

SIGNAL ANALYZERS

Spectrum Analyzers, High-Performance Portable

HP 8560 Series

245

- Synthesized tuning
- Frequency counter
- Digital bandwidths
- AM/FM demodulator
- Adjacent channel power and occupied bandwidth

- Meets all MIL-T-28800C specifications for ruggedness
- Optional precision frequency reference, tracking generator, mass memory
- One-year calibration cycle



HP 8560 Series



HP 8560 Series Spectrum Analyzers

These portable spectrum analyzers are HP's highest-performing portables. They combine MIL-rugged packaging, synthesized tuning, and HP's traditional ease of use as standard features.

The HP 8560A has a frequency range of 50 Hz to 2.9 GHz. A built-in tracking generator is optional. The HP 8561B has a frequency range of 50 Hz to 6.5 GHz. For higher, preselected frequency coverage, the HP 8562A and 8563A operate from 9 kHz to 22 GHz and 26.5 GHz, respectively. Using HP 11974 series millimeter mixers, preselected coverage reaches 75 GHz, and with other mixers, unpreselected coverage can be extended to 325 GHz. (See page 254 for information on HP millimeter mixers.)

Rugged for Field Service

The HP 8560 series meets all MIL-T-28800C requirements, including those for temperature, pulse shock, and transit drop. These analyzers are warmed up and running in only 5 minutes. They fully meet specifications at temperatures from -10° to $+55^{\circ}$ C, and can withstand 30 g's of shock.

Narrow Digital Resolution Bandwidths

For fast, accurate measurements of closely spaced signals, the HP 8560A, 8561B, and 8563A feature digital 10 Hz, 30 Hz, and 100 Hz resolution bandwidths. These bandwidths allow the analyzers to sweep as much as 20 times faster than do conventional analog bandwidths. Digital bandwidths also provide the spectrum analyzer CRT with a calibrated measurement range of 100 dB.

Improved Frequency Accuracy

An optional precision frequency reference improves frequency accuracy to less than ± 150 Hz at 1 GHz after a 15-minute warmup (1-year aging). This capability comes standard on the HP 8563A.

Specified Pulse Response

These portables easily capture and accurately display short-duration radar pulses. Specified pulse-digitization uncertainty is less than 1.25 dB and typical repeatability is less than 0.2 dB.

Occupied Bandwidth and Adjacent Channel Power

The HP 8560A, 8561B, and 8563A help you characterize radio transmitters with easy-to-use occupied bandwidth and adjacent channel power functions. Use the occupied bandwidth function to determine the 99% power bandwidth of the signal. The total transmitted power and the adjacent channel power are determined by the adjacent channel power measurement.

Scalar Network Analysis Capability

Two new tracking sources allow the HP 8560 series to make high-performance scalar network analysis measurements at microwave frequencies. The frequency range of the new HP 85644A is 300 kHz to 6.5 GHz, and the new HP 85645A extends to 26.5 GHz. (See page 249.) For RF testing, the HP 85640A tracking generator and the optional built-in tracking generator for the HP 8560A both cover a frequency range of 300 kHz to 2.9 GHz.

HP 85620A Mass Memory Module

This plug-in module adds extra memory and computer capability to the HP 8560 series. It allows you to create complex measurement routines that can be saved as single-key measurements using downloadable programming. Your DLPs can be stored on 32-Kbyte memory cards or in the 128-Kbyte battery-backed RAM of the mass memory module. You can also store traces with state information, and create and store limit lines. A clock/calendar and automatic save and execute functions let you set the analyzer for unattended, automatic measurements when specified criteria are met. This module comes standard with the HP 8563A.

HP 85629B Test and Adjustment Module

This accessory creates a whole new approach to servicing your spectrum analyzer. The module plugs into the rear panel of an HP 8560 series analyzer and automates high-level diagnostics, self-tests, and adjustment procedures. It performs more than 1000 troubleshooting measurements. Readjustments are fast and accurate because the module controls internal analyzer settings as well as external test equipment.

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Spectrum Analyzers, High-Performance Portable (cont'd)

HP 8560A, 8561B, 8562A, 8563A



HP 8563A



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HP 8560A and 8561B RF Spectrum Analyzers

The HP 8560A and 8561B offer excellent performance for RF design and service applications. The HP 8560A has a frequency range of 50 Hz to 2.9 GHz, and the HP 8561B extends this range up to 6.5 GHz. Both have synthesized tuning for drift-free, accurate measurements. They also have a sensitivity of -130 dBm and digital bandwidths of 10, 30, and 100 Hz. Both analyzers meet MIL-T-28800C specifications for ruggedness.

Manual control is simple with an easy-to-use combination of hardkeys and softkeys that minimizes the number of keystrokes required to make measurements. Other measurement features include advanced marker capability and built-in AM and FM demodulators. Hard copies of results are easily obtained using the analyzers' direct print and plot functions or by using a computer.

Scalar measurement capability is made available by adding an optional built-in tracking generator to the HP 8560A or by using the HP 85640A tracking generator or a new HP 85644A or 85645A tracking source with either analyzer. For millimeter applications that don't require full microwave coverage, the HP 8560A and 8561B provide lower-cost solutions. Both are compatible with HP 11970 series harmonic mixers and HP 11974 series preselected mixers. For very precise measurements, consider adding an optional precision frequency reference. It gives frequency accuracy of less than ± 150 Hz at 1 Gz.

HP 8562A and 8563A Microwave Spectrum Analyzers

The HP 8562A and 8563A extend the features and capabilities of the RF members of the HP 8560 series into the microwave frequency range. In addition, both the HP 8562A and the 8563A have standard,

preselected frequency ranges of 9 kHz to 22 GHz and 26.5 GHz, respectively. (The frequency range of the HP 8562A can be extended to 26.5 GHz with Option 026.) Their internal preselector requires no adjustment after 30 minutes at room temperature. This means faster measurements, which can be especially important in automated testing. For millimeter-wave measurements, preselection can be extended to 75 GHz using the HP 11974 series millimeter mixers. Unpreselected frequency range can be extended to 110 GHz using the HP 11970 series mixers and to 325 GHz using mixers from other manufacturers. (See page 254 for more information on HP millimeter mixers.)

The HP 8562A has a sensitivity of -120 dBm. The HP 8563A has a sensitivity of -110 dBm and digital resolution bandwidths of 10, 30, and 100 Hz. The HP 8563A also features 128 Kbytes of battery-backed RAM that stores up to 100 traces and states; limit-line capability for defining test criteria; and a built-in clock/calendar for time- and date-stamping traces and other output data. (These features can be added to the HP 8562A with the mass memory module accessory.) Scalar measurement capability to 6.5 GHz or 26.5 GHz can be added using a new HP 85644A or 85645A tracking source.

HP 85710A Digital Radio Measurement Personality

This measurement program, stored on a memory card, customizes the HP 8562A and 8563A microwave spectrum analyzers for digital radio measurements. It contains five agency masks for testing to U.S. FCC, UK, and FRG specifications. A compare-to-mask function allows you to characterize spectral emissions. Other functions include mean power level, transient analysis monitoring, and frequency response measurements. You can also create and store your own custom masks.

Specifications

Frequency

Frequency range

HP 8560A: 50 Hz to 2.9 GHz (dc-coupled); 100 kHz to 2.9 GHz (ac-coupled)

HP 8561B: 50 Hz to 6.5 GHz (dc-coupled); 100 kHz to 6.5 GHz (ac-coupled)

HP 8562A: 9 kHz to 22 GHz; 9 kHz to 26.5 GHz (Opt 026)

HP 8563A: 9 kHz to 26.5 GHz

Harmonic mode (n)	Center frequency
1	9 kHz to 2.9 GHz
1	2.75 to 6.46 GHz
2	5.86 to 13 GHz
3	12.4 to 19.7 GHz
4	19.1 to 22 GHz
4	19.1 to 26.5 GHz

Frequency readout accuracy (start, stop, center, or marker): \pm (freq readout \times freq ref acc'y + 5% \times span + 15% \times RBW + 10 Hz)

Counter resolution: 10 Hz to 1 MHz (HP8562A, selectable); 1 Hz to 1 MHz (HP 8560A, 8561B, 8563A, selectable)

Marker counter accuracy (S/N \geq 25 dB): \pm (marker freq \times freq ref acc'y + 50 Hz \times n + 1 LSD)

Delta counter accuracy (S/N \geq 25 dB): \pm (delta freq \times freq ref acc'y + 100 Hz \times n + 2 LSD)

Frequency reference accuracy (after 5-min warmup)

HP 8560A, 61B, 62A standard: $< 4 \times 10^{-6}$ /yr (includes aging, temp drift, settability)

Opt 003 precision frequency reference (standard on HP 8563A): $< 0.13 \times 10^{-6}$ /yr (includes aging, temp drift, settability, 15-min. warmup)

Residual FM (zero span)

HP 8560A and 8561B: < 10 Hz peak-to-peak in 20 ms (< 2 Hz peak-to-peak w/Opt 003)

HP 8562A: < 50 Hz \times N peak-to-peak in 100 ms (< 2 Hz \times N peak-to-peak w/Opt 003)

HP 8563A: < 2 Hz \times N peak-to-peak in 20 ms

Spectral purity

Noise sidebands: $< (-100 + 20 \log n)$ dBc/Hz at 30 kHz offset

Frequency span

Range

HP 8560A: 0 Hz, 100 Hz to 2.9 GHz

HP 8561B: 0 Hz, 100 Hz to 6.5 GHz

HP 8562A: 0 Hz, 2.5 kHz \times N to 19.25/23.75 GHz (Opt 026)

HP 8563A: 0 Hz, 100 Hz \times N to 23.75 GHz

Accuracy: $< \pm 5\%$

Resolution bandwidth (-3 dB)

Range

HP 8560A, 8561B, and 8563A: 10 Hz to 1 MHz in a 1, 3, 10 sequence, and 2 MHz

HP 8562A: 100 Hz to 1 MHz in a 1, 3, 10 sequence, and 2 MHz

Accuracy

HP 8560A, 8561B, and 8563A: $\pm 10\%$ (10 Hz to 300 kHz); $\pm 25\%$ (1 MHz, 2 MHz)

HP 8562A: $\pm 30\%$ (100 Hz); $\pm 10\%$ (300 Hz to 300 kHz); $\pm 25\%$ (1 MHz, 2 MHz)

Selectivity (-60 dB/-3 dB)

HP 8560A, 8561B, and 8563A: $< 5:1$ (RBW \leq 100 Hz); $< 15:1$ (RBW $>$ 100 Hz)

HP 8562A: $< 15:1$

Video bandwidth

Range: 1 Hz to 3 MHz in a 1, 3, 10 sequence

Amplitude

Amplitude range: +30 dBm to displayed average noise level

Maximum safe input

Average continuous power: +30 dBm (1W) with input atten > 10 dB

Peak pulse power: +50 dBm (100 W) with input atten ≥ 30 dB for $< 10 \mu$ s pulse width and $< 1\%$ duty cycle

DC: 0 V

Display range

Display: 10 \times 10 division graticule

Calibration: Log = 10, 5, 2, and 1 dB per division; linear = 10% of reference level/division

Reference level range: Log = -120 to +30 dBm in 0.1 dB steps; linear = 2.2 μ V to 7.07 V in 1% steps

Input attenuation range: 0 to 70 dB in 10 dB steps

Dynamic Range

Maximum dynamic range

Compression to noise

HP 8560A: 125 dB

HP 8561B and 8563A: 128 dB

HP 8562A: 118 dB

Signal to distortion, harmonic

HP 8560A: 81 dB

HP 8561B and 8563A: 81 dB (< 2.9 GHz), 110 dB (≥ 2.9 GHz)

HP 8562A: 76 dB (< 2.9 GHz), 105.5 dB (≥ 2.9 GHz)

Signal to distortion, intermodulation

HP 8560A: 90 dB

HP 8561B and 8563A: 90 dB (< 2.9 GHz), 92 dB (≥ 2.9 GHz)

HP 8562A: 83 dB (< 2.9 GHz), 86 dB (≥ 2.9 GHz)

Displayed average noise level (minimum RBW, 0 dB input attenuation, 1 Hz video BW, no signal at input)

Frequency	HP 8560A	HP 8561B	HP 8562A	HP 8563A
10 kHz	-103 dBm	-103 dBm	-90 dBm	-103
100 kHz	-110 dBm	-110 dBm	-100 dBm	-110
1 MHz to 2.9 GHz	-130 dBm	-130 dBm	-120 dBm	-130
2.75 to 6.46 GHz		-131 dBm	-121 dBm	-131
5.86 to 13.0 GHz			-110 dBm	-120
12.4 to 19.7 GHz			-105 dBm	-115
19.1 to 22.0/ 26.5 GHz			-100 dBm	-110

1 dB gain compression: -5 dBm at input mixer (10 MHz to 2.9 GHz); -3 dBm at input mixer (> 2.75 GHz)

Spurious responses (signals generated by analyzer due to input signals): For mixer level < -40 dBm, > 60 dB below input signal for frequencies < 6.46 GHz

Second harmonic distortion

Frequency	Mixer Level	HP 8560A	HP 8561B	HP 8562A/8563A
50 Hz to 10 MHz	-40 dBm	-60 dBc	-60 dBc	
10 MHz to 2.9 GHz	-40 dBm	-72 dBc	-72 dBc	-72 dBc
> 2.75 GHz	-10 dBm		-100 dBc	-100 dBc

Third-order intermodulation (two -30 dBm signals at mixer): -64 dBc, 50 Hz to 10 MHz (HP 8560A and 8561B); -70 dBc, 10 MHz to 2.9 GHz; -75 dBc, > 2.75 GHz (HP 8561B, 8562A, 8563A)

Image, multiple, and out-of-band responses: < -70 dBc, 10 MHz to 22 GHz; < -60 dBc, 10 MHz to 22 GHz

Residual responses (no signal at input, 0 dB input atten): < -90 dBm, > 200 kHz

Amplitude Accuracy

Frequency response (relative)

HP 8560A: ± 1.0 dB (dc-coupled)

HP 8561B: ± 1.0 dB (dc-coupled, 50 Hz to 2.9 GHz); ± 1.5 dB (dc-coupled, 2.75 to 6.5 GHz)

HP 8562A/8563A

Frequency Range	HP 8562A/8563A
9 kHz to 2.9 GHz	± 1.0 dB
2.75 to 6.46 GHz	± 1.5 dB
5.86 to 13.0 GHz	± 2.0 dB
12.4 to 19.7 GHz	± 3.0 dB
19.1 to 22.0 GHz	± 3.0 dB
19.1 to 26.5 GHz	± 3.0 dB

SIGNAL ANALYZERS

Accessories for Scalar Measurements (cont'd)

HP 85630A, 85640A, 85644A, 85645A, 85714A

Calibrator accuracy: ± 0.3 dB

IF gain uncertainty: ± 1 dB for 0 dBm to -80 dBm reference level

Scale fidelity: ± 0.4 dB/4 dB to a maximum of ± 1.5 dB over 0 to 90 dB range; linear, $\pm 3\%$ of reference level

Input attenuator switching accuracy (with 20 to 70 dB settings referenced to 10 dB): < 2.9 GHz ± 0.6 dB/10 dB step, ± 1.8 dB max

Resolution bandwidth switching uncertainty: ± 0.5 dB referenced to 300 kHz BW

Pulse digitization uncertainty (pulse-response mode, PRF > 720 /sweep time)

Log (peak-to-peak): 1.25 dB (RBW ≤ 1 MHz), 3 dB (RBW = 2 MHz)

Linear (peak-to-peak): 4% of ref level (RBW ≤ 1 MHz); 12% of ref level (RBW = 2 MHz), nominal standard deviation 0.2 dB

Sweep

Sweep time

Range: 50 μ s to 60 s (zero span); 50 ms to 100 s (span > 0)

Sweep trigger: free run, line, single, video, external

Demodulation

Modulation type: AM and FM

Audio output: Speaker and phone jack with volume control

Inputs and Outputs (all values are nominal)

Front-panel connectors

RF input: Precision type N (female), impedance 50 ohms

VSWR: $< 1.5:1$ for < 2.9 GHz and ≥ 10 dB input atten; $< 2.3:1$ for > 2.9 GHz and ≥ 10 dB input atten

LO emission level (average): with 10 dB input atten, < -80 dBm

Second IF input: SMA (female), frequency 310.7 MHz; NF 7 dB

First LO output: SMA (female), impedance 50 ohms; freq range 3.0000 to 6.8107 GHz; amplitude $+16.5$ dBm ± 2 dB (20° to 30° C); $+14.5$ dBm ± 2 dB (HP 8560A Opt 002)

Calibrator output: BNC (female), impedance 50 ohms

Rear-panel connectors

10 MHz reference (input/output): BNC (female), impedance 50 ohms; input range -2 to $+10$ dBm

Video output: BNC (female), impedance 50 ohms (dc-coupled)

LO sweep/0.5 V per GHz output: shared BNC (female), impedance 2,000 ohms (dc-coupled); LO sweep output 0 to $+10$ V (no load)

External trigger input: BNC (female), impedance $> 10,000$ ohms; trigger level, rising edge of TTL level

HP-IB

Interface functions: SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PPI, PCI, DT1, C1, C28

Direct plotter outputs: HP 7440A, 7470A, 7475A, 7550A

Printers: HP 3630A PaintJet, HP 2225A ThinkJet; other printers with IEEE 488 interface may work

General Specifications

Environmental

Military specifications: Meets MIL-T-28800C, Type III, Class 3, Style C

Calibration interval: 1 year

Warmup: 5 minutes from ambient conditions

Temperature: -10° to $+55^\circ$ C, operating; -62° to $+85^\circ$ C, not operating

Humidity: 95% at 40° C for 5 days

Altitude: 15,000 ft, operating; 50,000 ft, not operating

Rain resistance: Drip-proof at 16 liters/hour/ft²

Vibration: 0.059 inch peak-to-peak excursion (5 to 15 Hz); 0.039 inch peak-to-peak excursion (15 to 25 Hz); 0.020-inch peak-to-peak excursion (25 to 55 Hz)

Pulse shock: Half sine, 30 g's for 11 ms duration

Transit drop: 8-inch drop on 6 faces and 8 corners

Electromagnetic compatibility: Conducted and radiated interference in compliance with CISPR Publication 11 (1985) and FTZ 526/527/79. Meets MIL-STD 461B, Part 4, with exceptions noted below.

Conducted emissions: CE01 (narrowband), 1 to 15 kHz only; CE03 (narrowband), full limits; CE03 (broadband), 20 dB relaxation from 15 to 100 kHz

Conducted susceptibility: CS01, full limits; CS02, full limits; CS06, full limits

Radiated emissions: RE01, 15 dB relaxation to 28 kHz and excepted from 28 to 50 kHz; RE02, full limits < 1 GHz

Radiated susceptibility: RS01, full limits; RS02, excepted; RS03, limited to 1 V/meter from 14 kHz to 1 GHz with 20 dB relaxation at IF frequencies

Power requirements

115 Vac operation: Voltage 90 to 140 V rms; current 3.2 A rms max; frequency, 47 to 440 Hz

230 Vac operation: Voltage 180 to 250 V rms; current 1.8 A rms max; frequency 47 to 66 Hz

Maximum power dissipation: 180 W

Nominal audible noise: 5.0 Bels power at room temp (ISO DP7779)

Nominal weight

HP 8560A: 18.2 kg (40 lb)

HP 8561B, 8562A and 8563A: 20 kg (44 lb)

Size: 163 mm H \times 325 mm W \times 427 mm D (nominal, without handle, feet, or cover)

Option 002 Built-in Tracking Generator (HP 8560A only)

Frequency

Frequency range: 300 kHz to 2.9 GHz

Tracking drift: Usable in 1 kHz RBW after 5-minute warmup; usable in 300 Hz RBW after 30-minute warmup

Minimum usable RBW: 300 Hz

Amplitude

Output level: -10 to $+1$ dBm

Resolution: 0.1 dB

Accuracy

Vernier: ± 0.20 dB/dB, ± 0.5 dB max (25° C $\pm 10^\circ$ C)

Absolute: ± 0.75 dB

Level flatness: ± 2.0 dB

Return loss: 10 dB

Dynamic range: 96 dB at 300 kHz to 1 MHz; 116 dB at 1 MHz to 2.7 GHz; 111 dB at 2.7 to 2.9 GHz

Power sweep: 10 dB range, 0.1 dB resolution

Input/output

RF output (front panel): type N (female), 50 ohm nominal

Ext ALC input (rear panel): BNC (female); use with negative detector

Ordering Information

	Price
HP 8560A RF Spectrum Analyzer	\$24,995
HP 8561B RF Spectrum Analyzer	\$31,000
HP 8562A Microwave Spectrum Analyzer	\$38,995
HP 8563A Microwave Spectrum Analyzer	\$35,600

Options

Opt 001 Second IF Output (standard on HP 8563A)	+ \$850
Opt 002 Built-in Tracking Generator (HP 8560A only)	+ \$6,400
Opt 003 Precision Frequency Reference (standard on HP 8563A)	+ \$2,400
Opt 026 Extended Frequency Coverage to 26.5 GHz (HP 8562A)	+ \$3,500
Opt T01 TEMPEST-compliant (HP 8562A only)	
Opt 908 Rack Mount Kit Without Handles	+ \$400
Opt 909 Rack Mount Kit With Handles	+ \$450
Opt 915 Add Service Manuals	+ \$425
Opt W30 Extended Repair Service (See page 671)	
For HP 8560A	+ \$625
For HP 8561B	+ \$735
For HP 8562A	+ \$835
For HP 8563A	+ \$1,050
Opt W32 Calibration Service (See page 671)	
For HP 8560A	+ \$835
For HP 8561B	+ \$930
For HP 8562A	+ \$1,050
For HP 8563A	+ \$1,195

HP 41800A Active Probe

HP 85024A High-Frequency Probe

HP 85620A Mass Memory Module

Opt T01 TEMPEST-Compliant

HP 85629B Test and Adjustment Module

HP 85640A Tracking Generator

HP 85644A Tracking Source

HP 85645A Tracking Source

HP 85700A 32-Kbyte RAM Memory Card

HP 85710A Digital Radio Measurement Personality

HP 85901A Portable AC Power Source

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