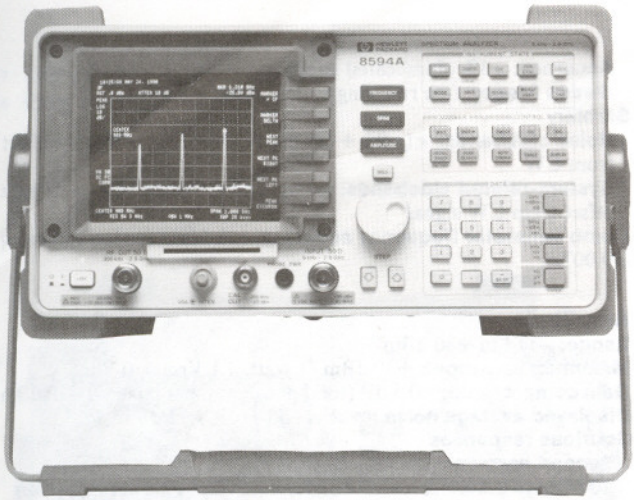
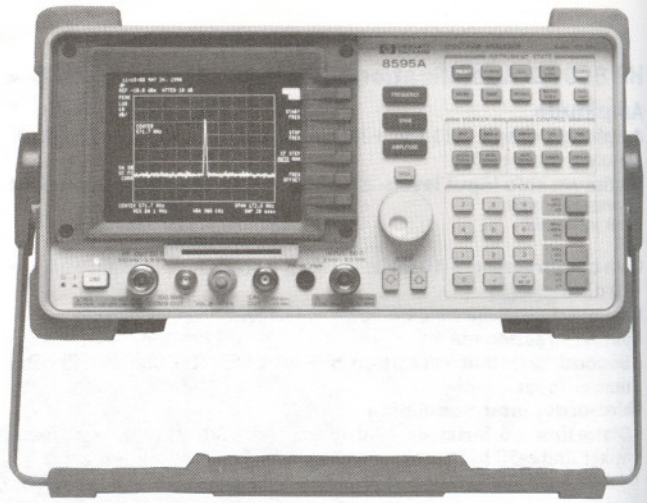
# SIGNAL ANALYZERS

## Spectrum Analyzers, Performance Portable

### HP 8591A, 8593A, 8594A, 8595A




HP 8594A




HP 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 32-Kbyte 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 ±2.3 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 32-Kbyte 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 cardcage 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 (IS0DP7779)
**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:** $\pm 2 \times 10^{-6}$ /year
**Settability:** $\pm 0.5 \times 10^{-6}$
**Precision frequency reference (option 004)**
**Aging:** $\pm 1 \times 10^{-7}$ /year
**Settability:** $\pm 1 \times 10^{-8}$
**Temperature stability:** $\pm 1 \times 10^{-8}$

#### 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 | 75 ohm |
|---|---|---|
| Average cont power | +30 dBm (1 watt) | +75 dBmV (0.4 watts) |
| Peak pulse power | +30 dBm (1 watt) | +75 dBmV (0.4 watts) |
| dc | 25 Vdc | 100 Vdc |

**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 sep
**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; <−38 dBmV, 75 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, ±(0.5 dB + input atten acc @ 50 MHz); −60 dBm to −115 dBm, ±(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 ±(300 MHz x freq ref error)
**Amplitude:** −20 dBm ±0.4 dB (50 Ω); +28.75 dBmV ±0.4 dB (75 Ω, opt 001)
**Input attenuator**
**Range:** 0 to 60 dB in 10 dB steps
**Accuracy at 50 MHz, 10 dB atten:** ±0.5 dB, 0 to 50 dB; ±0.75 dB, 60 dB
**Resolution Bandwidth:** 1 kHz to 3 MHz, ±20%
**Switching uncertainty, ref to 3 kHz bandwidth:** 3 kHz to 3 MHz RBW, ±0.4 dB; 1 kHz, ±0.5 dB
**Video bandwidth range:** 30 Hz to 1 MHz
**Log to linear switching:** ±0.25 dB at reference level
**Display scale fidelity**
**Log incremental accuracy:** ±0.2 dB/2 dB, 0 to −70 dB from ref lev
**Log maximum cumulative:** ±0.75 dB, 0 to −60 dB from ref level; ±1.0 dB, 0 to −70 dB from ref level
**Linear accuracy:** ±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:** $\pm 2 \times 10^{-6}$ /year
**Settability:** $\pm 5 \times 10^{-7}$
**Temperature stability:** $\pm 5 \times 10^{-6}$
**Precision frequency reference (Opt 004)**
**Aging:** $\pm 1 \times 10^{-7}$ /year
**Settability:** $\pm 1 \times 10^{-8}$
**Temperature stability:** $\pm 1 \times 10^{-8}$
**Frequency readout accuracy:** ±(frequency readout x frequency reference error + 3% of span + 20% of RBW + 100 Hz sweep time) for spans ≤10 MHz; ±(freq 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 ≥0.01:** ±(marker freq x freq ref error + counter res + 100 Hz) spans ≤10 MHz; ±(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:** ±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 (opt 101)
**Accuracy:** ±3%, 20 ms to 100 s; ±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 + 20 log N at >30 kHz offset from CW signal
**Comb generator:** 100 MHz fundamental freq; ±0.007% freq accuracy

### Amplitude

**Amplitude range:** −114 to +30 dBm
**Maximum safe input level:** +30 dBm (1 watt, 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, 10 MHz to 2.9 GHz; <−100 dBc for −10 dBm tone power at input mixer or below displayed av noise lev), >2.75 GHz
**Third-order 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, dBmB, dBmicroV, volts, watts
**Reference level**
**Range:** −114 to +30 dBm
**Resolution:** 0.01 dB for log scale; 0.12% of ref lev for linear
**Accuracy (ref to −20 dBm ref level):** ±(0.05 dB + input atten acc @ 50 MHz), 0 dBm to −59.9 dBm; ±(1.25 dB + input atten acc @ 50 MHz), −60 to −114 dBm
**Frequency response (ref to 300 MHz CAL OUT, preselector peaked)**
**Absolute:** ±2.0 to ±3.0 dB
**Relative flatness:** ±1.5 to ±2.0 dB
**Calibrator output**
**Frequency:** 300 MHz ±30 kHz
**Amplitude:** −20 dBm ±0.4 dB
**Input attenuator**
**Range:** 0 to 70 dB in 10 dB steps
**Accuracy at 50 MHz, ref to 10 dB atten:** +0.5 dB, 0 to 60 dB; +1.2 dB, 70 dB
**Resolution bandwidth:** 1 kHz to 3 MHz, ±20%
**Switching uncertainty:** ±0.4 dB, 3 kHz to 3 MHz RBW; ±0.5 dB, 1 kHz
**Video bandwidth range:** 30 Hz to 1 MHz
**Log to linear switching:** +0.25 dB at reference level
**Display scale fidelity:** ±0.2 dB/2 dB, 0 to −70 from ref lev, incremental; ±0.75 dB, 0 to −60 dB from ref lev and ±1.0 dB, 0 to −70 dB from ref lev, maximum cumulative
**Linear accuracy:** ±3% of reference level