

# Signal Analyzers

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## Spectrum Analyzers, Portable

HP 8590  
E-Series  
HP 8590L  
HP 8592L

- Easy-to-use, expandable, portable spectrum analyzers
- Full range of price and performance options
- One-button measurements for FFT, TOI, ACP, and more
- Expanded memory and trace-storage capability
- Optional narrow resolution bandwidths
- New custom measurement personalities

### HP 8590 Series Spectrum Analyzers



The HP 8590 E-Series and 8590 L-Series spectrum analyzers offer a wide range of performance, features, and prices designed to fit your budget. Choose from low-cost, basic performance analyzers or from higher-performance models. Whatever your choice, you'll find HP 8590 series spectrum analyzers easy to use and reliable. Their expandable feature sets allow them to be easily configured to meet your growing measurement needs.

Application measurement personalities customize the analyzer for tasks such as cable TV, EMC, digital cellular radio, RF communication, noise-figure, and scalar network analysis measurements (see page 235). You can also add a variety of printers, plotters, and other accessories.

### One Spectrum Analyzer for Many Applications

You can change the test capabilities of these spectrum analyzers to fit specific measurement needs. A memory card reader enables you to load application measurement personalities. Complex measurement routines are reduced to a keystroke. An option cardcage, unique to the HP 8590 E-series, allows you to add circuit-card options for additional capability. Optional built-in tracking generators provide a synchronously swept signal source for stimulus-response measurements. Operating any HP 8590 series spectrum analyzer requires only minimal training.

### Easy-to-Use Features

Numerous features make it easier to control measurements and to analyze the results. These spectrum analyzers have built-in, automatic calibration to ensure measurement consistency. Frequency panning lets you quickly reposition signals without repeated sweeps. The internal memory allows over 50 traces to be stored, and more can be stored on RAM cards using the memory-card reader. Time and date stamping come standard. Direct output to printer or plotter is available with either the HP-IB/parallel or the RS-232/parallel interface option. Both Hewlett-Packard and selected Epson printers are supported.

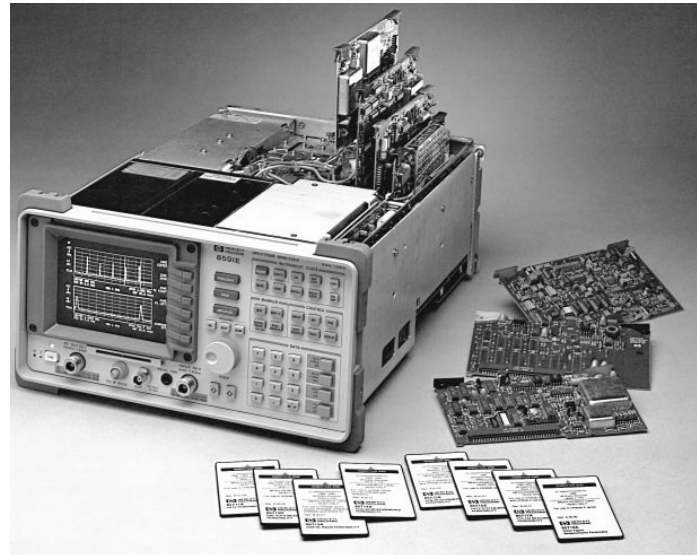
### PC Software for HP 8590 Series NEW

The new HP BenchLink Spectrum Analyzer PC software provides an easy-to-use communications link between your PC and the HP 8590 Series spectrum analyzers. Taking full advantage of the Windows interface, you can easily transfer screen images or trace data via HP-IB or RS-232 interfaces, thereby making it easy to capture, analyze, and document measurement results in a PC environment. For more information, see page 231.

### HP 8591E, 8593E, 8594E, 8595E, and 8596E Spectrum Analyzers

These portable spectrum analyzers bring powerful, comprehensive measurement capabilities to RF, microwave, and digital applications. Five models offer a choice of frequency coverage starting at 9 kHz and extending to 26.5 GHz.

Performance specifications include low phase noise of  $-105$  dBc at 30 kHz offset and frequency-synthesized accuracy of 2.1 kHz at 1 GHz, which can be improved to 210 Hz with an optional precision frequency reference. Second- and third-order dynamic ranges are 77 and 90 dB, respectively. Calibrated amplitude range is  $+30$  to  $-130$  dBm with Option 130, and calibrated onscreen display range is 70 dB. Narrow resolution bandwidths of 30, 100, 200 EMI, and 300 Hz are available on an optional circuit card, which can be added to these analyzers at any time.



HP 8591E with measurement personality and circuit card options

### Standard Features

A window capability divides the display into two horizontal areas, allowing you to zoom in on critical areas of a measurement trace or to display test data and the trace simultaneously. Many one-button measurements are standard, including a marker table, FFT, N dB bandwidths, third-order intercept, percent AM, and adjacent-channel power. A built-in memory card reader allows you to load measurement personalities, your own custom programs, and measurement data on 32-, 128-, 256-, and 512-K memory cards.

### Option Flexibility

A growing number of circuit-card options provides even more measurement capability. Circuit cards are installed easily into a built-in cardcage, and most are retrofittable.

Circuit-card options include:

- Narrow resolution bandwidths of 30, 100, 200 EMI, and 300 Hz
- Time-gated spectrum analysis
- "Analog+" display and fast time-domain sweeps
- AM/FM demodulator
- TV receiver/video tester
- Quasi-peak detector
- Noise-figure measurements
- Demodulators for CT2-CAI and DECT
- Digital demodulators and/or digital signal processing for GSM900, DCS-1800, PCS-1900, NADC-TDMA, PHS, CDMA and PDC wireless communication formats

A built-in 1.8 GHz tracking generator (retrofitable) is available for the HP 8591E, and a 2.9 GHz tracking generator (retrofitable) for the HP 8593E, 8594E, 8595E, and 8596E. The HP 85902A burst carrier trigger provides a TTL timing reference for digital wireless communication measurements. See page 249.

### HP 8590L and 8592L Spectrum Analyzers

These models offer general-purpose RF and microwave measurement performance with frequency accuracy at a low cost. The HP 8590L has a frequency range of 9 kHz to 1.8 GHz, amplitude range of  $-115$  to  $+30$  dBm. The HP 8592L extends the frequency range to 22/26.5 GHz.

- One button measurement solutions
- Save time, money and training
- Customized for your application
- Easy to use



Easy-to-install measurement personalities

### Measurement Personalities

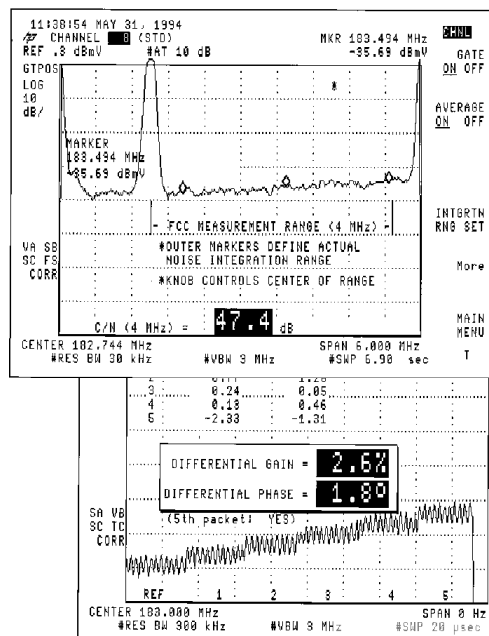
Measurement personalities are software programs provided on ROM-based memory cards. They customize your HP 8590 analyzer to perform complex tests simply and quickly with the push of a button from easy-to-follow screen menus. The personalities automatically set the analyzer controls and perform calculations required by application standards, improving accuracy and repeatability.

### Cable TV and Broadcast

(See page 520 for more information.)

#### HP 85721A Cable TV Measurements and System Monitor Personality

The HP 85721A measurement personality customizes the HP 8591C and 8590 E-series analyzers for easy, noninterfering proof-of-performance measurements on NTSC-, PAL-, or SECAM-format signals. The personality includes the capability to measure power levels for digital carriers. This software adds dedicated cable TV test functions and measurements for channel and system operation. Three video measurements as well as differential gain and phase and chrominance-to-luminance delay inequality can be performed if the spectrum analyzer has Option 107 TV receiver/video tester.



#### HP 85724A Broadcast Measurement Personality

The HP 85724A adds measurements for testing TV broadcast transmitters and relays. It allows selection of PAL-I/B/G, NTSC-M, and SECAM-D/K systems, channel bands CCIR VHF, UHF, S, M & B, FCC-AIR, and PRC, and channel number. Tests include carrier level, chroma level, vision, three-tone intermodulation, depth of modulation, spurious signals, NICAM carrier power and intermodulation, and FE deviation. Three video measurements as well as differential gain and phase, and chrominance-to-luminance delay inequality can be performed if the spectrum analyzer has Option 107 TV receiver/video tester.

#### Lightwave

(See page 429 for more information.)

#### HP 11982A Option 001 Lightwave Converter Personality

The HP 11982A Option 001 personality provides frequency response correction and amplitude conversion of the optical marker for lightwave signals when used with the HP 11982A amplified lightwave converter and an HP 8590 series analyzer.

#### Component Test

(See page 245 for more information.)

#### HP 85714A Scalar Measurement Personality

An HP 85714A measurement personality and HP 8590 series analyzer with optional built-in tracking generator make fast, accurate scalar transmission measurements from 100 kHz to 2.9 GHz. Features include guided calibration, pass/fail limit line testing, 120 dB display, bandwidth, Q factor, and shape factor. The HP 85630A scalar test set adds simultaneous transmission/reflection display.

#### HP 85719A Noise Figure Measurement Personality

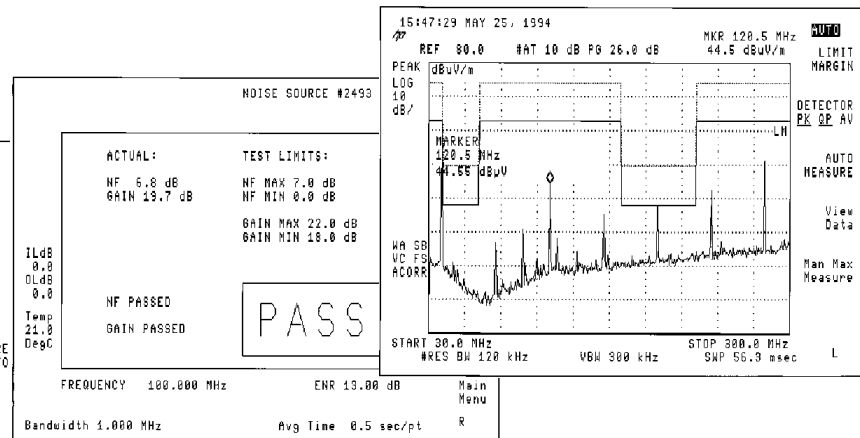
The HP 85719A noise figure measurement personality customizes an HP 8590 Option 119 E-series spectrum analyzer for displayed swept noise figure and gain measurements from 10 MHz to 2.9 GHz.

#### Electromagnetic Compatibility

(See page 324 for more information.)

#### HP 85712D EMC Auto-Measurement Personality

The HP 85712D simplifies precompliance EMI measurements. The spectrum analyzer is set up automatically with the correct limit lines, transducer factor corrections, frequency range, and bandwidths which are supplied on the personality card. It can perform automatic peak, quasi-peak, and average on up to 20 signals at a time and print the results directly, or store them to a RAM card for future viewing.



HP 8590  
E-Series



Wide selection of measurement personalities

## Wireless Communications

(See page 480 for more information.)

### HP 85715B GSM Measurement Personality

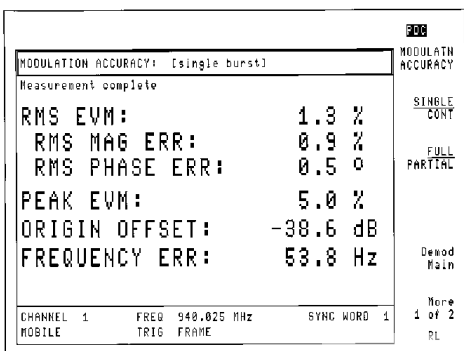
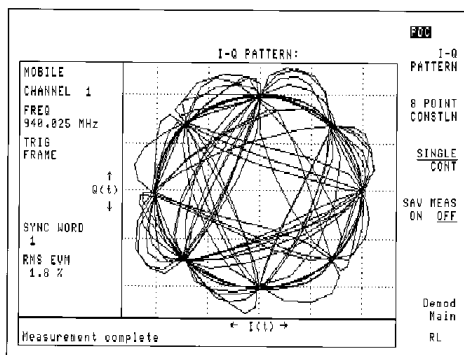
The HP 85715B provides all the GSM900 transmitter tests specified in the GSM 11.10 (mobile) and GSM 11.20 (base) recommendations. Measurements include those for power, frequency, timing, and modulation accuracy. GSM Phase II specification limits are used and the extended GSM (E-GSM) frequency bands are supported.

### HP 85717A CT2-CAI Measurement Personality

The HP 85717A personality provides all transmitter measurements in the MPT 1375 and I-ETS 300-131 specifications for second generation cordless telephone with common air interface. In addition, it has the flexibility to allow you to define your own custom channel tuning plan and band edges as well as spurious parameters. Transmitter tests include: mean carrier power, carrier-off power, adjacent channel power, out-of-band power, spurious emissions, intermodulation attenuation, and frequency error and deviation.

### HP 85718B NADC-TDMA Measurement Personality

Based on EIA/TIA IS-54 and IS-136 standards, the HP 85718B simplifies testing of time-division multiple access (TDMA) transmitters for North American Dual-Mode Cellular (NADC) and PCS IS-136 radio systems. The personality provides nine power, frequency, and timing tests as well as seven modulation accuracy tests.



### HP 85720C PDC Measurement Personality

The HP 85720C provides transmitter measurements for Personal Digital Cellular (PDC) time-division multiple access radio systems. Tests are based on the RCR STD-27C standard. There are 11 power, frequency, and timing tests as well as six modulation accuracy tests.

### HP 85722B DCS1800 Measurement Personality

The HP 85722B provides all the DCS1800 transmitter tests specified in the GSM 11.10 (mobile) and GSM 11.20 (base) recommendations. Measurements include those for power, frequency, timing, and modulation accuracy. Phase II specification limits are used. GSM-based PCS measurements at 1900 MHz may be made using the HP 85722B special Option H19.

### HP 85723A Option H01 DECT Measurement Personality

The HP 85723A Option H01 adds the key DECT transmitter measurements to the HP 8590 E-series analyzers. With the measurement personality, DECT power, frequency, timing, and modulation accuracy tests can be made. An optional DECT source built-in to the analyzer can be used as a stimulus for module testing or sensitivity measurements.

### HP 85725C CDMA Measurement Personality

Simplify your measurements of cellular, PCS, and other spread spectrum transmitters based on EIA/TIA IS-95, -97, -98, and J-STD-008 with the HP 85725C. Frequency- and time-domain measurements are provided. The new C version of this personality adds the adjacent channel power ratio (ACPR) measurement, as well as tuning plans for Japan and Korea. The HP 85725C is designed with a great amount of flexibility, including on-screen help messages, enabling measurements to be easily configured to meet your special needs.

### HP 85726B PHS Measurement Personality

Measure Personal Handy Phone System (PHS) personal and cell station transmitters operate easily, quickly, and reliably. The HP 85726B PHS personality provides tests based on RCR STD-28. Measurements included are antenna power, adjacent channel power, burst ramp-up and ramp-down power versus time, carrier-off time leakage power, spurious emission, occupied bandwidth, and modulation accuracy (EVM).

## Digital Radio Measurements

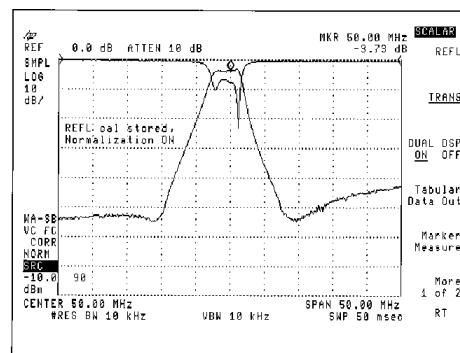
(See page 465 for more information.)

### HP 85713A Digital Radio Measurement Personality

The HP 85713A measurement personality for microwave spectrum analyzers includes five major agency masks for testing to US, UK, and FRG digital radio specifications. Automatic compare-to-mask and mean power level measurements are made on the modulated signal. Functions include transient analysis monitoring and frequency response measurement. You can create and store your own masks for later use. For additional digital radio tests, see the HP 11758V digital radio test system.

### HP 11770A Link Measurement Personality

The HP 11770A enables group delay and amplitude flatness measurements on systems that carry digital data, such as microwave radio systems, coax cable, and satellite links. Capability includes end-to-end link, DADE, and IF return loss measurements.





HP 8591E

### HP 8591E, 8593E, 8594E, 8595E, 8596E

#### Specifications

Specifications apply to any of these analyzers unless otherwise noted.

#### Frequency

##### Frequency Range

###### HP 8591E:

50 Ω: 9 kHz to 1.8 GHz

75 Ω: 1 MHz to 1.8 GHz

**HP 8594E:** 9 kHz to 2.9 GHz, dc-coupled; 100 kHz to 2.9 GHz, ac-coupled

**HP 8595E:** 9 kHz to 6.5 GHz, dc-coupled; 100 kHz to 6.5 GHz, ac-coupled

	Band	LO harmonic = N	Center frequency
HP 8596E	0	1	9 kHz to 2.9 GHz (dc-coupled)
	0	1	100 kHz to 2.9 GHz (ac-coupled)
	1	1	2.75 to 6.5 GHz
	2	2	6.0 to 12.8 GHz
HP 8593E	0	1	9 kHz to 2.9 GHz
	1	1	2.75 to 6.5 GHz
	2	2	6.0 to 12.8 GHz
	3	3	12.4 to 19.4 GHz
	4	4	19.1 to 22 GHz
	4	4 (Option 026/027)	19.1 to 26.5 GHz

##### Frequency Reference

**Aging:**  $\pm 2 \times 10^{-9}$ /year;  $\pm 1 \times 10^{-7}$ /year (Option 004)

**Temperature Stability:**  $\pm 5 \times 10^{-6}$ ;  $\pm 1 \times 10^{-8}$  (Option 004)

**Initial Achievable Accuracy:**  $\pm 0.5 \times 10^{-6}$ ;  $\pm 2.2 \times 10^{-8}$  (Option 004)

##### Frequency Readout Accuracy (start, stop, center, marker):

$\pm$  (freq. readout x freq. ref error + span accuracy + 1% of span + 20% of RBW + 100 Hz x N)

##### Marker Count Accuracy

Span  $\leq 10$  MHz x N:  $\pm$  (marker freq. x freq. ref error + counter resolution + 100 Hz x N)

Span  $> 10$  MHz x N:  $\pm$  (marker freq. x freq. ref error + counter resolution + 1 kHz x N)

##### Counter Resolution

Span  $\leq 10$  MHz x N: Selectable from 10 Hz to 100 kHz

Span  $> 10$  MHz x N: Selectable from 100 Hz to 100 kHz

##### Frequency Span

**Range:** 0 Hz (zero span) and

**HP 8591E:** 10 kHz to 1.8 GHz; 1 kHz min (Option 130)

**HP 8594E:** 10 kHz to 2.9 GHz; 1 kHz min (Option 130)

**HP 8595E:** 10 kHz to 6.5 GHz; 1 kHz min (Option 130)

**HP 8596E:** [10 x N] kHz to 12.8 GHz; [1 x N] kHz min (Option 130)

**HP 8593E:** [10 x N] kHz to 19.25 GHz; [1 x N] kHz min (Option 130)

**Resolution:** Four digits or 20 Hz x N, whichever is greater

##### Accuracy

Span  $\leq 10$  MHz x N:  $\pm 2\%$  of span

Span  $> 10$  MHz x N:  $\pm 3\%$  of span

##### Sweep Time

###### Range

Span = 0 Hz or  $> 1$  kHz: 20 ms to 100 s

Span = 0 Hz (Option 101): 20  $\mu$ s to 100 s

###### Accuracy

20 ms to 100 s:  $\pm 3\%$

20  $\mu$ s to  $< 20$  ms (Option 101):  $\pm 2\%$

**Sweep Trigger:** Free run, single, line, video, external

**Resolution Bandwidth:** 1 kHz to 3 MHz (3 dB) in 1, 3, 10 sequence; 9 kHz and 120 kHz (6 dB) EMI bandwidths. Option 130 adds 30, 100, and 300 Hz (3 dB) bandwidths and 200 Hz (6 dB) EMI bandwidth.

**Accuracy:**  $\pm 20\%$

**Selectivity (characteristic)**

-60 dB/-3 dB: 3 kHz to 10 kHz, 15:1

100 kHz to 3 MHz, 15:1

1 kHz, 30 kHz, 16:1

-40 dB/-3 dB: 30 Hz to 300 Hz, 10:1

**Video Bandwidth Range:** 30 Hz to 1 MHz in 1, 3 sequence

(1 Hz to 1 MHz with Option 130)

##### Stability

**Noise Sidebands** (1 kHz RBW, 30 Hz VBW, sample detector)

$> 10$  kHz offset from CW signal:  $\leq -90$  dBc/Hz + 20 log N

$> 20$  kHz offset from CW signal:  $\leq -100$  dBc/Hz + 20 log N

$> 30$  kHz offset from CW signal:  $\leq -105$  dBc/Hz + 20 log N

##### Residual FM

###### HP 8591E:

1 kHz RBW, 1 kHz VBW:  $\leq 250$  Hz pk-pk in 100 ms

30 Hz RBW, 30 Hz VBW:  $\leq 30$  Hz pk-pk in 300 ms

###### HP 8593E, 8594E, 8595E, 8596E:

1 kHz RBW, 1 kHz VBW:  $\leq (250 \times N)$  Hz pk-pk in 100 ms

30 Hz RBW, 30 Hz VBW:  $\leq (30 \times N)$  Hz pk-pk in 300 ms

**System Related Sidebands** ( $> 30$  kHz offset from CW signal):

$\leq -65$  dBc + 20 log N

**Comb Generator Frequency** (HP 8593E, 8596E): 100 MHz fundamental

frequency;  $\pm 0.007\%$  frequency accuracy

#### Amplitude

**Amplitude Range:** Displayed average noise level to + 30 dBm

**HP 8591 Option 001:** Displayed average noise level to + 72 dBmV

**Maximum Safe Input Level** (input attenuator  $\geq 10$  dB)

**Average Continuous Power:** + 30 dBm (1 W)

**HP 8591E Option 001:** + 72 dBmV (0.2 W)

##### Peak Pulse Power

**HP 8591E:**  $\pm 30$  dBm (1 W)

**HP 8591E Option 001:** + 72 dBmV (0.2 W)

**HP 8593E, 8594E, 8595E, 8596E:** +50 dBm (100 W) for  $< 10$   $\mu$ s

pulse width and  $< 1\%$  duty cycle, input atten.  $\geq 30$  dB

##### DC

**HP 8591E:** 25 Vdc

**HP 8591E Option 001:** 100 Vdc

**HP 8593E:** 0 Vdc

**HP 8594E, 8595E, 8596E:** 0 V (dc-coupled); 50 V (ac-coupled)

**Gain Compression** ( $> 10$  MHz):  $\leq 0.5$  dB (total power at

input mixer = -10 dBm)

**Displayed Average Noise Level** (input terminated, 0 dB atten.,

30 Hz VBW or 1 Hz VBW with Option 130, sample detector)

	30 Hz RBW	1 kHz RBW
<b>HP 8591E</b>		
400 kHz to 1 MHz	$\leq -130$ dBm	$\leq -115$ dBm
1 MHz to 1.5 GHz	$\leq -130$ dBm	$\leq -115$ dBm
1.5 GHz to 1.8 GHz	$\leq -128$ dBm	$\leq -113$ dBm
<b>HP 8591E Option 001</b>		
1 MHz to 1.5 GHz	$\leq -78$ dBmV	$\leq -63$ dBmV
1.5 GHz to 1.8 GHz	$\leq -76$ dBmV	$\leq -61$ dBmV
<b>HP 8594E</b>		
400 kHz to 5 MHz	$\leq -122$ dBm	$\leq -107$ dBm
5 MHz to 2.9 GHz	$\leq -127$ dBm	$\leq -112$ dBm
<b>HP 8595E</b>		
400 kHz to 2.9 GHz	$\leq -125$ dBm	$\leq -110$ dBm
2.75 to 6.5 GHz	$\leq -127$ dBm	$\leq -112$ dBm
<b>HP 8596E</b>		
400 kHz to 2.9 GHz	$\leq -125$ dBm	$\leq -110$ dBm
2.75 to 6.5 GHz	$\leq -127$ dBm	$\leq -112$ dBm
6.0 to 12.8 GHz	$\leq -115$ dBm	$\leq -100$ dBm
<b>HP 8593E</b>		
400 kHz to 2.9 GHz	$\leq -127$ dBm	$\leq -112$ dBm
2.75 to 6.5 GHz	$\leq -129$ dBm	$\leq -114$ dBm
6.0 to 12.8 GHz	$\leq -117$ dBm	$\leq -102$ dBm
12.4 to 19.4 GHz	$\leq -113$ dBm	$\leq -98$ dBm
19.1 to 22 GHz	$\leq -107$ dBm	$\leq -92$ dBm
<b>HP 8593E Option 026/027</b>		
19.1 to 26.5 GHz	$\leq -102$ dBm	$\leq -87$ dBm

HP 8590  
E-Series  
HP 8591E  
HP 8593E  
HP 8594E  
HP 8595E  
HP 8596E

## Specifications (cont'd)

## Spurious Responses

## Second Harmonic Distortion

**HP 8591E** (5 MHz to 1.8 GHz):  $< -70$  dBc for  $-45$  dBm tone at input mixer

**HP 8593E** (10 MHz to 2.9 GHz):  $< -70$  dBc for  $-40$  dBm tone at input mixer

**HP 8594E, 8595E, 8596E** ( $> 10$  MHz):  $< -70$  dBc for  $-40$  dBm tone at input mixer

**HP 8593E, 8595E, 8596E** ( $> 2.75$  GHz):  $< -100$  dBc for  $-10$  dBm tone at input mixer (or below DANL)

## Third-Order Intermodulation

**HP 8591E** (5 MHz to 1.8 GHz):  $< -70$  dBc for two  $-30$  dBm tones at input and  $> 50$  kHz separation

**HP 8593E, 8594E, 8595E, 8596E** ( $> 10$  MHz):  $< -70$  dBc for two  $-30$  dBm tones at input and  $> 50$  kHz separation

**Other Input-Related Spurious** ( $\geq 30$  kHz offset,  $-20$  dBm tone at input mixer)

**HP 8591E, 8594E, 8595E, 8596E**:  $< -65$  dBc

**HP 8593E**:  $< -65$  dBc (applied frequency  $\leq 18$  GHz);  $< -60$  dBc (applied frequency  $\leq 22$  GHz)

## Residual Responses (input terminated, 0 dB attenuation)

**1 MHz to 1.8 GHz** (HP 8591E Option 001):  $< -38$  dBmV

**150 kHz to 1.8 GHz** (HP 8591E):  $< -90$  dBm

**150 kHz to 2.9 GHz** (HP 8594E):  $< -90$  dBm

**150 kHz to 6.5 GHz** (HP 8593E, 8595E, 8596E):  $< -90$  dBm

## Display Range

**Log Scale**: 0 to  $-70$  dB from ref level is calibrated; 0.1, 0.2, 0.5 dB/div and 1 to 20 dB/div in 1 dB steps; 8 div displayed

**Linear Scale**: 8 divisions

**Scale Units**: dBm, dBmV, dB $\mu$ V, V, W

## Marker Readout Resolution

**Log Scale**: 0.05 dB

**Linear Scale**: 0.05% of ref level

**Fast Time Sweep for Zero Span** (Option 101 or 301, 20  $\mu$ s to 20 ms)

$\leq 1$  GHz: 0.7% of ref level for linear scale

$> 1$  GHz: 1.0% of ref level for linear scale

## Reference Level

**Range**: Same as amplitude range

**Resolution**:  $\pm 0.01$  dB for log scale;  $\pm 0.12\%$  of ref level for linear scale

**Accuracy**:  $\pm 0.3$  dB at  $-20$  dBm; 0 to  $-59.9$  dBm:  $\pm (0.3 \text{ dB} + 0.01 \times \text{dB from } -20 \text{ dBm})$

## Frequency Response (10 dB input attenuation)

**Absolute** (referenced to 300 MHz CAL OUT)

**HP 8591E, 8594E**:  $\pm 1.5$  dB

**HP 8595E**:  $\pm 1.5$  to  $\pm 2.0$  dB

**HP 8596E**:  $\pm 1.5$  to  $\pm 2.5$  dB

**HP 8593E**:  $\pm 1.5$  to  $\pm 5.0$  dB (preselector peaked)

**Relative Flatness** (referenced to midpoint between highest and lowest frequency response deviations)

**HP 8591E, 8594E**:  $\pm 1.0$  dB

**HP 8595E**:  $\pm 1.0$  to  $\pm 1.5$  dB

**HP 8596E**:  $\pm 1.0$  to  $\pm 2.0$  dB

**HP 8593E**:  $\pm 1.0$  to  $\pm 2.0$  dB (preselector peaked)

**Calibrator Output Amplitude**:  $-20$  dBm  $\pm 0.4$  dB;  $+28.75$  dBmV  $\pm 0.4$  dB, HP 8591 Option 001

**Resolution Bandwidth Switching Uncertainty** (ref to 3 kHz RBW, at ref level)

**3 kHz to 3 MHz RBW**:  $\pm 0.4$  dB

**1 kHz RBW**:  $\pm 0.5$  dB

**30 Hz to 300 Hz RBW**:  $\pm 0.6$  dB

**Log to Linear Switching**:  $\pm 0.25$  dB at ref level

## Display Scale Fidelity

**Log Incremental Accuracy** (0 to  $-60$  dB from ref level):  $\pm 0.4$  dB/4 dB

**Log Maximum Cumulative** (0 to  $-70$  dB from ref level)

**3 kHz to 3 MHz RBW**:  $\pm (0.3 + 0.01 \times \text{dB from ref level})$

**30 Hz to 1 kHz RBW**:  $\pm (0.4 + 0.01 \times \text{dB from ref level})$

**Linear Accuracy**:  $\pm 3\%$  of ref level

## General Specifications

**MIL-T-28800**: Has been type-tested to the environmental specifications of MIL-T-28800 Class 5

## Temperature

**Operating**:  $0^\circ$  to  $+55^\circ$  C

**Storage**:  $-40^\circ$  to  $+75^\circ$  C

**EMI Compatibility**: Conducted and radiated interference CISPR Pub. 11 and Messempefaenger Postverfuegung 526/527/79

**Audible Noise**:  $< 37.5$  dBA pressure and  $< 5.0$  Bels power (ISODP7779)

## Power Requirements

**On** (line 1): 90 to 132 V rms, 47 to 440 Hz

195 to 250 V rms, 47 to 66 Hz

Power consumption  $< 500$  VA;  $< 180$  W

**Standby** (line 0): Power consumption  $< 7$  W

**User Program Memory** (nominal): 238 KB nonvolatile RAM

## Data Storage (nominal)

**Internal**: 24 traces or 32 states

**External**: 50 traces, 8 states

**Memory Cards**: HP 85700A (32 KB), 24 traces or 32 states;

HP 85702A (128 KB), 99 traces or 128 states

**Video Cassette Recorder** (VCR): Continuous video recording of display supported through composite video output

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

**Weight**: 14.5 kg (HP 8591E); 16.4 kg (HP 8593E, 8594E, 8595E, 8596E)

## Option 010 and 011 Built-In Tracking Generators

Option 010 (50  $\Omega$ ) is available for all HP 8590 series spectrum analyzers except the HP 8592L. Option 011 (75  $\Omega$ ) is available for the HP 8590L and 8591E only.

## Frequency Range

**Option 010**: 100 kHz to 1.8 GHz (HP 8590L, 8591E); 9 kHz to 2.9 GHz (HP 8593E, 8594E, 8595E, 8596E)

**Option 011**: 1 MHz to 1.8 GHz (HP 8590L, 8591E)

## Output Level

## Range

**Option 010**: 0 to  $-15$  dBm (HP 8590L); 0 to  $-70$  dBm (HP 8591E);

$-1$  to  $-66$  dBm (HP 8593E, 8594E, 8595E, 8596E)

**Option 011**:  $+42.8$  to  $+27.8$  dBmV (HP 8590L);

$+42.8$  to  $-27.2$  dBmV (HP 8591E)

**Resolution**: 0.1 dB

**Absolute Accuracy**:  $\pm 1.5$  dB (HP 8590L);  $\pm 1.0$  dB (HP 8591E);

$\pm 0.75$  dB (HP 8593E, 8594E, 8595E, 8596E)

## Vernier

**Range**: 15 dB (HP 8590L); 10 dB (HP 8591E);

9 dB (HP 8593E, 8594E, 8595E, 8596E)

**Accuracy**:  $\pm 1.0$  dB (HP 8590L);  $\pm 0.75$  dB (HP 8591E);

$\pm 0.5$  dB (HP 8593E, 8594E, 8595E, 8596E)

**Output Flatness**:  $\pm 1.75$  dB (HP 8590L, 8591E);  $\pm 2.0$  dB,  $> 10$  MHz (HP 8593E, 8594E, 8595E, 8596E)

## Spurious Output

**Harmonic Spurs**: 0 dBm + 42.8 dBmV output,  $< -25$  dBc (HP 8590L, HP 8591E);  $-1$  dBm output,  $< -25$  dBc (HP 8593E, 8594E, 8595E, 8596E)

**Nonharmonic Spurs**:  $< -30$  dBc (HP 8590L, 8591E);  $\leq -27$  dBc, 300 kHz to 2.0 GHz,  $\leq -23$  dBc, 2.0 GHz to 2.9 GHz (HP 8593E, 8594E, 8595E, 8596E)

**Dynamic Range** (characteristic; max. output level  $-TG$  feedthrough)

**Option 010**: 106 dB (HP 8590L, 8591E); 106 dB (HP 8594E,  $> 400$  kHz);

109 dB (HP 8595E, 8596E,  $> 400$  kHz); 111 dB (HP 8593E,  $> 400$  kHz)

**Option 011**: 100 dB

## Power Sweep

## Range

**Option 010**:  $-15$  dBm to 0 dBm (HP 8590L);  $-75$  dBm to 0 dBm

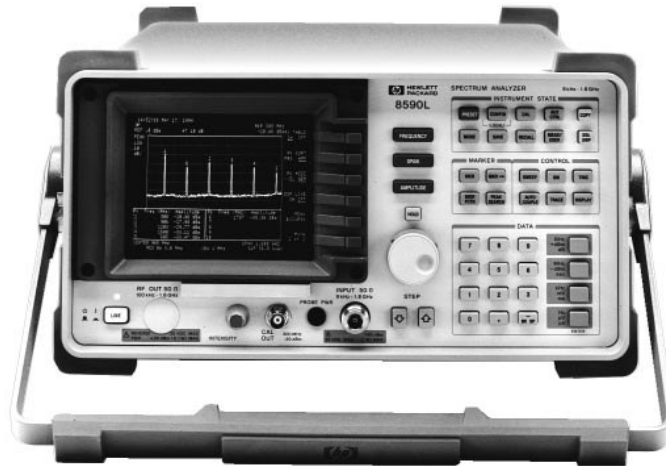
(HP 8591E);  $-66$  dBm to  $-1$  dBm in 8 dB increments (HP 8593E, 8594E, 8595E, 8596E)

**Option 011**:  $+27.8$  dBmV to  $+42.8$  dBmV (HP 8590L);

$-32.2$  to  $+42.8$  dBmV (HP 8591E)

**Resolution**: 0.1 dB

- Low-cost general purpose spectrum analysis with frequency accuracy



### HP 8590L and 8592L Specifications

Specifications apply to either analyzer unless otherwise noted.

#### Frequency

##### Frequency Range

###### HP 8590L:

50  $\Omega$ : 9 kHz to 1.8 GHz

75  $\Omega$  (Option 001): 1 MHz to 1.8 GHz

HP 8592L: 9 kHz to 22 GHz

HP 8592L (Option 026/027): 9 kHz to 26.5 GHz

Band	LO harmonic=N	Center frequency
0	1	9 kHz to 2.9 GHz
1	1	2.75 to 6.5 GHz
2	2	6.0 to 12.8 GHz
3	3	12.4 to 19.4 GHz
4	4	19.1 to 22.0 GHz
4	4 (Option 026/027)	19.1 to 26.5 GHz

##### Frequency Reference

**Aging:**  $\pm 2 \times 10^{-6}$ /year

**Temperature Stability:**  $\pm 5 \times 10^{-6}$

**Initial Achievable Accuracy:**  $\pm 0.5 \times 10^{-6}$

##### Frequency Readout Accuracy (start, stop, center, marker):

$\pm$  (freq. readout x freq. ref. error + span accuracy + 1% of span + 20% of RBW + 100 Hz x N)

##### Marker Count Accuracy

Span  $\leq 10$  MHz x N:  $\pm$  (marker freq. x freq. ref. error + counter resolution + 100 Hz x N)

Span  $> 10$  MHz x N:  $\pm$  (marker freq. x freq. ref. error + counter resolution + 1 kHz x N)

##### Counter Resolution

Span  $\leq 10$  MHz x N, selectable from 10 Hz to 100 kHz

Span  $> 10$  MHz x N, selectable from 100 Hz to 100 kHz

##### Frequency Span

###### Range

HP 8590L: 0 Hz (zero span), 10 kHz to 1.8 GHz

HP 8592L: 0 Hz (zero span), [50 kHz x N] to 19.25 GHz

**Resolution:** Four digits

###### Accuracy:

HP 8590L:  $\pm 3\%$  of span

HP 8592L: Span  $\leq 10$  MHz x N:  $\pm 2\%$  of span; span  $> 10$  MHz x N:  $\pm 3\%$  of span

##### Sweep Time

**Range:** 20 ms to 100 s

**Accuracy:**  $\pm 3\%$

**Sweep Trigger:** Free run, single, line, video, external

##### Resolution Bandwidth (characteristic): 1 kHz to 3 MHz (3 dB) in

1, 3, 10 sequence, 9 kHz and 120 kHz (6 dB) EMI bandwidths

**Accuracy:**  $\pm 20\%$

##### Video Bandwidth Range: 30 Hz to 1 MHz in 1, 3, 10 sequence

**Stability** (same as for HP 8590E series)

**Noise Sidebands** (1 kHz RBW, 30 Hz VBW and sample detector):

$\leq -105$  dBc/Hz + 20 log N at  $> 30$  kHz offset from CW signal

**System-Related Sidebands:**  $\leq -65$  dBc + 20 log N at  $> 30$  kHz offset from CW signal

**Comb Generator Frequency** (HP 8592L): 100 MHz fundamental frequency  
**Accuracy:**  $\pm 0.007\%$

HP 8590  
L-Series

#### Amplitude

##### Amplitude Range

HP 8590L, 8592L: Displayed average noise level to +30 dBm

HP 8590L Option 001: Displayed average noise level to +75 dBmV

**Maximum Safe Input Level** (input attenuator  $\geq 10$  dB)

##### Average Continuous Power

HP 8590L, 8592L: +30 dBm (1 W)

HP 8590L Option 001: +75 dBmV (0.4 W)

##### Peak Pulse Power

HP 8590L: +30 dBm (1 W); +75 dBmV (0.4 W) (Option 001)

HP 8592L: +50 dBm (100 W) for  $< 10$   $\mu$ s pulse width and  $< 1\%$  duty cycle, input atten.  $\geq 30$  dB

##### DC

HP 8590L: 25 Vdc; 100 Vdc (Option 001)

HP 8592L: 0 Vdc

**Gain Compression** ( $> 10$  MHz):  $\leq 0.5$  dB (total power at input mixer =  $-10$  dBm)

**Displayed Average Noise Level** (input terminated, 0 dB atten., 1 kHz RBW, 30 Hz VBW, sample detector)

HP 8590L:  $\leq -115$  to  $\leq -113$  dBm;  $\leq -63$  to  $\leq -61$  dBmV (Option 001)

HP 8592L:  $\leq -112$  to  $\leq -92$  dBm;  $\leq -112$  to  $\leq -87$  dBm (Option 026)

##### Spurious Responses

###### Second Harmonic Distortion

HP 8590L: ( $> 5$  MHz)  $< -70$  dBc for  $-45$  dBm tone at input mixer

HP 8592L (10 MHz to 2.9 GHz):  $< -70$  dBc for  $-40$  dBm tone at input mixer;  $> 2.75$  GHz:  $< -100$  dBc for  $-10$  dBm tone at input mixer (or below DANL)

###### Third-Order Intermodulation Distortion

###### HP 8590L

Distortion  $> 5$  MHz:  $< -70$  dBc for two  $-30$  dBm tones at input mixer and  $> 50$  kHz separation  
Other Input-Related:  $< -65$  dBc at  $\geq 30$  kHz offset, for  $-20$  dBm tone at input mixer

###### HP 8592L

Distortion  $> 10$  MHz:  $< -70$  dBc for two  $-30$  dBm tones at input mixer and  $> 50$  kHz separation  
Other Input-Related:  $< -65$  dBc at  $\geq 30$  kHz offset, for  $-20$  dBm tone at input mixer,  $\leq 18$  GHz;  $< -60$  dBc for  $-20$  dBm tone at input mixer,  $\leq 22$  GHz

##### Display Range

**Log Scale:** 0 to  $-70$  dB from ref. level is calibrated; 0.1, 0.2, 0.5 dB/div. and 1 to 20 dB/div. in 1 dB steps; 8 div. displayed

**Linear Scale:** 8 divisions

**Scale Units:** dBm, dBmV, dB $\mu$ V, V, W

**Marker Readout Resolution:** 0.05 dB for log scale; 0.05% of reference level for linear

##### Reference Level

**Range:** Same as amplitude range

**Resolution:** 0.01 dB for log scale; 0.12% of ref. level for linear

**Accuracy:**  $\pm 0.3$  dB @  $-20$  dBm; 0 dBm to  $-59.9$  dBm:  $\pm (0.3$  dB +  $0.01$  x dB from  $-20$  dBm)

##### Frequency Response (10 dB input attenuation)

**Absolute** (referenced to 300 MHz CAL OUT)

HP 8590L:  $\pm 1.5$  dB

HP 8592L (preselector peaked in band  $> 0$ ):  $\pm 1.5$  to  $\pm 5.0$  dB

**Relative:** Referred to midpoint between highest and lowest frequency response deviations

HP 8590L:  $\pm 1.0$  dB

HP 8592L (preselector peaked in band  $> 0$ ):  $\pm 1.0$  to  $\pm 2.0$  dB

##### Calibrator Output Amplitude: $-20$ dBm $\pm 0.4$ dB;

HP 8590L Option 001: +28.75 dBmV  $\pm 0.4$  dB

##### Resolution Bandwidth Switching Uncertainty (ref. to 3 kHz RBW,

at ref. level):  $\pm 0.4$  dB for 3 kHz to 3 MHz RBW;  $\pm 0.5$  dB for 1 kHz

**Log to Linear Switching:**  $\pm 0.25$  dB at ref. level

##### Display Scale Fidelity

**Log Incremental Accuracy:**  $\pm 0.4$  dB/4 dB, 0 to  $-60$  dB from ref. level

**Log Maximum Cumulative:**  $\pm (0.4$  dB +  $0.01$  x dB from ref. level), 0 to  $-70$  dB from ref. level

**Linear Accuracy:**  $\pm 3\%$  of ref. level

#### General

Same as for HP 8590 E-series

Built-in tracking generator (see page 238)

HP 8590  
L-Series

## Ordering Information

**HP 8590L** Spectrum Analyzer (9 kHz to 1.8 GHz)

**HP 8592L** Spectrum Analyzer (9 kHz to 22 GHz)

Options<sup>1</sup>

- Opt 001** 75  $\Omega$  Input (HP 8590L only)
- Opt 003** Memory Card Reader
- Opt 010** Tracking Generator (100 kHz to 1.8 GHz, HP 8590L only)
- Opt 011** Tracking Generator (75  $\Omega$ , HP 8590L only)
- Opt 015** Soft Tan Carrying/Operating Case
- Opt 016** Soft Yellow Carrying/Operating Case
- Opt 041** HP-IB and Parallel Printer Interfaces
- Opt 043** RS-232 and Parallel Printer Interfaces
- Opt 026** 26.5 GHz Frequency Extension, APC-3.5 mm Connector (HP 8592L only)
- Opt 027** 26.5 GHz Frequency Extension, Type-N Connector (HP 8592L only)
- Opt 040** Front Panel Protective Cover With Storage
- Opt 042** Protective Soft Carrying Case/Backpack
- Opt 711** 50/75  $\Omega$  Matching Pad/100 Vdc Block
- Opt 008** Factory Service Training
- Opt UK6** Commercial Calibration Certificate with Test Data
- Opt ABX** Quick Reference Guide in Local Languages
- Opt 908** Rackmount Without Handles
- Opt 909** Rackmount With Handles
- Opt 910** Additional Manual Set
- Opt 915** Component Level Information and Service Guide
- Opt W30** Two Additional Years Return-to-HP Service
- Opt W32** Two Additional Years Return-to-HP Calibration

**HP 8591E** Spectrum Analyzer, 9 kHz to 1.8 GHz

**HP 8594E** Spectrum Analyzer, 9 kHz to 2.9 GHz

**HP 8595E** Spectrum Analyzer, 9 kHz to 6.5 GHz

**HP 8596E** Spectrum Analyzer, 9 kHz to 12.8 GHz

**HP 8593E** Spectrum Analyzer, 9 kHz to 22 GHz

Options<sup>1</sup>

- Opt 001** 75  $\Omega$  Input (HP 8591E only)
- Opt 004** Precision Frequency Reference
- Opt 009** LO and Sweep + Tune
- Opt 010** Tracking Generator (100 kHz to 1.8 GHz, HP 8591E only)
- Opt 010** Tracking Generator (9 kHz to 2.9 GHz)
- Opt 011** Tracking Generator (75  $\Omega$ , HP 8591E only)
- Opt 012** Source for DECT Receiver Test
- Opt 015** Soft Tan Carrying/Operating Case
- Opt 016** Soft Yellow Carrying/Operating Case
- Opt 026** 26.5 GHz Frequency Extension, APC-3.5 mm Connector (HP 8593E only)
- Opt 027** 26.5 GHz Frequency Extension, Type-N Connector (HP 8593E only)
- Opt 040** Front Panel Protective Cover With Storage
- Opt 041** HP-IB and Parallel Printer Interfaces
- Opt 042** Protective Soft Carrying Case/Backpack
- Opt 043** RS-232 and Parallel Printer Interfaces
- Opt 050** Improved Amplitude Accuracy (NADC-TDMA bands)
- Opt 051** Improved Amplitude Accuracy for PDC Bands
- Opt 052** Improved Amplitude Accuracy for PHS Band
- Opt 053** Improved Amplitude Accuracy for CDMA Bands
- Opt 101** Fast Time-Domain Sweeps and Analog+ Display
- Opt 102** AM/FM Demodulator and TV Sync Trigger (TV Sync requires Option 101)
- Opt 103** Quasi-Peak Detector, AM/FM Demodulator
- Opt 105** Time-Gated Spectrum Analysis
- Opt 107** TV Receiver Video Tester
- Opt 110** CT2 Demodulator

**Opt 111** Group Delay and Amplitude Flatness

(HP 8593/4/5/6E only)

**Opt 112** DECT Demodulator

**Opt 119** Noise Figure

**Opt 130** Narrow Resolution Bandwidths

(30 to 300 Hz and 200 Hz EMI)

**Opt 140** Narrow Bandwidths and Precision Frequency Reference

**Opt 151** DSP, FAST ADC, and Digital Demodulator

**Opt 160** PDC, PHS, NADC, and CDMA Firmware

for Option 151

**Opt 163** GSM900/DCS1800 Firmware for Option 151

**Opt 180** TV Picture NTSC/PAL/SECAM

**Opt 301** TV Sync Trigger, Fast Time-Domain Sweeps, AM/FM Demodulator, Analog+ Display

**Opt 711** 50/75  $\Omega$  Matching Pad/100 Vdc Block

**Opt 008** Factory Service Training

**Opt UK6** Commercial Calibration Certificate with Test Data

**Opt ABX** Quick Reference Guide in Local Languages

**Opt W30** Two Additional Years Return-to-HP Service

**Opt W32** Two Additional Years Return-to-HP Calibration

Application Measurement Cards/Personalities<sup>2,3</sup>

**HP 11770A** Link Measurement Personality

**HP 85700A** Blank 32-KB Memory Card

**HP 85702A** Blank 128-KB Memory Card

**HP 85704A** Blank 256-KB Memory Card

**HP 85705A** Blank 512-KB Memory Card

**HP 85712D** EMC Measurement Personality

**HP 85713A** Digital Radio Measurement Personality

**HP 85714A** Scalar Measurement Personality

**HP 85715B** GSM900 Measurement Personality

**HP 85717A** CT2-CAI Measurement Personality

**HP 85718B** NADC-TDMA Measurement Personality

**HP 85719A** Noise-Figure Measurement Personality

**HP 85720C** PDC Measurement Personality

**HP 85721A** Cable TV Measurement Personality

**HP 85722B** DCS1800 Measurement Personality

**HP 85723A** DECT Measurement Personality

**HP 85724A** Broadcast Measurement Personality

**HP 85725C** CDMA Measurement Personality

**HP 85726B** PHS Measurement Personality

## Printers and Accessories

**HP DeskJet 340** (C2655A) portable monochrome/color printer

**HP DeskJet 400** (C2642A) monochrome/color printer

**HP DeskJet 680C** (C4549A) color printer

**HP DeskJet 690C** (C4562A) color printer

**HP DeskJet 693C** (C4589A) color printer

**HP DeskJet 870C** (C4565A, C4555A) color printer

**HP C1405B** Keyboard (requires C1405-60015 Adapter)

**HP 10833A** HP-IB Cable (1 m)

**HP 24542U** RS-232 Cable 3 Meter (9 Pin F to 9 Pin F)

Option 043 Only (for RS-232 9 Pin PC Connection to Analyzer)

**HP 24542G** RS-232 Cable 3 Meter (25 Pin M to 9 Pin F)

Option 043 Only (for RS-232 25 Pin PC or Printer

Connection to Analyzer)

**HP C2932A** RS-232 Cable 3 Meter (9 Pin M to 9 Pin F)

Option 043 Only (for Serial 9 Pin LaserJet 4P/4Plus Connection to Analyzer)

**HP C2950A** HP IEEE-1284 A-B Parallel Cable (2 m)

**HP ITEL-45CHVUB** HP-IB/Parallel Converter (U.S./Canada)

**HP ITEL-45CHVEB** HP-IB/Parallel Converter

(International) (requires HP F1011A ac adapter)

## Key Literature

HP 8590 Series Configuration Guide, p/n 5963-6858E

HP 8590 E-Series Data Sheet, p/n 5963-6909E

HP 8590 L-Series Product Overview, p/n 5962-7575E

HP 8590 Series Brochure, p/n 5963-6908E

<sup>1</sup>Most options can be retrofitted. Please contact your local HP sales representative.

<sup>2</sup>Some measurement personalities are not supported by all HP 8590 series models.

For complete information, please contact your local HP sales representative.

<sup>3</sup>HP 8590L series requires Option 003 memory card reader.