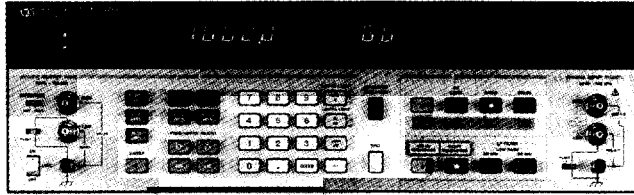


# MOBILE/CELLULAR RADIO INSTRUMENTS & SYSTEMS

Audio Analyzer, 20 Hz to 100 kHz; Distortion Analyzer, 20 Hz to 100 kHz

HP 8903B, 8903E

- Measures distortion, SINAD, signal-to-noise
- Measures true-rms ac volts, dc volts, frequency
- Low-distortion programmable source
- rms, average, and quasi-peak detection



HP 8903B



## HP 8903B Audio Analyzer and HP 8903E Distortion Analyzer

The HP 8903B audio analyzer and HP 8903E distortion analyzer provide unparalleled versatility and performance for audio measurements from 20 Hz to 100 kHz. The HP 8903B combines the functionality of a low-distortion audio source, high-performance distortion analyzer, frequency counter, ac voltmeter, dc voltmeter, and SINAD meter into one compact package. With microprocessor control of source and analyzer, the HP 8903B can perform stimulus-response measurements, such as signal-to-noise ratio and swept distortion, automatically with no additional equipment. The HP 8903E distortion analyzer is the analyzer portion of the HP 8903B audio analyzer. (The HP 8903E has no source.)

For ease of use, most measurements on the HP 8903B and HP 8903E are made with only one or two keystrokes. Both instruments automatically tune and autorange for maximum accuracy and resolution. For quick identification of input signals, the analyzer counts and displays the input frequency in all ac measurement modes.

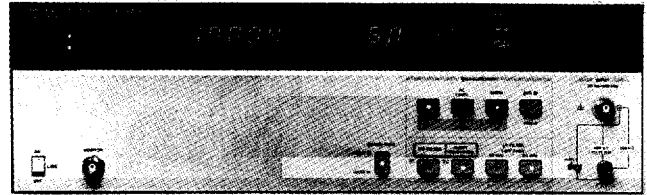
### Low-Frequency Applications

The HP 8903B/E have many features that make difficult audio measurements easy. These include flexible data display formats, a selectable balanced or unbalanced input, plug-in filters, and automatic notch filter tuning. With the ratio key, you can establish a reference in % or dB and directly make frequency-response and 3 dB bandwidth measurements without computation. A fully balanced analyzer input allows testing of the bridged power amplifiers found in many radios and car stereos, as well as professional balanced audio equipment.

With 2 internal plug-in filter slots and 6 optional filters to choose from, we simplify your audio measurements by providing the filter networks required by international standards. (See the next page for a complete list of filters.) The HP 8903B and HP 8903E both use true-rms detection (for all signals with crest factor 3) for accurate measurement of complex waveforms and noise. Average and quasi-peak detectors are also available. (Quasi-peak is selectable only via HP-IB on the HP 8903E.) Accurate distortion measurements typically can be made down to less than  $-90$  dB (0.003%) from 20 Hz to 20 kHz.

For receiver testing, both instruments have a tunable SINAD notch filter. On the HP 8903B, the filter is automatically tuned to the source frequency. With the HP 8903E, a front-panel key allows the operator to lock the notch filter at any given input frequency.

- Measures distortion, SINAD
- Measures true-rms ac volts, dc volts, frequency
- rms, average, and quasi-peak detection



HP 8903E



## HP 8903B and HP 8903E Specifications

### System Specifications

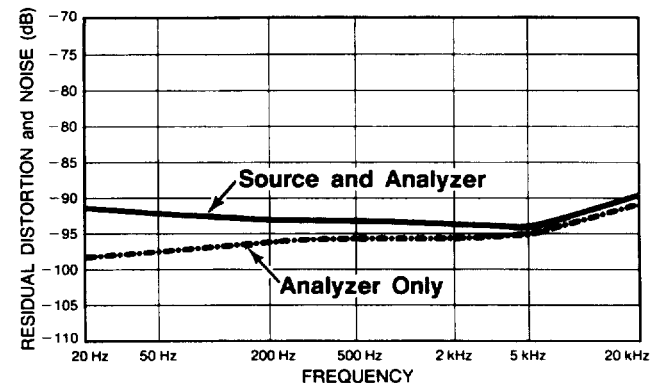
(HP 8903B only, source and analyzer combined)

### Distortion

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

**80 kHz BW:**  $-80$  dB (0.01%) or  $17 \mu\text{V}$ , 20 Hz to 20 kHz

**500 kHz BW:**  $-70$  dB (0.032%) or  $50 \mu\text{V}$ , 20 Hz to 50 kHz  
 $-65$  dB (0.056%) or  $50 \mu\text{V}$ , 50 kHz to 100 kHz



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

### 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):  $-85$  dB or  $17 \mu\text{V}$ , 80 kHz BW;  
 $-70$  dB or  $50 \mu\text{V}$ , 500 kHz BW

### 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** (open circuit): 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 to 6 mV,  
 20 Hz to 100 kHz

**Flatness** (1 kHz reference):  $\pm 0.7\%$  ( $\pm 0.06$  dB), 20 Hz to 20 kHz;  $\pm 2.5\%$  ( $\pm 0.22$  dB), 20 Hz to 100 kHz

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

- 80 kHz BW:** -80 dB (0.01%) or  $15 \mu\text{V}$ , 20 Hz to 20 kHz
- 500 kHz BW:** -70 dB (0.032%) or  $38 \mu\text{V}$ , 20 Hz to 50 kHz  
-65 dB (0.056%) or  $38 \mu\text{V}$ , 50 to 100 kHz

**Impedance:**  $600 \Omega \pm 1\%$  or  $50 \Omega \pm 2\%$ , front-panel selectable (HP-IB programmable)

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

**Analyzer Specifications**  
(both HP 8903B and HP 8903E)

**Distortion**

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

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

**Accuracy:**  $\pm 1$  dB, 20 Hz to 20 kHz;  $\pm 2$  dB, 20 kHz to 100 kHz

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

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

- 80 kHz BW:** -80 dB (0.01%) or  $15 \mu\text{V}$ , 20 Hz to 20 kHz
- 500 kHz BW:** -70 dB (0.032%) or  $45 \mu\text{V}$ , 20 Hz to 50 kHz  
-65 dB (0.056%) or  $45 \mu\text{V}$ , 50 kHz to 100 kHz

**Supplemental Characteristics**

**3 dB measurement bandwidth:** 10 Hz to 500 kHz

**Detection:** true rms or rms calibrated average

**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:**  $\pm 1$  dB, 20 Hz to 20 kHz;  $\pm 2$  dB, 20 to 100 kHz

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

**Supplemental Characteristics**

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

**Tuning:** HP 8903B: Notch filter is tuned to the internal source frequency. HP 8903E: Notch filter is tuned to the counted input frequency. Notch filter hold function available on front panel.

**AC Level**

**Full Range Display:** 300 V, 30 V, 3 V, 0.3 V, 30 mV, 3 mV, 0.3 mV

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

**Accuracy:**  $\pm 2\%$ , 50 mV to 300 V, 20 Hz to 20 kHz;  $\pm 4\%$ , 0.3 to 50 mV, 20 Hz to 100 kHz;  $\pm 4\%$ , 50 mV to 300 V, 20 to 100 kHz

**Supplemental Characteristics**

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

**3 dB measurement bandwidth:** > 500 kHz

**DC Level**

**Full Range Display:** 300 V, 48 V, 16 V, 4 V

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

**Accuracy:**  $\pm 1.0\%$  of reading, 600 mV to 300 V  
 $\pm 6$  mV,  $V_m < 600$  mV

**Frequency Measurement**

**Measurement Range:** 20 Hz to 150 kHz (20 Hz to 100 kHz in distortion and SINAD modes)

**Resolution:** 5 digits (0.01 Hz for input frequencies <100 Hz)

**Accuracy:**  $\pm (0.004\% + 1 \text{ digit})$

**Sensitivity:** 50 mV in distortion and SINAD modes, 5.0 mV in ac level and signal-to-noise (HP 8903B only) modes

**Standard Audio Filters**

**30 kHz Low-Pass Filter**

**3 dB cutoff frequency:** 30 kHz  $\pm 2$  kHz

**Rolloff:** Third-order Butterworth; 18 dB/octave or 60 dB/decade

**80 kHz Low-Pass Filter**

**3 dB cutoff frequency:** 80 kHz  $\pm 4$  kHz

**Rolloff:** Third-order Butterworth; 18 dB/octave or 60 dB/decade

**Internal Plug-In Filter Options**

Both the HP 8903B and HP 8903E have two internal plug-in filter slots, each of which will accept one of 6 optional filters. The standard HP 8903B/E come with 30 kHz and 80 kHz low-pass filters, but with no plug-in filters. The appropriate filter options must be ordered for the analyzers to have any of the filters listed below. Each filter option has two option numbers: the 010 series for the left filter slot and the 050 series for the right filter slot. Each filter option ordered (maximum of two) adds additional cost to the instrument.

Filters	Option Numbers	
	Left slot	Right slot
400 Hz High-Pass	010	050
CCITT Weighting Filter	011	051
CCIR Weighting Filter	012	052
C-MESSAGE Weighting Filter	013	053
CCIR/ARM Weighting Filter	014	054
"A" Weighting Filter	015	055

**Analyzer Input**

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

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

**Max Input** (maximum peak input voltage, any combination of ac/dc):

**HP 8903B:** 425 V peak, applied differentially or between either input to ground

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

**CMRR:** > 60 dB, 20 Hz to 1 kHz,  $V_m < 2$  V; > 45 dB, 20 Hz to 1 kHz; > 30 dB, 20 Hz to 20 kHz

**General**

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

**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)

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

**Ordering Information**

Analyzer mainframes	Price
<b>HP 8903B Audio Analyzer<sup>1</sup></b>	\$6,970
<b>Opt 001</b> Input/Output Connectors on Rear Panel Only	+ \$122
<b>Opt 910</b> Two sets of Operation/Calibration (08903-90079) and Service Manuals (08903-90062)	+ \$290 ☎
<b>Opt 915</b> Service Manual (08903-90062)	+ \$122 ☎
<b>Opt W30</b> Extended Repair Service (see page 663)	+ \$150
<b>Opt W32</b> Calibration Service (see page 663)	+ \$765
<b>HP 8903E Distortion Analyzer<sup>1</sup></b>	\$4,775
<b>Opt 001</b> Input/Output Connectors on Rear Panel Only	+ \$235
<b>Opt 910</b> Additional Operation and Calibration Manual (08903-90053) and Two Service Manuals (08903-90065)	+ \$300 ☎
<b>Opt 915</b> Add Service Manual (08903-90065)	+ \$135 ☎
<b>Opt W30</b> Extended Repair Service (see page 663)	+ \$95
<b>Opt W32</b> Calibration Service (see page 663)	+ \$405
<b>Options for both HP 8903B and HP 8903E</b>	
<b>Opt 010 or 050</b> 400 Hz High-Pass Filter	+ \$245
<b>Opt 011 or 051</b> CCITT Weighting Filter	+ \$245
<b>Opt 012 or 052</b> CCIR Weighting Filter	+ \$245
<b>Opt 013 or 053</b> C-Message Weighting Filter	+ \$245
<b>Opt 014 or 054</b> CCIR/ARM Weighting Filter	+ \$245
<b>Opt 015 or 055</b> "A" Weighting Filter	+ \$245
<b>Opt 907</b> Front Handle Kit (5061-9689)	+ \$56
<b>Opt 908</b> Rack Flange Kit (5061-9677)	+ \$33
<b>Opt 909</b> Rack Flange Kit (5061-9683) with Front Handles	+ \$82 ☎

<sup>1</sup>HP-IB cables not included. For description and price, see page 99.

☎ For off-the-shelf shipment, call 800-452-4844.

