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SIGNAL ANALYZERS

Spectrum Analyzers, High-performance Portable

HP 8560 Series

- Synthesized tuning
- Frequency counter
- Digital bandwidths
- AM/FM demodulator
- MIL-T-28800C rugged
- Optional precision frequency reference, tracking generator, mass memory, more
- One-year calibration cycle



HP 8563A

NEW

DESIGNED FOR HP-IB SYSTEMS

Supported by HP ITG Software

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* extends from 50 Hz to 6.5 GHz. For higher, preselected frequency coverage, the HP 8562A and 8563A* operate from 9 kHz to 22 GHz or to 26.5 GHz with option 026. Using HP 11974A series millimeter mixers, preselected coverage reaches 75 GHz, and with other mixers, unpreselected coverage can be extended to 325 GHz. (See page 187 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 five minutes. They fully meet specifications in temperatures from −10 degrees to +55 degrees C. They 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-, 30-, and 100-Hz resolution bandwidths. These bandwidths allow the analyzers to sweep up to 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 150 Hz at 1 GHz after a 15 minute warmup (1 year aging).

Specified Pulse Response

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

Accessories

A number of accessories increase the power and performance of the HP 8560 series spectrum analyzers.

- The HP 85640A portable tracking generator and the built-in tracking generator for the HP 8560A add component-test capability to 2.9 GHz.
- The HP 85620A mass memory module adds extra memory and controller capability.
- The HP 85710A digital radio measurement personality customizes the spectrum analyzer for digital radio measurements.

For details on these options, see page 183.

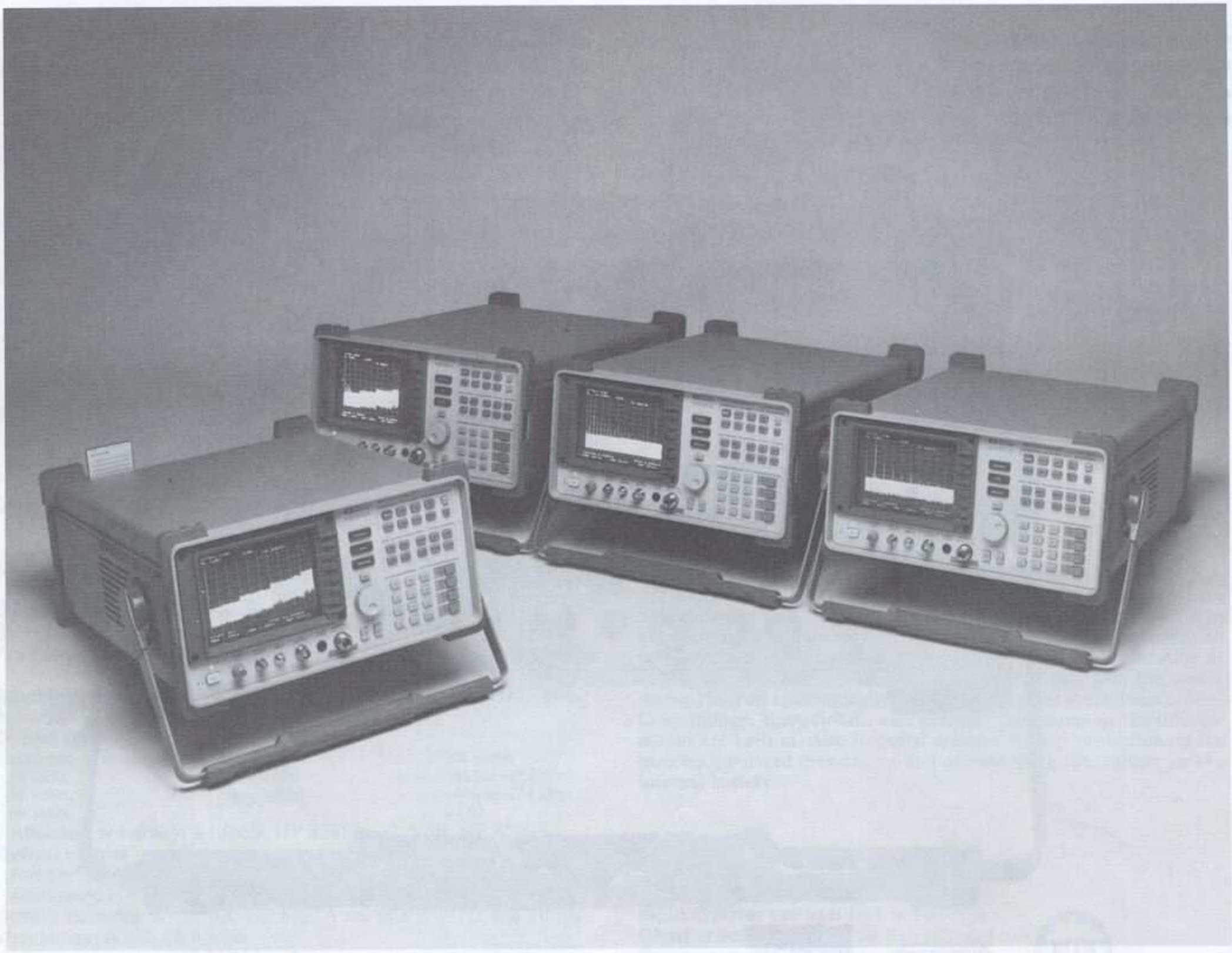
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SIGNAL ANALYZERS

Spectrum Analyzers, High-performance Portable

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



DESIGNED FOR HP-IB SYSTEMS

Supported by HP ITG Software

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 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. Hardcopies of results are easily obtained using the analyzers' direct print and plot functions or by using a computer.

Scalar measurement capability is available by adding an optional built-in tracking generator to the HP 8560A or by using the HP 85640A portable tracking generator 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 millimeter mixers. For very precise measurements, consider an optional precision frequency reference. It gives frequency accuracy of 150 Hz at 1 GHz. See page 183 for more information on options and accessories.

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 new HP 8563A have standard, preselected frequency ranges of 9 kHz to 22 GHz that 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 11970A series mixers and to 325 GHz using mixers from other manufacturers. (See page 187 for more information on HP millimeter mixers.)

The HP 8562A has sensitivity of −110 dBm. The HP 8563A has sensitivity of −120 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 stamping traces and other output data. (These features can be added to the HP 8562A with the mass memory module accessory.) Enhance the capabilities of both the HP 8562A and the 8563A with any of the accessories described on page 183.

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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 (option 026)

HP 8563A: 9 kHz to 22 GHz; 9 kHz to 26.5 GHz (option 026)

Harmonic mode (n)	Center frequency
1	9 kHz - 2.9 GHz
1	2.75 GHz - 6.46 GHz
2	5.86 GHz - 13.0 GHz
3	12.4 GHz - 19.7 GHz
4	19.1 GHz - 22 GHz
4	19 GHz - 26.5 GHz (opt 026)

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

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

Marker counter accuracy (S/N ≥ 25 dB): ±(marker freq x freq ref acc'y + 50 Hz x n + 1 LSD)

Delta counter accuracy (S/N ≥ 25 dB): ±(delta freq x freq ref acc'y + 100 Hz x n + 2 LSD)

Frequency reference accuracy (after 5-min warmup)

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

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

Residual FM (zero span)

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

HP 8562A: < 50 Hz x n p-p in 100 ms (<2 Hz x N p-p w/opt 003)

HP 8563A: <2 Hz x N p-p

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 x N to 19.25/23.75 GHz (opt 026)

HP 8563A: 0 Hz, 100 Hz x N to 19.25/23.75 GHz (opt 026)

Accuracy: <±5%

Resolution bandwidth (−3 dB)

Range

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

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

Accuracy

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

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

Selectivity (−60 dB/−3 dB)

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

HP 8562A: < 15:1

Video bandwidth

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

Amplitude Range

Amplitude range: +30 dBm to displayed average noise level

Maximum safe input

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

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

dc Volts

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Display range

Display: 10 x 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 μVolts to 7.07 Volts 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 - 2.9 GHz	–130 dBm	–130 dBm	–120 dBm	–130
2.75 GHz - 6.46 GHz		–131 dBm	–121 dBm	–131
5.86 GHz - 13.0 GHz			–110 dBm	–120
12.4 GHz - 19.7 GHz			–105 dBm	–115
19.1 GHz - 22.0 GHz			–100 dBm	–110

1 dB gain compression: −5 dBm at input mixer (10 MHz - 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 - 10 MHz	–40 dBm	–60 dBc	–60 dBc	
10 MHz - 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 - 10 MHz (HP 8560A and 8561B); −70 dBc, 10 MHz - 2.9 GHz; −75 dBc, > 2.75 GHz (HP 8561B, 8562A, 8563A)

Image, multiple, and out-of-band responses: < −70 dBc, 10 MHz - 22 GHz; < −60 dBc, 10 MHz - 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 - 2.9 GHz); ±1.5 dB (dc-coupled, 2.75 - 6.5 GHz)

HP 8562A/8563A

Frequency Range	HP 8562A/8563A
9 kHz - 2.9 GHz	±1.0 dB
2.75 - 6.46 GHz	±1.5 dB
5.86 - 13.0 GHz	±2.0 dB
12.4 - 19.7 GHz	±3.0 dB
19.1 - 22.0 GHz	±3.0 dB
19.1 - 26.5 GHz (opt 026)	±3.0 dB

SIGNAL ANALYZERS

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

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

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 - 90 dB range; linear, ±3% of reference level
Input attenuator switching accuracy (with 20 - 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/sweeptime)
- **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 μs 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 - 6.8107 GHz; amplitude +16.5 dBm ±2 dB (20° - 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, PP1, PC1, 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° C, operating; −62° to +85° 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/square foot
- **Vibration:** 0.059 inch p-p excursion (5 - 15 Hz); 0.039 inch p-p excursion (15 - 25 Hz); 0.020 inch p-p excursion (25 - 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 - 15 kHz only; CE03 (narrowband), full limits; CE03 (broadband), 20 dB relaxation from 15 - 100 kHz
  - **Conducted susceptibility:** CS01, full limits; CS02, full limits; CS06, full limits
  - **Radiated emissions:** RE01, 15 db relaxation to 28 kHz and ex- [illegible] RE02, full limits < 1 GHz
  - **Radiated susceptibility:** RS01, full limits; RS02, exceptioned; RS03, limited to 1 V/meter from 14 kHz - 1 GHz with 20 dB relaxation at IF frequencies

Power requirements
- **115 Vac operation:** voltage 90 - 140 V rms; current 3.2 A rms Max; frequency, 47 - 440 Hz
- **230 Vac operation:** voltage 180 - 250 V rms; current 1.8 A rms Max; frequency 47 - 66 Hz

Maximum power dissipation: 180 Watts
Nominal audible noise: 5.0 Bels power at room temp (ISO DP7779)
Nominal weight
- **HP 8560A:** 18.2kg (40lb)
- **HP 8561B, 8562A and 8563A:** 20 kg (44 lb)

Size: 163H x 325W x 427mmD (nominal, without handle, feet, or cover)

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

Frequency
- **Frequency range:** 300 kHz - 2.9 GHz
- **Tracking drift:** useable in 1 kHz RBW after 5-minute warmup; useable in 300 Hz RBW after 30-minute warmup
- **Minimum useable 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 + 10° C)
  - **Absolute:** ±0.75 dB
  - **Level flatness:** ±2.0 dB
  - **Return loss:** 10 dB
- **Dynamic range:** 96 dB at 300 kHz - 1 MHz; 116 dB at 1 MHz - 2.7 GHz; 111 dB at 2.7 - 2.9 GHz

Power sweep: 10 dB range, 0.1 dB resolution

Input/output
- **RF output (front panel):** type-N, 50-ohm nominal
- **Ext ALC input (rear panel):** BNC female; use with negative detector

Ordering Information	Price
HP 8560A RF spectrum analyzer	$24,695
HP 8561B RF spectrum analyzer	$29,795
HP 8562A microwave spectrum analyzer	$37,200
HP 8563A microwave spectrum analyzer	$43,500
Options	
Opt 001 second IF output	+$850
Opt 002 built-in tracking generator (HP 8560A only)	+$6,140
Opt 003 precision frequency reference	+$2,050
Opt 026 extended frequency coverage to 26.5 GHz (HP 8562A and 8563A)	+$3,280
Opt T01 TEMPEST compliant (HP 8562A only)	
Opt 908 rackmount kit without handles	+$400
Opt 909 rackmount kit with handles	+$450
Opt 915 support documentation package	+$360
Opt 916 extra quick reference guide (HP 8560A, 8561B and 8563A) or extra pocket operating guide (HP 8562A)	+$25
Opt W30 extended repair service. See page 723.	
for HP 8560A	+$625
for HP 8561B	+$700
for HP 8562A	+$835
for HP 8563A	$1,050
Opt W32 calibration service. See page 723.	
for HP 8560A	+$965
for HP 8561B	+$1,355
for HP 8562A	+$1,230
for HP 8563A	$1,415
HP 85620A mass memory module	$2,055
Opt T01 TEMPEST compliant	
HP 85629B test and adjustment module	$2,055
HP 85640A tracking generator	$7,675
HP 85700A 32 Kbyte RAM memory card	$100
HP 85710A digital radio measurement personality	$770
HP 85901A portable ac power source	$1,120

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