

# HP 8903B Audio Analyzer HP 8903E Distortion Analyzer

20 Hz to 100 kHz

## Technical Specifications

**The versatile choice  
for audio analysis**

**Related Literature:**

Product Overview ..... 5968-1388E

Price List ..... 5968-1389EUS

All parameters describe performance in automatic operation or properly set manual conditions. Specifications describe the instrument's warranted performance. Supplemental characteristics (shown in italics) are intended to provide information useful in applying the instrument by giving typical, but non-warranted, performance parameters.

### HP 8903B System Specifications

(HP 8903B only, source and analyzer combined)

#### Distortion

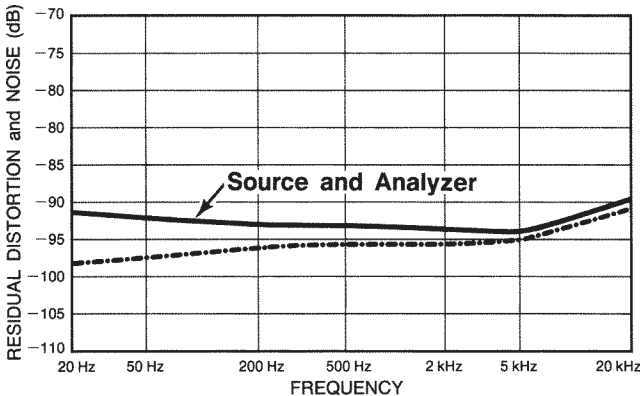
**Residual Distortion and Noise (the higher of): 80 kHz**

**BW:** -80 dB or 17  $\mu$ V, 20 Hz to 20 kHz.

**500 kHz BW:** -70 dB or 50  $\mu$ V, 20 Hz to 50 kHz.

-65 dB or 50  $\mu$ V, 50 kHz to 100 kHz.

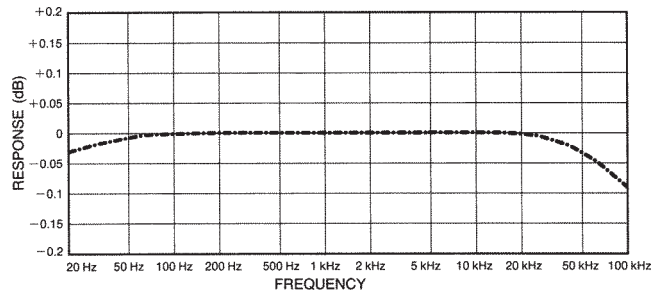
#### *Supplemental Characteristics*



*Typical residual distortion and noise of the source and analyzer combined (source voltage set to 1.5 V, 80 kHz BW). Dashed line represents typical residual distortion and noise for the analyzer only.*

#### Flatness

##### *Supplemental Characteristics*



*Typical flatness of source and analyzer combined (source voltage set to 1 V, 1 kHz reference).*

#### Signal-to-Noise

**Frequency Range:** 50 Hz to 100 kHz

**Display Range:** 0 to 99.99 dB

**Accuracy:**  $\pm 1$  dB

**Input Voltage Range:** 50 mV to 300 V

**Residual Noise (the higher of):**

**80 kHz BW:** -85 dB or 17  $\mu$ V

**500 kHz BW:** -70 dB or 50  $\mu$ V

##### *Supplemental Characteristics*

**Time to Return First Measurement:** <2.5 second

**Measurement Rate:** One reading per second

**Resolution:** Same as listed under SINAD, on page 2

## HP 8903B Source Specifications

(HP 8903B only)

### Frequency

**Range:** 20 Hz to 100 kHz

**Resolution:** 0.3%

**Accuracy:** 0.3% of setting

### Output Level

**Range:** 0.6 mV to 6 V open circuit

**Resolution:** 0.3% or better

**Accuracy:**

2% of setting 60 mV to 6 V, 20 Hz to 50 kHz.

3% of setting 6 mV to 6 V, 20 Hz to 100 kHz.

5% of setting 0.6 mV to 6 mV, 20 kHz to 100 kHz.

**Flatness (1 kHz reference):**

±0.7% (±0.06 dB), 20 Hz to 20 kHz.

±2.5% (±0.22 dB), 20 Hz to 100 kHz.

**Distortion and Noise (the higher of):**

**80 kHz BW:** -80 dB or 15 µV, 20 Hz to 20 kHz.

**500 kHz BW:** -70 dB or 38 µV, 20 Hz to 50 kHz.  
-65 dB or 38 µV, 50 kHz to 100 kHz.

**Impedance:** 600 Ω ±1% or 50 Ω ±2% front panel or HP-IB programmable (47 special function).

### Supplemental Characteristics

**Frequency Switching Speed:** <3 ms (does not include HP-IB programming time)

**Output Level Switching Speed:** 20 ms (does not include HP-IB programming time)

**Sweep Mode:** Log sweep with up to 500 points per decade or 255 points total between entered start and stop frequencies.

## HP 8903B and HP 8903E Analyzer Specifications

### Distortion

**Fundamental Frequency Range:** 20 Hz to 100 kHz

**Display Range:** 0.001% to 100% (-99.99 to 0 dB)

**Accuracy:**

±1 dB, 20 Hz to 20 kHz.

±2 dB, 20 kHz to 100 kHz.

**Input Voltage Range:** 50 mV to 300 V

**Residual Distortion and Noise (the higher of):**

**80 kHz BW:** -80 dB or 15 µV, 20 Hz to 20 kHz.

**500 kHz BW:** -70 dB or 45 µV, 20 Hz to 50 kHz.  
-65 dB or 45 µV, 50 kHz to 100 kHz.

### Supplemental Characteristics

**3 dB Measurement Bandwidth:** 10 Hz to 500 kHz

**Detection:** True rms or rms-calibrated average

**Displayed Resolution:**

0.0001% (<0.1% distortion).

0.001% (0.1% to 3% distortion).

0.01% (3% to 30% distortion).

0.1% (>30% distortion).

**Time to Return First Measurement:** 1.5 s

**Measurement Rate:** Two readings per second

### SINAD

**Fundamental Frequency Range:** 20 Hz to 100 kHz

**Display Range:** 0 to 99.99 dB

**Residual Distortion and Noise:** Same as listed under distortion

**Accuracy:**

±1 dB, 20 Hz to 20 kHz.

±2 dB, 20 kHz to 100 kHz.

**Input Voltage Range:** 50 mV to 300 V

### Supplemental Characteristics

**Detection:** True-rms or rms-calibrated average

**Resolution:**

**HP 8903B:** 0.01 dB for SINAD ratios >25 dB. For ratios <25 dB the display is rounded to the nearest 0.5 dB to reduce digit flickering of noisy signals (full resolution is available via special function 16.1).

**HP 8903E:** Powers up with special function 16.1 active for 0.01 dB resolution at all SINAD ratios.

**Analog Meter (HP 8903B only):** Active in SINAD mode only and for SINAD ratios up to 18 dB (24 dB using special function 7.1).

1.0 dB typical accuracy.

**Tuning:**

**HP 8903B:** Notch filter is tuned to the internal audio source frequency.

**HP 8903E:** Notch filter is tuned to the counted input frequency.

**Time to Return First Measurement:** 1.5 s

**Measurement Rate:** Two readings per second

### AC Level

**Full Range Display:** 300.0 V, 30.00 V, 3.000 V, 0.3000 V, 30.00 mV, 3.000 mV, 0.3000 mV.

**Overrange:** 33%, except on 300 V range

**Accuracy:** (rms and average detection)

±2%, 50 mV to 300 V, 20 Hz to 20 kHz.

±3%, 0.3 mV to 50 mV, 20 Hz to 100 kHz.

±5%, 50 mV to 300 V, 20 kHz to 100 kHz.

### Supplemental Characteristics

**AC Converter:** True-rms responding for signals with crest factor up to 3, rms calibrated average detection, or quasi-peak detection.

**Time to Return First Measurement:** <1.5 s

**Measurement Rate:** >2.5 readings per second

**3 dB Measurement Bandwidth:** >500 kHz

**Quasi-Peak Detector Characteristic:** Meets CCIR 468-4

**Quasi-Peak Detector Accuracy:** (20 Hz to 20 kHz) ±6% typically

# HP 8903B and HP 8903E Analyzer Specifications *cont.*

## DC Level

**Full Range Display:** 300.0 V, 48.00 V, 16.00 V, 4.000 V.  
**Overrange:** 33%, except on 300 V range  
**Accuracy:**  $\pm 1.0\%$  of reading (600 mV to 300 V).  
 $\pm 6$  mV ( $V_{in} < 600$  mV).

### Supplemental Characteristics

**Time to Return First Measurement:**  $< 1.5$  s  
**Measurement Rate:** Three readings per second

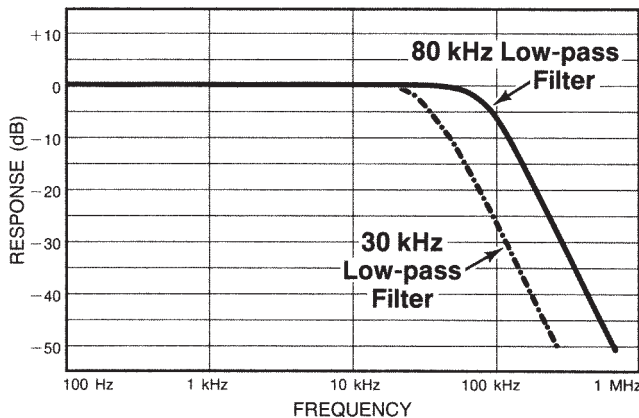
## Frequency Measurement

**Measurement Range:** 20 Hz to 150 kHz. (20 Hz to 100 kHz in distortion and SINAD modes.)  
**Resolution:** Five digits (0.01 Hz for input frequencies  $< 100$  Hz).  
**Accuracy:**  $\pm(0.004\%$  plus one digit).  
**Sensitivity:** 50 mV in distortion and SINAD modes. 5 mV in AC-level and signal-to-noise (HP 8903B only) modes.

### Supplemental Characteristics

**Measurement Rate:** Same as measurement mode selected  
**Counting Technique:** Reciprocal with 2 MHz timebase

## Standard Audio Filters



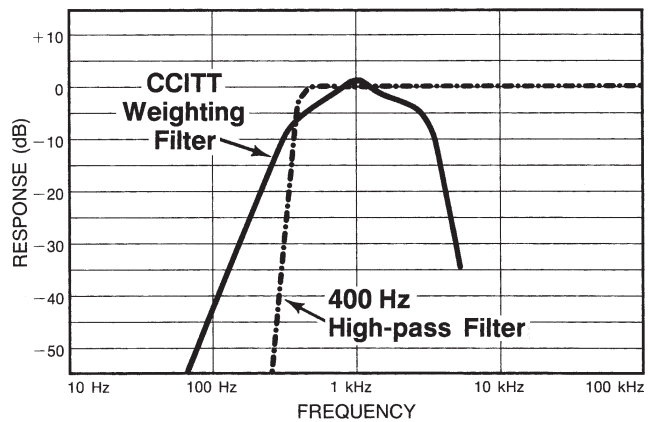
### 30 kHz Low-Pass Filter

**3 dB Cutoff Frequency:** 30 kHz  $\pm 2$  kHz.  
**Roll-off:** Third-order Butterworth; 18 dB per octave or 60 dB per decade

### 80 kHz Low-Pass Filter

**3 dB Cutoff Frequency:** 80 kHz  $\pm 4$  kHz.  
**Roll-off:** Third-order Butterworth; 18 dB per octave or 60 dB per decade

## Plug-In Audio Filters

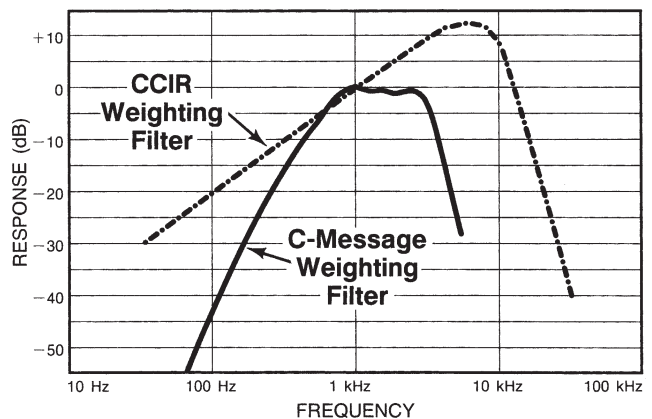


### 400 Hz High-Pass Filter

**3 dB Cutoff Frequency:** 400 kHz  $\pm 40$  Hz.  
**Roll-off:** Seventh-order Butterworth; 42 dB per octave or 140 dB per decade

### CCITT Weighting Filter (CCITT rec. P53)

**Deviation from Ideal Response:**  
 $\pm 0.2$  dB at 800 Hz.  
 $\pm 1.0$  dB, at 300 Hz to 3 kHz.  
 $\pm 2.0$  dB, at 50 Hz to 3.5 kHz.  
 $\pm 3.0$  dB, at 3.5 kHz to 5 kHz.



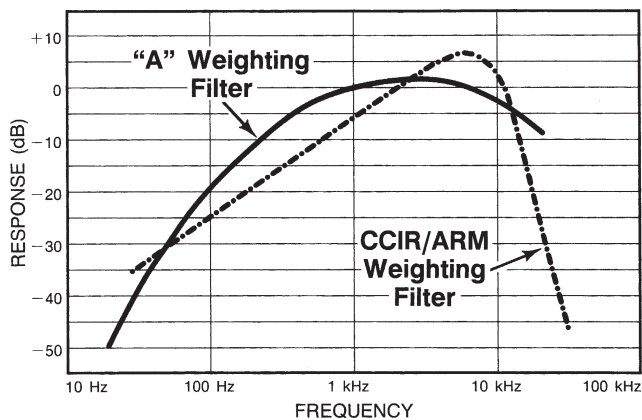
### CCIR Weighting Filter (CCIR rec. 468-2)

**Deviation from Ideal Response:**  
 $\pm 0.1$  dB at 6.3 kHz.  
 $\pm 0.2$  dB, at 6.3 kHz to 7.1 kHz.  
 $\pm 0.4$  dB, at 7.1 kHz to 10 kHz.  
 $\pm 0.5$  dB, at 200 Hz to 6.3 kHz.  
 $\pm 1.0$  dB, at 31.5 Hz to 200 Hz, 10 kHz to 20 kHz.  
 $\pm 2.0$  dB, at 20 kHz to 31.5 kHz.

### C-Message Weighting Filter (per BSTM 41004)

**Deviation from Ideal Response:**  
 $\pm 0.1$  dB at 1 kHz  
 $\pm 1.0$  dB, 60 Hz to 5 kHz

## Plug-In Audio Filters *cont.*



**CCIR/ARM Weighting Filter (CCIR rec. 468-2, average-responding meter, Dolby Labs Bulletin No. 19/4)**

**Deviation from Ideal Response:** Same as listed previously under CCIR Weighting Filter.

**"A" Weighting Filter (IEC rec. 179 and ANSI S1.4, type one sound-level meter)**

**Deviation from Ideal Response:**

±0.1 dB at 1 kHz.

±0.5 dB, 20 Hz to 10 kHz.

±1.0 dB, at 10 kHz to 20 kHz.

## HP 8903B and HP 8903E General Specifications

### HP 8903B Rear Panel Features

#### HP-IB Connector

**Monitor Output:** Provides a scaled output of the input signal. In SINAD, distortion, and distortion-level modes, the fundamental is removed.

### Front/Rear Panel Outputs

**Monitor Output:** Output impedance 600  $\Omega$ .

**AC-level mode:** provides scaled output of input signal.

**SINAD, distortion, and distortion-level modes:** provide a scaled output of the input signal with the fundamental removed.

### HP 8903E Rear Panel Features

#### HP-IB Connector

### Analyzer Input

**Input Type:** Balanced (full differential).

**Input Impedance:** 100 k $\Omega$   $\pm$ 1% shunted by <300 pF, each side to ground. (In dc-level mode the input resistance is 101 k $\Omega$   $\pm$ 1%).

**Maximum Input: Maximum peak input voltage, any combination of ac and dc:**

**HP 8903B:** 425 volts peak, applied differentially or between either input and ground.

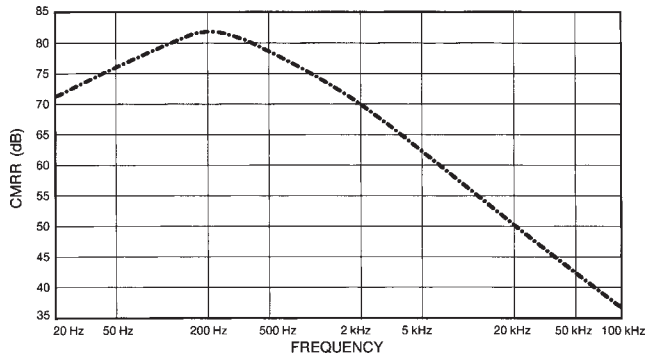
**HP 8903E:** 42 volts peak, low side to ground. 425 volts peak, differentially or high side to ground.

**CMRR:** >60 dB, 20 Hz to 1 kHz,  $V_{in}$  <2 V.

>45 dB, 20 Hz to 1 kHz.

>30 dB, 20 Hz to 20 kHz.

## Supplemental Characteristics



**Typical CMRR:** From 20 Hz to 100 kHz with input voltage of 6 volts.

## General

**Temperature:** Operating, 0  $^{\circ}$ C to 55  $^{\circ}$ C; storage, -55  $^{\circ}$ C to 75  $^{\circ}$ C.

**Remote Operation:** HP-IB. All functions except the line switch, low-terminal ground switches, and the  $\times$ 10- and  $\div$ 10- increment keys (HP 8903B only), are remotely controllable. The HP 8903E has many special functions which can only be accessed via HP-IB commands.

**HP-IB Compatibility:** SH1, AH1, T5, TE0, L3, LE0, SR1, RL1, PP0, DC1, DT1, C0, E1.

**Power:** 100, 120, 220, or 240 V (+5, -10%); 48 to 66 Hz. 100 or 120 V (+5, -10%); 48 to 440 Hz. 100 VA maximum.

#### Weight:

**HP 8903B:** Net 12.3 kg. (27 lb.); shipping 16.4 kg. (36 lb.)

**HP 8903E:** Net 11.8 kg. (26 lb.); shipping 15.9 kg. (35 lb.)

**Dimensions:** 146 mm H  $\times$  425 mm W  $\times$  462 mm D. (5.75  $\times$  16.8  $\times$  18.2 in.)

**HP System II Size:** 5.25 H  $\times$  1 MW  $\times$  17 D.

**EMI:** Radiated interference is within the requirements of RE02 of MIL STD 461B and FTZ 526/527.

**Conducted and Radiated Susceptibility:** Meets the requirements of methods CS01, CS02, and RS03 (1 V/meter) of MIL STD 461B dated 1980.

#### Warranty Information

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

#### Limitation Of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by buyer, buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance. No other warranty is expressed or implied. Hewlett-Packard specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

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