stored in a non-volatile memory and recalled at any time with a single key operation. This, together with the standard HP-IB interface, makes the HP 4191A extremely efficient either as a stand-alone or systems instrument.

These unique features permit very wide applications in: (1) semiconductor testing such as surface state evaluation at high frequencies (C-V/G-V and conductance ( $G/\omega$ )) characteristics), and the input/output impedance evaluation of diodes and transistors, (2) resonator, filter, and magnetic and dielectric materials testing, (3) evaluation of LCR components such as high frequency chip and leaded components, and (4) testing of communications related components such as cables, connectors, etc.

### Specifications

**Parameter measured:**  $|Z| - \theta$ ,  $|Y| - \theta$ ,  $|\Gamma| - \theta$

R—X, G—B,  $\Gamma_x - \Gamma_y$

L—R • G • D • Q, C—R • G • D • Q

**Display:** 4½ digit, max display 19999 counts

**Deviation Measurement** (deviation from stored reference)

$\Delta$ : -19999 to +19999 counts

$\Delta\%$ : -1999.9 to +1999.9%

**Measuring Signal** ( $23 \pm 5^\circ\text{C}$ )

**Frequency range:** 1 MHz to 1000 MHz

**Frequency step:** Standard: 100 kHz, 1-500 MHz  
200 kHz, 500-1000 MHz

Opt 002: 100 Hz, 1-500 MHz

200 Hz, 500-1000 MHz

**Frequency accuracy:**  $\pm 3$  ppm

**Signal level (into 50 $\Omega$ ):**  $-20 \pm 3$  dBm

**Frequency control:** spot and swept

**Measuring Mode**

**Spot measurement:** at specific frequency (or dc bias)

**Swept measurement:** manual or automatic sweep from start to stop frequency (or dc bias) at step frequency (or dc bias) rate in linear or logarithmic form.

**Auto Calibration**

Automatic error compensation referenced to connected terminations (0  $\Omega$ , 50  $\Omega$ , 0 S)

**Calibration frequency:** 51 frequencies including start and stop frequencies.

**Electrical length compensation:** automatic compensation for electrical length of test fixtures.

**Compensating range:** 0 to 99.99 cm.

**DC Bias**

**Internal dc Bias**

**Voltage range:** -40 to +40 V, 10 mV step  
**Setting accuracy:** 0.1% of setting +10 mV  
**Bias control:** spot and swept

**External dc Bias**

**Voltage range:** -40 to +40 V  
**Max allowable current:** 100 mA

**Key status memory:** 2 sets of measuring conditions can be stored and recalled at any time. These conditions are kept in storage even when LINE is turned off.

**Ranging:** Auto/Range hold

**Trigger:** Internal, External or Manual

**Self-test:** automatic internal program test

**HP-IB data output and remote control:** standard

**Measuring Range, Resolution and Accuracy**

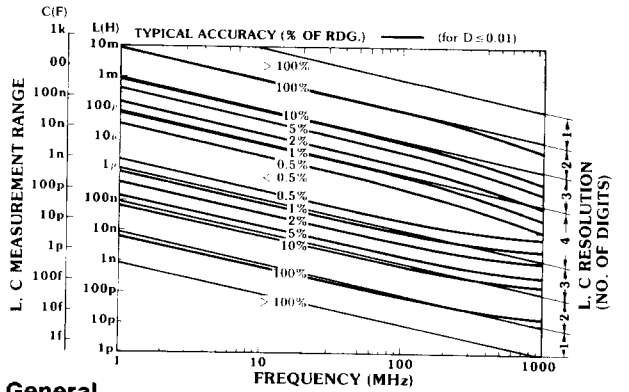
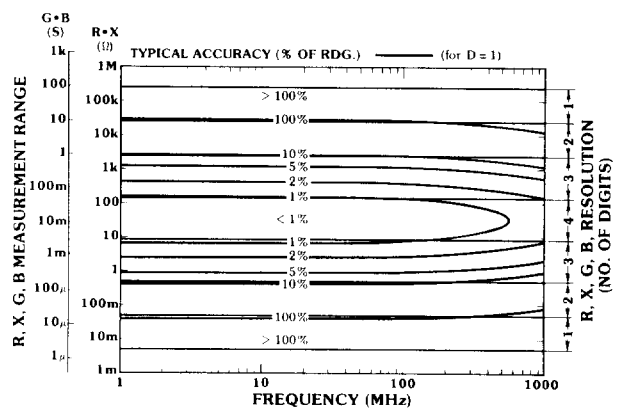
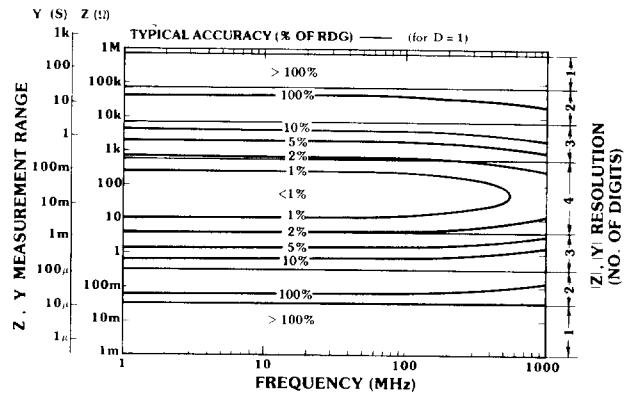
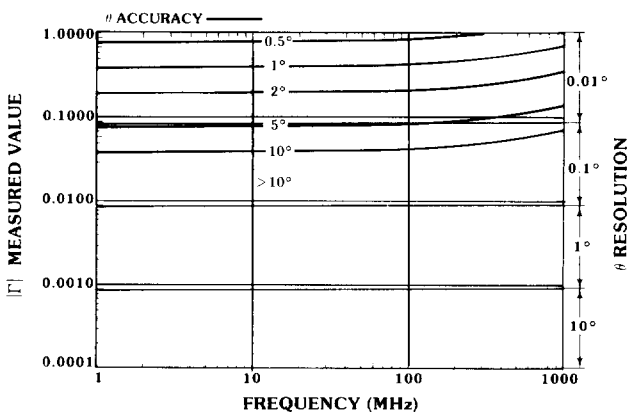
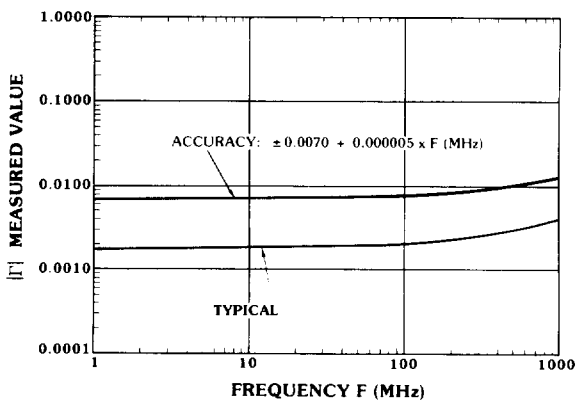
Specified at APC-7 UNKNOWN connector for reflect coefficient measurement at measuring frequency and ambient temperature (0 - 55°C) where calibration is performed after the warm-up time of 40 minutes. Refer to General Information for temperature coefficient and typical measuring range/resolution and accuracies of other measuring parameters (see data sheet for detailed specifications).

**$\Gamma$  -  $\Theta/\Gamma_x$  -  $\Gamma_y$  Measurement**

**Measuring Range**

$\Gamma$ ,  $\Gamma_x$ ,  $\Gamma_y$ : 0.0001 to 1.0000  
 $\Theta$ : 0° to ±180.00° (0 to ±π rad.)  
 $\Gamma$ ,  $\Gamma_x$ ,  $\Gamma_y$  resolution: 0.0001

$\Gamma$ ,  $\Gamma_x$ ,  $\Gamma_y$  accuracy (see graph below)



**General**

**Temperature coefficient for  $\Gamma$ ,  $\Gamma_x$ , and  $\Gamma_y$ :** 0.0001/°C (23 ± 5°C)

**Measuring time:** <800 ms or <250 ms (high speed mode)

**Frequency switching time:** ≤ 200 ms

**Temperature:** 0 - 55°C, < 95% RH

**Power:** 100, 120, 220 V ± 10%, 240 V + 5% - 10%, 48 - 66 Hz, 150 VA max.

**Size:** 425.5 mm W x 230 H x 574 mm D (16.75" x 9" x 22.6").

**Weight:** approx. 24 kg (52.8 lb)

**Accessories furnished:** accessory case (with reference terminations included).

**Accessories Available**

Accessory	Price
HP 16091A Coaxial Fixture Set	\$465
HP 16092A Spring Clip Fixture	\$455
HP 16093A Binding Post Fixture	\$170
HP 16093B Binding Post Fixture	\$175
HP 16094A Probe Fixture	\$150

**Options**

002: 100 Hz/200 Hz resolution synthesizer	\$1,650
004: Recorder Outputs	\$445

**HP 4191A RF Impedance Analyzer \$14,320**