SIGNAL ANALYZERS
Spectrum Analyzers, Performance Portable
HP 8591A, 8593A, 8594A, 8595A

HP 8594A and 8595A Spectrum Analyzers
These new models offer expanded frequency ranges with the same frequency accuracy and variety of options associated with the HP 8591A. The HP 8594A has a frequency range of 9 kHz to 2.9 GHz and an amplitude range of -112 to +30 dBm. The HP 8595A has a frequency range of 9 kHz to 6.5 GHz with an amplitude range of -114 to +30 dBm. (For general export, both analyzers offer option 1BH, which does not display spans wider than 2.3 GHz.) Both instruments have an optional 2.9 GHz built-in tracking generator. In addition, each comes standard with a memory-card reader that enables you to load HP's custom measurement personalities, your own programs, or measurement data into the spectrum analyzer using 32K-byte memory cards.

HP 8591A and 8593A Spectrum Analyzers
These portable spectrum analyzers offer frequency accuracy and a wide range of options for applications that demand higher performance. The HP 8591A has a frequency range of 9 kHz to 1.8 GHz and amplitude range of -115 to +30 dBm. The HP 8593A has a frequency range of 9 kHz to 22 GHz or 26.5 GHz with option 026, an internal preselector, and an amplitude range of -114 to +30 dBm. (For general export, the HP 8593A option 1BH does not tune above 18 GHz nor span greater than 2.3 GHz.) Both instruments have standard 7.5 ppm frequency accuracy that can be improved with an optional precision frequency reference to marker count accuracy of ±230 Hz at 1 GHz or ±0.3 kHz at 18 GHz.

Standard Features
These performance analyzers share the same ease-of-use features found in the lower-cost HP 8590B and 8592B. (See page 174.) In addition, each performance portable comes with a built-in memory card reader that enables you to load HP's custom measurement personalities (see page 173) and measurement data into the spectrum analyzer using 32K-byte memory cards. A catalog function allows you to determine the exact content of information stored on your memory cards or within internal memory.

Option Flexibility
For easy installation of a growing variety of options, a card cage for circuit cards has been designed in each performance portable spectrum analyzer. All card options are retrofittable, so the options you need are always available. Circuit-card options include:
- AM/FM demodulator speaker to let you view and hear the signal
- TV sync trigger to let you select any line of the TV field for measurement
- Fast time-domain sweep to allow zero-span sweep rates to 20 μs
- Quasi-peak detector for EMC measurements

HP 8591A Specifications
General
Temperature: 0° to +55° C operating; -40° to +75° C storage
EMI compatibility: CISPR Pub. 11 and FTZ 526/527/79
Audible noise: <37.5 dBA pressure and <5.0 Bels power (ISO5777)
Power requirements: 86 to 127 or 195 to 250 Vrms, 47 to 66 Hz. 103 to 126 Vrms, 400 Hz ±10%
Power consumption: <300 VA; <100 watts
Frequency
Range: 9 kHz to 1.8 GHz (50 Ω); 1 MHz to 1.8 GHz (75 Ω, opt. 001)
Reference
Aging: ±2 x 10⁻⁶ /year
Settability: ±0.5 x 10⁻⁶
Precision frequency reference (option 004)
Aging: ±1 x 10⁻⁷ /year
Settability: ±1 x 10⁻⁶
Temperature stability:

Frequency
Frequency readout accuracy (start, stop, center, frequency)
Span ≤10 MHz: ±(freq readout x freq ref error + 3% of span + 20% of RBW + 100 Hz)
Span >10 MHz: ±(freq readout x freq ref error + 3% of span + 20% of RBW)
Marker count accuracy (signal to noise ratio ≥25 dB, RBW/span ≥0.01)
Frequency span ≤10 MHz: ±(marker freq x freq ref error + counter res + 100 Hz)
Frequency span >10 MHz: ±(marker freq x freq ref error + counter res + 1 kHz)
Counter resolution: selectable from 10 Hz to 100 kHz
Frequency span
Range: 0 Hz (zero span), 10 kHz to 1.8 GHz
Accuracy: ±2% of span, span ≤10 MHz, ±3% of span, span >10 MHz
Sweep time
Range: 20 ms to 100 s, span = 0 Hz or >10 kHz; 20 μs to 100 s, span = 0 Hz (option 101)
Accuracy: ±3%, 20 ms to 100 s; ±2% 20 μs to <20 ms (opt 101)
Sweep trigger: free run, single, line, video, external
Stability
Noise sidebands: ≤90 dBc/Hz at ≥10 kHz offset from CW signal (1 kHz RBW, 30 Hz VBW, sample detector); ≤100 dBc/Hz at ≥30 kHz offset from CW signal (1 kHz RBW, 30 Hz VBW, sample detector)
Residual FM: <250 Hz p-p in 100 ms (1 kHz RBW, 1 kHz VBW)
System-related sidebands: ≤−65 dBc at >30 kHz offset from CW
**HP 8591A Specifications (continued)**

**Amplitude**
- **Amplitude range:** 
  - $-115$ to $+30$ dBm (50 ohm); $-63$ to $+75$ dBmV
  - (75 ohm, opt 001)
- **Maximum safe input:**
  - 50 ohm: $+30$ dBm (1 watt)
  - 75 ohm: $+30$ dBm (0.4 watts)
  - 100 ohm: $+30$ dBm (1 watt)
- **Gain compression, > 10 MHz:** $0.5$ dB, total power at input mixer $= -10$ dBm
- **Displayed average noise level:** $-115$ to $-113$ dBm

**Noise level**
- **Spurious responses**
  - **Second harmonic distortion:** 5 MHz to 1.8 GHz, $< -70$ dBc for $-45$ dBm tone at input mixer
  - **Third-order intermodulation distortion:** 5 MHz to 1.8 GHz, $< -70$ dBc for two $-30$ dBm tones at input mixer and $> 50$ kHz separation
  - **Other input-related spurious:** $< -65$ dBc for $> 30$ kHz offset from CW signal
- **Residual responses (input terminated and 0 dB attenuation):**
  - 150 kHz to 1 MHz: $<$ -90 dBm, 50 ohm
  - 1 MHz to 1.8 GHz: $<$ -90 dBm, 50 ohm
- **Display range**
  - **Log scale:** 0 to $-70$ dB from ref lev is cal’d; 1 to 20 dB/div in 1 dB steps; 8 divisions displayed
  - **Linear scale:** 8 divisions
- **Scale units:** dBm, dBmV, dBmicroV, volts, watts
- **Marker readout resolution:** 0.05 dB, log scale; 0.07% of ref level, linear scale
- **Fast sweep times for zero span (opt 101):** 20 µs to 20 ms, 0.7% of ref level for linear scale

**Reference level**
- **Range:** $-115$ to $+30$ dBm (50 ohm), $-63$ to $+75$ dBmV (75 ohm)
- **Resolution:** 0.01 dB for log scale; 0.12% of ref level for linear scale
- **Accuracy, referred to $-20$ dBm ref level:**
  - 0 dBm to $-59.9$ dBm: $a(0.5$ dB + input atten acc @ 50 MHz); $-60$ dBm to $-115$ dBm: $a(1.25$ dB + input atten acc @ 50 MHz)
- **Frequency response**
  - **Absolute:** 1.5 dB, referred to 300 MHz CAL OUT
  - **Relative flatness:** $+1.0$ dB, referred to midpoint between highest and lowest response deviations

**Calibrator output**
- **Frequency:** 300 MHz, $a(300$ MHz x freq ref error)
- **Amplitude:** $-20$ dBm, $a(28.75$ dBmV $a(0.4$ dB (50 Ω)

**Input attenuator**
- **Range:** 0 to 60 dB in 10 dB steps
- **Accuracy at 50 MHz, 10 dB attenuation:** $a(0.5$ dB, 0 to 50 dB; $a(0.75$ dB, 60 dB

**Resolution Bandwidth:** 1 kHz to 3 MHz, $a(20$% Switching uncertainty, ref to 3 kHz bandwidth: 3 kHz to 3 MHz
- **RBW:** $0.4$ dB, 1 kHz, $a(0.5$ dB
- **Video bandwidth range:** 30 Hz to 1 MHz
- **Log to linear switching:** $a(0.25$ dB at reference level

**Display scale fidelity**
- **Log incremental accuracy:** $a(0.2$ dB/2 dB, 0 to $-70$ dB from ref lev
- **Log maximum cumulative:** $a(0.75$ dB, 0 to $-60$ dB from ref lev
- **Linear accuracy:** $a(3$% of reference level

**HP 8593A Specifications**

**Frequency**
- **Frequency range:** 9 kHz to 22 GHz; 9 kHz to 26.5 GHz (option 026)
- **Frequency reference**
  - **Aging:** $a(2$ x $10^7$/year
  - **Settability:** $a(5$ x $10^7$
  - **Temperature stability:** $a(5$ x $10^4$
- **Precision frequency reference (Opt 004)**
  - **Aging:** $a(1$ x $10^7$/year
  - **Settability:** $a(1$ x $10^8$
  - **Temperature stability:** $a(1$ x $10^8$

**Frequency readout accuracy:** $a(frequency readout x frequency reference error + 3% of span + 20% of RBW + 100 Hz sweep time) for spans $< 10$ MHz; $a(frequency readout x freq ref error + 3% of span + 20% of RBW) for spans $> 10$ MHz

**Marker count accuracy (signal-to-noise ratio > 25 dB, RBW/span < 0.05):** $a(marker freq x freq ref error + counter res + 100 Hz)$ spans $< 10$ MHz; $a(marker freq x freq ref error + counter res + 1 kHz)$, spans $> 10$ MHz

**Counter resolution:** Selectable from 10 Hz to 100 kHz

**Frequency span**
- **Range:** zero span, (10 x N) kHz to 19.25 GHz, (10 x N) kHz to 23.75 GHz (opt 026)
- **Accuracy:** $a(2$% of span, span $< 10$ MHz; $a(3$% of span, span $> 10$ MHz

**Sweep time**
- **Range:** 20 ms to 100 s, span $= 0$ Hz or $> 10$ kHz; 20 ms to 100 s, span $= 0$ Hz (opt 101)
- **Accuracy:** $a(3$% 20 ms to 100 s; $a(2$%, 20 µs to 20 ms

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

**Stability**
- **Noise sidebands:** $< -95$ dBc/Hz $+ 20$ log N at $> 30$ kHz offset from CW signal
- **Residual FM:** $< (400$ x N) Hz peak-peak in 100 ms (1 kHz RBW, 1 kHz VBW)
- **System-related sidebands:** $< -65$ and $< + 20$ log N at $> 30$ kHz offset from CW signal

**Comb generator:** 100 MHz fundamental freq; $a(0.007$% freq accuracy

**Amplitude**
- **Amplitude range:** $-114$ to $+30$ dBm
- **Maximum safe input level:** +30 dBm (1 W, 7.1 Vrms), 0 Vdc
- **Gain compression:** $< 0.5$ dB (total power at input mixer $= -10$ dBm)

**Displayed average noise level:** $-114$ to $< -92$ dBm

**Spurious responses**
- **Second harmonic distortion:** $< -70$ dBc for $-40$ dBm tone at input mixer
- **Third-order intermodulation distortion:** $< -100$ dBc for $-10$ dBm tone power at input mixer or below displayed av noise lev., $> 2.75$ GHz

**Order-related intermodulation distortion > 10 MHz:** $< -70$ dBc for two $-30$ dBm tones at input mixer and $> 50$ kHz separation

**Other input-related spurious:** $< -70$ dBc for applied freq $< 18$ GHz; $< -60$ dBc for applied freq $< 22$ GHz

**Display range**
- **Log scale:** 0 to $-70$ dB from ref lev is calibrated; 1 to 20 dB/div in 1 dB steps; 8 divisions displayed
- **Linear scale:** 8 divisions

**Scale units:** dBm, dBM, dBmicroV, volts, watts

**Reference level**
- **Range:** $-114$ to $+30$ dBm
- **Resolution:** 0.01 dB for log scale; 0.12% of ref level for linear
- **Accuracy, referred to $-20$ dBm ref level:** $a(0.05$ dB + input atten acc @ 50 MHz); $-60$ dBm to $-114$ dBm: $a(1.25$ dB + input atten acc @ 50 MHz)

**Frequenc response (ref to 300 MHz CAL OUT, preselector peaked)**
- **Absolute:** $a(2.0$ to $a(3.0$ dB
- **Relative flatness:** $a(1.5$ to $a(2.0$ dB

**Calibrator output**
- **Frequency:** 300 MHz $a(30$ kHz
- **Amplitude:** $-20$ dBm $a(0.4$ dB

**Input attenuator**
- **Range:** 0 to 70 dB in 10 dB steps
- **Accuracy at 50 MHz, 10 dB attenuation:** $+0.5$ dB, 0 to 60 dB; $+1.2$ dB, 70 dB

**Resolution Bandwidth:** 1 kHz to 3 MHz, $a(20$% Switching uncertainty, ref to 3 kHz bandwidth: 3 kHz to 3 MHz
- **RBW:** $a(0.4$ dB, 1 kHz, $a(0.5$ dB
- **Video bandwidth range:** 30 Hz to 1 MHz
- **Log to linear switching:** $a(0.25$ dB at reference level

**Display scale fidelity:** $a(0.2$ dB/2 dB, 0 to $-70$ dB from ref lev

**Linear accuracy:** $a(3$% of reference level
SIGNAL ANALYZERS
Spectrum Analyzers, Performance Portable and Accessory
HP 8591A, 8593A, 85901A

HP 8590 series RF spectrum analyzers have built-in tracking generator option

HP 8591A, 8593A Specifications

Option 010 and 011 built-in tracking generators
Specifications apply to both HP 8590B and 8591A.
Frequency range: 50 ohm 75 ohm
-100 kHz to 1.8 GHz -1 MHz to 1.8 GHz
Tracking drift (10 kHz RBW, 30-minute warmup): 1.5 kHz/5 min, nominal

Output power level
Range: 50 ohm 75 ohm
HP 8591A: 0 to -30 dBm -27.2 dBm
HP 8590B: 0 to -15 dBm -27.8 dBm
Resolution
-0.1 dB -0.1 dB
Absolute accuracy: ±1.0 dB, HP 8591A; ±1.5 dB, HP 8590B

Output vernier
Range: HP 8591A, 10 dB; HP 8590B, 15 dB
Accuracy: HP 8591A, ±0.75 dB; HP 8590B, ±1.0 dB
Output flatness: ±1.75 dB, HP 8591A to 300 MHz and 10 dB attenuation; ±1.75 dB 8590B

Output attenuator (HP 8591A only)
Range: 0 to 60 dB
Switching accuracy: ±0.8 dB or 2.5% of attenu setting, whichever greater for max of 1 dB (10 dB attenu setting)
Repeatability: ±0.2 dB, nominal

Dynamic range (difference between max power output and t.g. feedthrough): >80 dB, nominal, 50 ohm; >100 dB, nominal, 75 ohm

Tracking generator feedthrough: <=-106 dBm, 50 ohm;
<=-52.2 dBm, 75 ohm

Output VSWR
0 dB attenuation: 2.5:1
10 dB attenuation (HP 8591A only): 1.6:1

Ordering Information
HP 8591A spectrum analyzer (9 kHz to 1.8 GHz) $12,625
HP 8593A spectrum analyzer (9 kHz to 22 GHz) $24,805
HP 8594A spectrum analyzer (9 kHz to 2.9 GHz) TBD
HP 8595A spectrum analyzer (9 kHz to 6.5 GHz) TBD

Opt 001 75-ohm input (HP 8591A only) $0
Opt 004 precision frequency reference +$2,050
Opt 010 50-ohm built-in tracking generator +$4,500

Ordering information
HP 85901A portable ac power source $1,120

HP 85901 portable ac power source
Extra power cord adapter for HP instruments $17
HP 8120-5230 General-purpose power cord adapters $55
HP 8120-5210 European $55
HP 8120-5211 USA $55
HP 8120-5212 UK $55

For same-day shipment, call HP DIRECT at 800-538-8787.

HP 85901A Portable ac Power Source
This small, easy-to-carry power source gives you ac power where and when you need it. Use it as a standalone battery or connect it to an external 12 Vdc source for even longer operation. As a standalone battery, the ac power source gives you over an hour of operation at 100 Watts continuous load. When the charge gets low, the power source shuts off automatically. It can be recharged in six hours or less. Over-voltage, short-circuit, and overload protection on the inverter output are built in. Also included are over-voltage protection on the inverter input and over-charge and over-discharge protection for the internal battery.

Specifications
Input inverter voltage: 10.8 to 14.5 Vdc
Charger voltage: 90 to 250 Vac auto selected
Frequency: 47 to 66 Hz
Power consumption: 122 VA maximum

Output
Voltage: 135 or 270 Vpeak ±5% rectangular waveform with 25% dead zone (115 or 230 Vrms ±5%)
Frequency: 60 Hz ±0.1%, crystal reference
Max power: 200 watts continuous
Connectors: two CEE22-V type; female
Temperature: 0° to 55°C, operating; -20° to 40° C storage with battery; -40° to 70° C storage without battery
EMI: conducted and radiated VDE 0871 level B

Battery
Type: sealed acid lead
Voltage: 12 Vdc, nominal
Capacity: 17 AMP.HR, nominal
Mechanical (nominal)
Size: 125 H x 337 W x 461 mm D
Weight: net, with battery, 14.2 kg (31.3 lb); without battery, 8.0 kg (17.7 lb); shipping, 16.3 kg (36.0 lb)