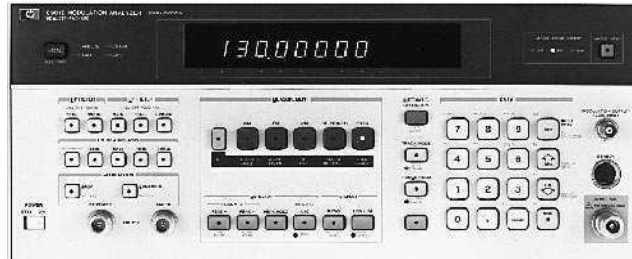


- Measures AM and FM to 1% accuracy
- Measures RF frequency
- Measures RF power
- Low internal noise
- Completely automatic

HP 8901A  
HP 8901B  
HP 11715A



HP 8901A



HP 8901B

### HP 8901A and HP 8901B Modulation Analyzers

The HP 8901A and HP 8901B modulation analyzers combine the capabilities of several RF instruments to give complete, accurate characterization of modulated signals in the 150 kHz to 1300 MHz frequency range. Both instruments very accurately measure modulation and recover the modulation signal. They determine RF frequency and measure RF power. The major additional capabilities of the HP 8901B are its improved power-meter accuracy, its ability to use external power sensors, its ability to make adjacent-channel power measurements or carrier-noise measurements (with Options 030 through 037), and its ability to count audio frequencies and measure distortion on 400 Hz and 1 kHz signals. Both instruments are fully automatic and make all major measurements at the press of a key or under GPIB control.

#### Transmitter Testing

The HP 8901A/B have the features required to perform standard transmitter measurements. They measure transmitter power, count frequency, and measure the signal modulation very accurately. The HP 8901B also characterizes the demodulated audio signal's frequency, level, and distortion. With Option 030 the HP 8901B can quickly and accurately make adjacent-channel power measurements to CEPT standards.

#### RF Signal Characterization

The HP 8901A/B are excellent lab and production tools for accurately characterizing RF signals.

Use the HP 8901A/B to make accurate AM/FM and FM/AM conversion measurements of phase- and amplitude-sensitive devices such as bandpass filters and multiple-channel receivers. Excellent isolation between AM and FM make it simple to separate the AM and FM of AM stereo, the incidental AM of FM transmitters, and the AM, FM, and FM components of complex signals.

#### Automatic Test Systems

The HP 8901A/B are important components of automatic RF test systems. All functions are fully automatic and easily programmed. With these measurements combined into one instrument, interfacing requirements, hardware costs, and software-development time are reduced.

#### HP 8901A and HP 8901B Specifications

##### RF Input

**Frequency Range:** 150 kHz to 1300 MHz  
**Operating Level:** 12 mV rms to 7 V rms  
**Input Impedance:** 50  $\Omega$  nominal  
**Tuning:** Manual frequency entry, automatic, or track  
**Acquisition Time (automatic operation):** ~1.5 s  
**Maximum Safe Input Level (typical):** 35 V rms (25 W for source SWR <4), ac; 40 V, dc

##### Frequency Modulation

**Rates:** 20 Hz to 200 kHz  
**Deviations:** To 400 kHz

##### Accuracy:

$\pm 2\%$  of reading  $\pm 1$  digit, 20 Hz to 10 kHz rates, 250 kHz to 10 MHz;  
 $\pm 1\%$  of reading  $\pm 1$  digit, 50 Hz to 100 kHz rates, 10 to 1300 MHz

##### Demodulated Output Distortion: <0.1% THD

**AM Rejection (for 50% AM at 400 Hz and 1 kHz rates):** <20 Hz peak deviation measured in a 50 Hz to 3 kHz BW

**Residual FM (50 Hz to 3 kHz BW):** <8 Hz rms @ 1300 MHz, decreasing linearly with frequency to <1 Hz rms for 100 MHz and below

**Maximum Deviation Resolution:** 1 Hz

**Stereo Separation (50 Hz to 15 kHz):** >47 dB typical

##### Phase Modulation

**Carrier Frequency:** 10 to 1300 MHz

**Rates:** 200 Hz to 20 kHz; typically usable from 20 Hz to 100 kHz with degraded performance

**Deviation:** To 400 radians

**Maximum Deviation Resolution:** 0.001 radian

**Accuracy:**  $\pm 3\%$  of reading  $\pm 1$  digit

**Demodulated Output Distortion:** <0.1% THD

**AM Rejection (for 50% AM at 1 kHz rate):** <0.03 radian peak deviation (50 Hz to 3 kHz BW)

##### Amplitude Modulation

**Rates:** 20 Hz to 100 kHz

**Depth:** To 99%

##### Accuracy

$\pm 2\%$  of reading  $\pm 1$  digit, 50 Hz to 10 kHz rates, 150 kHz to 10 MHz;

$\pm 1\%$  of reading  $\pm 1$  digit, 50 Hz to 50 kHz rates, 10 to 1300 MHz

**Flatness (variation in indicated AM depth for constant depth on input signal):**  $\pm 0.3\%$  of reading  $\pm 1$  digit

**Demodulated Output Distortion:** <0.3% THD

**FM Rejection (at 400 Hz and 1 kHz rates, 50 Hz to 3 kHz BW):** <0.2% AM

**Residual AM (50 Hz to 3 kHz BW):** <0.01% rms

**Maximum Depth Resolution:** 0.01%

##### Frequency Counter

**Range:** 150 kHz to 1300 MHz

**Accuracy:**  $\pm 3$  counts of least significant digit  $\pm$  reference accuracy

##### Internal Reference

**Frequency:** 10 MHz

**Aging rate:**  $<1 \times 10^{-9}$ /month (optional:  $1 \times 10^{-9}$ /day)

##### Maximum Resolution

HP 8901A: 10 Hz for frequencies <1 GHz;

100 Hz for frequencies  $\geq 1$  GHz

HP 8901B: 1 Hz

#### HP 8901A RF Level (Peak Voltage Responding, RMS Sine Wave Power Calibrated)

**Range:** 1 mW to 1 W

**Instrumentation Accuracy:**  $\pm 1.5$  dB

**SWR:**  $\leq 1.3$ , 150 kHz to 650 MHz;  $\leq 1.5$ , 650 to 1300 MHz

**Maximum Resolution:** 0.001 mW for levels <0.01 W

# Cellular/PCS Transmitter & Receiver Test Equipment

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## Modulation Analyzer, 150 kHz to 1300 MHz, AM/FM Test Source

HP 8901A  
HP 8901B  
HP 11715A

### HP 8901B RF Level (True RMS)

Frequency Range with HP 11722A: 100 kHz to 2.6 GHz  
Power Range: -20 to +30 dBm  
RF Range-to-Range Change Error:  $\pm 0.02$  dB/RF range change from reference range  
Input SWR: <1.15, using HP 11722A sensor module  
Zero Set (digital settability of zero):  $\pm 0.5\% \pm 1$  digit of full scale on lowest range (decrease by a factor of 10 for each high range)  
RF Power Resolution: 0.1% of full scale in watts or volts mode; 0.001 in dBm or dB relative mode

### HP 8901B Selective Power Measurements (Options 030 through 037)

Frequency Range: 10 MHz to 1.3 GHz  
Carrier Power Range: +30 to -20 dBm, 12.5, 25 and 30 kHz filters; +30 to -10 dBm, carrier noise filter  
Dynamic Range: 115 dB  
Carrier Rejection (temp.  $\leq 35^\circ\text{C}$ ): >90 dB for offsets  $\geq 1$  channel spacing or 5 kHz, whichever is larger  
Relative Accuracy:  $\pm 0.5$  dB, levels  $\geq -95$  dBc or levels  $\geq -129$  dBc/Hz

#### Power Reference

Power Output: 1.00 mW, factory set to  $\pm 0.7\%$ , traceable to the U.S. National Institute of Standards and Technology  
Accuracy:  $\pm 1.2\%$  worst case ( $\pm 0.9\%$  rss) for one year ( $0^\circ$  to  $55^\circ\text{C}$ )

#### Audio Filters

High-Pass (3 dB cutoff frequency): 50 Hz and 300 Hz  
Low-Pass (3 dB cutoff frequency except >20 kHz filter): 3 kHz, 15 kHz, >20 kHz  
De-emphasis Filters: 25  $\mu\text{s}$ , 50  $\mu\text{s}$ , 75  $\mu\text{s}$ , and 750  $\mu\text{s}$

Calibrators (Standard HP 8901B, Option 010 HP 8901A)  
AM Calibrator Depth and Accuracy: 33.33% depth, nominal; internally calibrated to an accuracy of  $\pm 0.1\%$   
FM Calibrator Deviation and Accuracy: 34 kHz peak deviation, nominal; internally calibrated to an accuracy of  $\pm 0.1\%$

### General Characteristics

Operating Temperature Range:  $0^\circ$  to  $55^\circ\text{C}$   
Power Requirements: 100, 120, 220, or 240 V (+5%, -10%); 48 to 66 Hz; 200 VA max.  
Size: HP 8901A: 425 mm W x 190 mm H x 468 mm D (16.8 in x 7.5 in x 18.4 in); HP 8901B: 425 mm W x 190 mm H x 551 mm D (16.8 in x 7.5 in x 21.7 in)  
Weight: HP 8901A: Net, 20 kg (44 lb); shipping, 25 kg (55 lb); HP 8901B: Net, 23 kg (52 lb); shipping, 31 kg (69 lb)

### Ordering Information

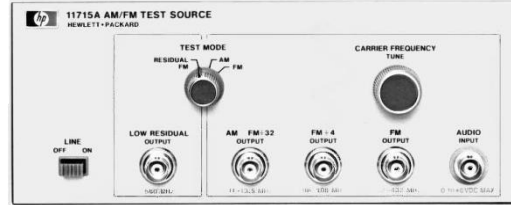
#### HP 8901A Modulation Analyzer\*

- Opt 001 RF Connectors on Rear Panel Only
- Opt 002  $1 \times 10^3$ /Day Internal Reference
- Opt 003 Connections for External Local Oscillator
- Opt 004 Operation from 48 to 440 Hz Power (temp.  $< 40^\circ\text{C}$ )
- Opt 010 AM and FM Calibrators
- Opt 907 Front Handle Kit (5061-9690)
- Opt 908 Rack Flange Kit (5061-9678)
- Opt 909 Front Handle and Rack Flange Kit (5061-9684)
- Opt 910 Two Sets of Operating (08901-90135) and Service Manuals (08901-90136) 4
- Opt 915 Service Manual (08901-90136) 4
- Opt W30 Extended Repair Service
- Opt W32 Calibration Service

#### HP 8901B Modulation Analyzer\*

- Opt 021 Add HP 11722A Sensor Module
- Opt 030 High Selectivity (select only 2 filter options) (Options 032 through 037 require Option 030; Option 030 includes Option 003 connections for external local oscillators)
- Opt 032 12.5 kHz Adjacent Channel Filter
- Opt 033 25.0 kHz Adjacent Channel Filter

- Opt 035 30.0 kHz Adjacent Channel Filter
- Opt 037 Carrier Noise Filter
- Opt 910 Two Sets of Operation/Calibration (08901-90113) and Service Manuals (08901-90114) 4
- Opt 915 Service Manual (08901-90114) 4
- Opt W30 Extended Repair Service
- Opt W32 Calibration Service



HP 11715A

### HP 11715A AM/FM Test Source

The HP 11715A AM/FM test source provides very flat, wide-bandwidth, and low-distortion amplitude- or frequency-modulated RF signals. Designed primarily for performance tests and adjustments of the HP 8901A/B modulation analyzer and HP 8902A measuring receiver, it will also serve as a high-quality modulated test oscillator where its frequency ranges apply.

The major components of the HP 11715A are a low-noise voltage-controlled oscillator (VCO), 2 digital dividers, and a double-balanced mixer. The VCO is the primary signal source, with a typical frequency range of 330 to 470 MHz at the FM output. FM is produced by directly coupling the external modulation source to the VCO's tune input, providing very wide bandwidth modulation with low phase shift. This design also ensures very little incidental AM.

The HP 11715A can also be used in conjunction with an HP 8901A/B and an HP 8902A as a calibrated signal source for special applications. In particular, the U.S. commercial FM broadcast band of 88 to 108 MHz is covered by the FM 4 4 output of the HP 11715A.

### HP 11715A Specifications

#### FM Outputs

Frequency Range:  
11 to 13.5 MHz, AM FM 4 32 output  
88 to 108 MHz, FM 4 4 output  
352 to 432 MHz, FM output

#### Peak Deviation:

>12.5 kHz, 11 to 13.15 MHz carrier  
>100 kHz, 88 to 108 MHz carrier  
>400 kHz, 352 to 432 MHz carrier

#### Distortion: <0.025% THD (<-72 dB) for

Carrier frequency	Peak deviation	Modulation rate
12.5 MHz	12.5 kHz	<10 kHz
100 MHz	100 kHz	<100 kHz
400 MHz	400 kHz	<100 kHz

Flatness:  $\pm 0.1\%$ , dc to 100 kHz rates  $\pm 0.25\%$ , dc to 200 kHz rates

Stereo Separation (88 to 108 MHz carrier, 75 kHz peak deviation, 1 kHz rate): >60 dB typical

#### AM Output

Frequency Range (AM/FM  $\div$  32 output): 11 to 13.5 MHz

Depth: To 99%

#### Distortion:

<0.05% THD (<-66 dB), 50% AM, 20 Hz to 100 kHz rates

<0.1% THD (<-60 dB), 95% AM, 20 Hz to 100 kHz rates

Flatness:  $\pm 0.1\%$ , 50 Hz to 50 kHz rates;  $\pm 0.25\%$ , 20 Hz to 100 kHz rates

Linearity:  $\pm 0.1\%$ , <95% AM;  $\pm 0.2\%$ , <99%

### Ordering Information

HP 11715A AM/FM Test Source  
Opt 910 A Total of Two Sets of Operating and Service Manuals (11715-90004)

### Price

4 Indicates QuickShip availability.

\* GPIB cables not included.