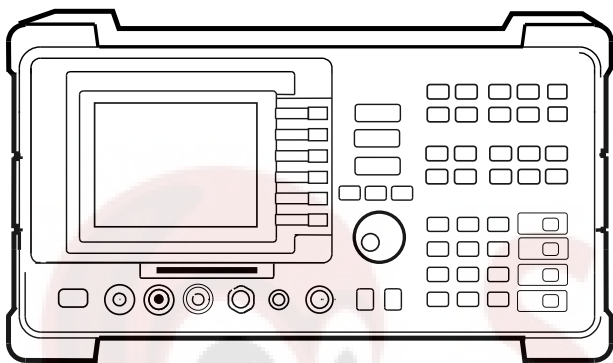




# HP 8590 E-Series Portable Spectrum Analyzers

## Technical Specifications

### Product Specifications and data



These specifications apply to the HP 8591E, 8593E, 8594E, 8595E, and 8596E spectrum analyzers.

### Specifications

All specifications apply over 0°C to +55°C. The analyzer will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 30 minutes after the analyzer is turned on, and after CAL FREQ and CAL AMPTD (and for the HP 8593E, 8595E, and 8596E CAL YTF) have been run.

### Frequency Specifications

#### Frequency Range

##### HP 8591E

|             |                  |
|-------------|------------------|
| 50 $\Omega$ | 9 kHz to 1.8 GHz |
| 75 $\Omega$ | 1 MHz to 1.8 GHz |

##### HP 8593E

|  |                 |
|--|-----------------|
|  | 9 kHz to 22 GHz |
|--|-----------------|

##### Option 026/027

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

##### HP 8594E

|            |                    |
|------------|--------------------|
| dc coupled | 9 kHz to 2.9 GHz   |
| ac coupled | 100 kHz to 2.9 GHz |

##### HP 8595E

|            |                    |
|------------|--------------------|
| dc coupled | 9 kHz to 6.5 GHz   |
| ac coupled | 100 kHz to 6.5 GHz |

##### HP 8596E

|            |                     |
|------------|---------------------|
| dc coupled | 9 kHz to 12.8 GHz   |
| ac coupled | 100 kHz to 12.8 GHz |

| Band | LO harmonic = N |                                 |
|------|-----------------|---------------------------------|
| 0    | 1               | 9 kHz to 2.9 GHz (dc coupled)   |
| 0    | 1               | 100 kHz to 2.9 GHz (ac coupled) |
| 1    | 1               | 2.75 GHz to 6.5 GHz             |
| 2    | 2               | 6.0 GHz to 12.8 GHz             |

#### Frequency Reference

|                             |                              | (Opt. 004)                   |
|-----------------------------|------------------------------|------------------------------|
| Aging                       | $\pm 2 \times 10^{-6}$ /year | $\pm 1 \times 10^{-7}$ /year |
| Temperature Stability       | $\pm 5 \times 10^{-6}$       | $\pm 1 \times 10^{-8}$       |
| Initial Achievable Accuracy | $\pm 0.5 \times 10^{-6}$     | $\pm 2.2 \times 10^{-8}$     |



## Frequency Readout

### Accuracy

|                               |                                                                                                                                                                          |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (Start, Stop, Center, Marker) | $\pm(\text{frequency readout} \times \text{frequency reference error}^1 + \text{span accuracy} + 1\% \text{ of span} + 20\% \text{ of RBW} + 100 \text{ Hz} \times N^*)$ |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Marker Count Accuracy

|                                                    |                                                                                                                                  |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Frequency Span<br>$\leq 10 \text{ MHz} \times N^*$ | $\pm(\text{marker frequency} \times \text{frequency reference error}^1 + \text{counter resolution} + 100 \text{ Hz} \times N^*)$ |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|

|                                                 |                                                                                                                                 |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Frequency Span<br>$> 10 \text{ MHz} \times N^*$ | $\pm(\text{marker frequency} \times \text{frequency reference error}^1 + \text{counter resolution} + 1 \text{ kHz} \times N^*)$ |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|

|                                                    |                                   |
|----------------------------------------------------|-----------------------------------|
| Counter Resolution                                 |                                   |
| Frequency Span<br>$\leq 10 \text{ MHz} \times N^*$ | Selectable from 10 Hz to 100 kHz  |
| Frequency Span<br>$> 10 \text{ MHz} \times N^*$    | Selectable from 100 Hz to 100 kHz |

### Frequency Span

| Range    | 0 Hz (zero span), and     |                       |              |
|----------|---------------------------|-----------------------|--------------|
|          | Opt. 130<br>Min.<br>(KHz) | Std.<br>Min.<br>(KHz) | Max<br>(GHz) |
| HP 8591E | 1                         | 10                    | 1.8          |
| HP 8593E | $1 \times N^*$            | $10 \times N^*$       | 19.25        |
| HP 8594E | 1                         | 10                    | 2.9          |
| HP 8595E | 1                         | 10                    | 6.5          |
| HP 8596E | $1 \times N^*$            | $10 \times N^*$       | 12.8         |

|            |                                                                |
|------------|----------------------------------------------------------------|
| Resolution | Four digits or $20 \text{ Hz} \times N^*$ whichever is greater |
|------------|----------------------------------------------------------------|

|                                       |                   |
|---------------------------------------|-------------------|
| Accuracy                              |                   |
| Span $\leq 10 \text{ MHz} \times N^*$ | $\pm 2\%$ of span |
| Span $> 10 \text{ MHz} \times N^*$    | $\pm 3\%$ of span |

### Frequency Sweep Time

|                                |                           |
|--------------------------------|---------------------------|
| Range                          |                           |
| Span = 0 Hz, $> 1 \text{ kHz}$ | 20 ms to 100 s            |
| Span = 0 Hz (Opt. 101)         | $20 \mu\text{s}$ to 100 s |

|                                                  |           |
|--------------------------------------------------|-----------|
| Accuracy                                         |           |
| 20 ms to 100 s                                   | $\pm 3\%$ |
| $20 \mu\text{s}$ to $< 20 \text{ ms}$ (Opt. 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.<br>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.           |

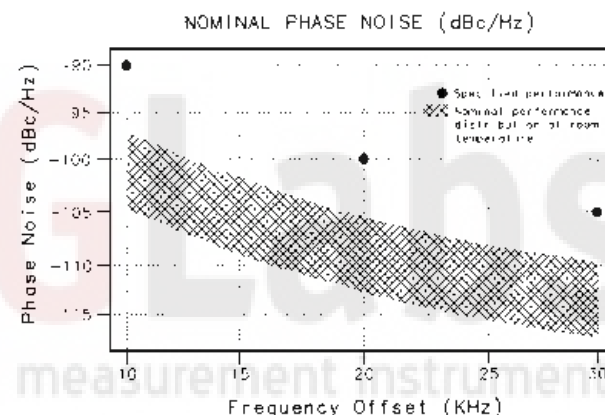
|          |            |
|----------|------------|
| Accuracy | $\pm 20\%$ |
|----------|------------|

|                              |      |
|------------------------------|------|
| 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<br>1 Hz to 1 MHz (Opt 130) |
|-----------------------|-----------------------------------------------------------|

### Stability

|                                                            |                                                  |
|------------------------------------------------------------|--------------------------------------------------|
| Noise Sidebands (1 kHz RBW, 30 Hz VBW and sample detector) |                                                  |
| $> 10 \text{ kHz}$ offset from CW signal                   | $\leq -90 \text{ dBc/Hz} + 20 \text{ Log } N^*$  |
| $> 20 \text{ kHz}$ offset from CW signal                   | $\leq -100 \text{ dBc/Hz} + 20 \text{ Log } N^*$ |
| $> 30 \text{ kHz}$ offset from CW signal                   | $\leq -105 \text{ dBc/Hz} + 20 \text{ Log } N^*$ |



### Residual FM

|                                          |                                                    |
|------------------------------------------|----------------------------------------------------|
| HP 8591E                                 |                                                    |
| 1 kHz RBW, 1 kHz VBW                     | $\leq 250 \text{ Hz pk-pk}$ in 100 ms              |
| 30 Hz RBW, 30 Hz VBW                     | $\leq 30 \text{ Hz pk-pk}$ in 300 ms               |
| HP 8593E, 94E, 95E, 96E                  |                                                    |
| 1 kHz RBW, 1 kHz VBW                     | $\leq (250 \times N^*) \text{ Hz pk-pk}$ in 100 ms |
| 30 Hz RBW, 30 Hz VBW                     | $\leq (30 \times N^*) \text{ Hz pk-pk}$ in 300 ms  |
| System-Related Sidebands                 |                                                    |
| $> 30 \text{ kHz}$ offset from CW signal | $\leq -65 \text{ dBc} + 20 \text{ Log } N^*$       |

### Comb Generator Frequency

|               |                               |
|---------------|-------------------------------|
| HP 8593E, 96E | 100 MHz fundamental frequency |
| Accuracy      | $\pm 0.007\%$                 |

\*  $N = \text{LO harmonic}$ .  $N = 1$  for 91E, 94E, 95E

1. Frequency reference error = (aging rate x period of time since adjustment + initial achievable accuracy + temperature stability).

## Amplitude Specifications

Amplitude specifications do not apply for Analog+ mode and negative peak detector mode except as noted in "Amplitude Characteristics."

### Amplitude Range

|                     |                                           |
|---------------------|-------------------------------------------|
|                     | Displayed average noise level to +30 dBm  |
| HP 8591E (Opt. 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 (Opt. 001)      | +72 dBmV (0.2 W)                                                                                  |
| Peak Pulse Power         |                                                                                                   |
| HP 8591E                 | +30 dBm (1 W)                                                                                     |
| HP 8591E (Opt. 001)      | +72 dBmV (0.2 W)                                                                                  |
| HP 8593E, 94E, 95E, 96E  | +50 dBm (100 W) for < 10 $\mu$ s pulse width and <1 % duty cycle, input attenuation $\geq 30$ dB. |

dc

|                     |                                       |
|---------------------|---------------------------------------|
| HP 8591E            | 25 Vdc                                |
| HP 8591E (Opt. 001) | 100 Vdc                               |
| HP 8593E            | 0 Vdc                                 |
| HP 8594E, 95E, 96E  | 0 V (dc coupled)<br>50 V (ac coupled) |

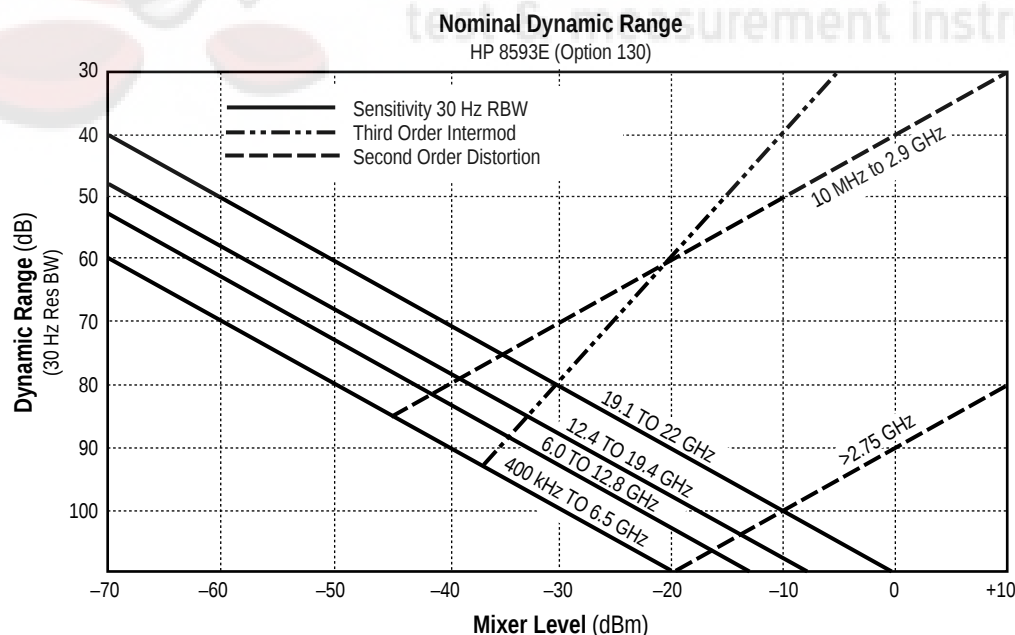
### Gain Compression

>10 MHz  $\leq 0.5$  dB (total power at input mixer<sup>2</sup> = -10 dBm)

### Displayed Average Noise Level

(Input terminated, 0 dB attenuation, 1 Hz/30 Hz VBW, sample-detector)

|                         |                 |                 |
|-------------------------|-----------------|-----------------|
| HP 8591E                | 30 Hz RBW       | 1 kHz RBW       |
| 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 |
| HP 8591E (Opt. 001)     |                 |                 |
| 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 |
| HP 8593E                |                 |                 |
| 400 kHz to 2.9 GHz      | $\leq -127$ dBm | $\leq -112$ dBm |
| 2.75 GHz to 6.5 GHz     | $\leq -129$ dBm | $\leq -114$ dBm |
| 6.0 GHz to 12.8 GHz     | $\leq -117$ dBm | $\leq -102$ dBm |
| 12.4 GHz to 19.4 GHz    | $\leq -113$ dBm | $\leq -98$ dBm  |
| 19.1 GHz to 22 GHz      | $\leq -107$ dBm | $\leq -92$ dBm  |
| HP 8593E (Opt. 026/027) |                 |                 |
| 19.1 GHz to 26.5 GHz    | $\leq -102$ dBm | $\leq -87$ dBm  |
| HP 8594E                |                 |                 |
| 400 kHz to <5 MHz       | $\leq -122$ dBm | $\leq -107$ dBm |
| 5 MHz to 2.9 GHz        | $\leq -127$ dBm | $\leq -112$ dBm |
| HP 8595E                |                 |                 |
| 400 kHz to 2.9 GHz      | $\leq -125$ dBm | $\leq -110$ dBm |
| 2.75 GHz to 6.5 GHz     | $\leq -127$ dBm | $\leq -112$ dBm |
| HP 8596E                |                 |                 |
| 400 kHz to 2.9 GHz      | $\leq -125$ dBm | $\leq -110$ dBm |
| 2.75 GHz to 6.5 GHz     | $\leq -127$ dBm | $\leq -112$ dBm |
| 6.0 GHz to 12.8 GHz     | $\leq -115$ dBm | $\leq -100$ dBm |



$$2. \text{ Mixer Power Level (dBm)} = \text{Input Power (dBm)} - \text{Input Atten. (dB)}$$

## Spurious Responses

### Second Harmonic Distortion

|                           |                                                                                                    |
|---------------------------|----------------------------------------------------------------------------------------------------|
| 5 MHz to 1.8 GHz (91E)    | < -70 dBc for -45 dBm tone at input mixer. <sup>2</sup>                                            |
| 10 MHz to 2.9 GHz (93E)   | < -70 dBc for -40 dBm tone at input mixer. <sup>2</sup>                                            |
| >10 MHz (94E, 95E, 96E)   | < -100 dBc for -10 dBm tone at input mixer. <sup>2</sup> (or below displayed average noise level). |
| >2.75 GHz (93E, 95E, 96E) |                                                                                                    |

### Third Order Intermodulation Distortion

|                              |                                                                                     |
|------------------------------|-------------------------------------------------------------------------------------|
| 5 MHz to 1.8 GHz (91E)       | < -70 dBc for two -30 dBm tones at input mixer <sup>2</sup> and >50 kHz separation. |
| >10 MHz (93E, 94E, 95E, 96E) |                                                                                     |

### Other Input Related Spurious

|                 |                                                                           |
|-----------------|---------------------------------------------------------------------------|
| ≤1.8 GHz (91E)  | < -65 dBc at ≥30 kHz offset, for -20 dBm tone at input mixer <sup>2</sup> |
| ≤2.9 GHz (94E)  |                                                                           |
| ≤6.5 GHz (95E)  |                                                                           |
| ≤12.8 GHz (96E) |                                                                           |
| ≤18 GHz (93E)   |                                                                           |
| ≤22 GHz (93E)   | < -60 dBc at ≥30 kHz offset, for -20 dBm tone at input mixer <sup>2</sup> |

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

|                                    |            |
|------------------------------------|------------|
| 1 MHz to 1.8 GHz (91E Opt. 001)    | < -38 dBmV |
| 150 kHz to 1.8 GHz (91E)           | < -90 dBm  |
| 150 kHz to 2.9 GHz (94E)           | < -90 dBm  |
| 150 kHz to 6.5 GHz (93E, 95E, 96E) | < -90 dBm  |

## Display Range

|              |                                                                                                                                             |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Log Scale    | 0 to -70 dB from reference level is calibrated; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps; eight divisions displayed. |
| Linear Scale | Eight divisions                                                                                                                             |
| Scale units  | dBm, dBmV, dBuV, V, and W                                                                                                                   |

## Marker Readout Resolution

|                                                  |                                           |
|--------------------------------------------------|-------------------------------------------|
|                                                  | 0.05 dB for log scale                     |
|                                                  | 0.05% of reference level for linear scale |
| Fast Sweep Times for Zero Span (Opt. 101 or 301) |                                           |
| 20 μs to 20 ms                                   |                                           |
| ≤1 GHz                                           | 0.7% of reference level for linear scale  |
| >1 GHz                                           | 1.0% of reference level for linear scale  |

## Reference Level

|                    |                                                                 |
|--------------------|-----------------------------------------------------------------|
| Range              | same as amplitude range                                         |
| Resolution         | 0.1 dB for log scale, 0.12% of reference level for linear scale |
| Accuracy           | ±0.3 dB @ -20 dBm                                               |
| 0 dBm to -59.9 dBm | ±(0.3 dB + 0.01 x dB from -20 dBm)                              |

## Frequency Response

|                      | (10 dB input attenuation)       |                                |
|----------------------|---------------------------------|--------------------------------|
| HP 8591E             | Absolute <sup>3</sup>           | Relative Flatness <sup>4</sup> |
| 9 kHz to 1.8 GHz     | ±1.5 dB                         | ±1.0 dB                        |
| HP 8593E             | Preselector peaked in band > 0  |                                |
|                      | Absolute <sup>3</sup>           | Relative Flatness <sup>4</sup> |
| 9 kHz to 2.9 GHz     | ±1.5 dB                         | ±1.0 dB                        |
| 2.75 GHz to 6.5 GHz  | ±2.0 dB                         | ±1.5 dB                        |
| 6.0 GHz to 12.8 GHz  | ±2.5 dB                         | ±2.0 dB                        |
| 12.4 GHz to 19.4 GHz | ±3.0 dB                         | ±2.0 dB                        |
| 19.1 GHz to 22 GHz   | ±3.0 dB                         | ±2.0 dB                        |
| 19.1 GHz to 26.5 GHz | ±5.0 dB                         | ±2.0 dB                        |
| HP 8594E, 95E, 96E   | (dc coupled preselector peaked) |                                |
|                      | Absolute <sup>3</sup>           | Relative Flatness <sup>4</sup> |
| 9 kHz to 2.9 GHz     | ±1.5 dB                         | ±1.0 dB                        |
| 2.75 GHz to 6.5 GHz  | ±2.0 dB                         | ±1.5 dB                        |
| 6.0 GHz to 12.8 GHz  | ±2.5 dB                         | ±2.0 dB                        |

## Calibrator Output

|                  |                     |
|------------------|---------------------|
| Amplitude        | -20 dBm ±0.4 dB     |
| HP 8591E Opt.001 | +28.75 dBmV ±0.4 dB |

## Resolution Bandwidth Switching Uncertainty

|                                          |         |
|------------------------------------------|---------|
| (Referenced to 3 kHz RBW, at ref. level) |         |
| 3 kHz to 3 MHz RBW                       | ±0.4 dB |
| 1 kHz RBW                                | ±0.5 dB |
| 30 Hz to 300 Hz RBW                      | ±0.6 dB |

## Linear to Log Switching

|  |                             |
|--|-----------------------------|
|  | ±0.25 dB at reference level |
|--|-----------------------------|

## Display Scale Fidelity

|                                  |                                          |
|----------------------------------|------------------------------------------|
| Log Maximum Cumulative           | 0 to -70 dB from reference level         |
| 3 kHz to 3 MHz RBW               | ± (0.3 + 0.01 x dB from reference level) |
| 30 Hz to 1 kHz RBW               | ± (0.4 + 0.01 x dB from reference level) |
| Log Incremental Accuracy         | ±0.4 dB/4 dB                             |
| 0 to -60 dB from reference level |                                          |
| Linear Accuracy                  | ±3% of reference level                   |

## Option Specifications

### Option 010 and 011 Tracking Generator

#### Frequency Range

|                         |                    |
|-------------------------|--------------------|
| HP 8591E                | 100 kHz to 1.8 GHz |
| (Opt. 011, 75 Ω)        | 1 MHz to 1.8 GHz   |
| HP 8593E, 94E, 95E, 96E | 9 kHz to 2.9 GHz   |

3. Referenced to 300 MHz CAL OUT.

4. Ref. to midpoint between highest and lowest freq. response deviations.

## Output Level

### Range

|                         |                     |
|-------------------------|---------------------|
| HP 8591E                | 0 to -70 dBm        |
| HP 8591E (Opt. 011)     | +42.8 to -27.2 dBmV |
| HP 8593E, 94E, 95E, 96E | -1 to -66 dBm       |

Resolution 0.1 dB

### Absolute Accuracy

(@ 300 MHz, -20 dBm, +28.8 dBmV)

|                         |          |
|-------------------------|----------|
| HP 8591E                | ±1.0 dB  |
| HP 8593E, 94E, 95E, 96E | ±0.75 dB |

## Vernier

### Range

|                         |       |
|-------------------------|-------|
| HP 8591E                | 10 dB |
| HP 8593E, 94E, 95E, 96E | 9 dB  |

### Accuracy

|                         |          |
|-------------------------|----------|
| HP 8591E                | ±0.75 dB |
| HP 8593E, 94E, 95E, 96E | ±0.5 dB  |

## Output Attenuator

### Range

|                         |                         |
|-------------------------|-------------------------|
| HP 8591E                | 0 to 60 dB, 10 dB steps |
| HP 8593E, 94E, 95E, 96E | 0 to 56 dB, 8 dB steps  |

## Output Flatness

|                         |          |
|-------------------------|----------|
| HP 8591E                | ±1.75 dB |
| HP 8593E, 94E, 95E, 96E | ±2.0 dB  |
| (>10 MHz)               | ±2.0 dB  |

## Effective Source Match (Characteristic)

|                         |                           |
|-------------------------|---------------------------|
| HP 8591E                | 1.6:1 (10 dB attenuation) |
| HP 8593E, 94E, 95E, 96E | 1.5:1 (8 dB attenuation)  |

## Spurious Output

### Harmonic Spurs

|                            |                |
|----------------------------|----------------|
| HP 8591E                   | <-25 dBc       |
| (0 dBm, +42.8 dBmV output) |                |
| HP 8593E, 94E, 95E, 96E    | <-1 dBm Output |

### Nonharmonic Spurs

|                         |          |
|-------------------------|----------|
| HP 8591E                | <-30 dBc |
| HP 8593E, 94E, 95E, 96E | ≤-27 dBc |
| 300 kHz to 2.0 GHz      | ≤-23 dBc |
| 2.0 GHz to 2.9 GHz      | ≤-23 dBc |

## Dynamic Range (Characteristic)

|                      | Dynamic Range <sup>5</sup> | TG Feedthrough |
|----------------------|----------------------------|----------------|
| HP 8591E             | 106 dB                     | ≤-106 dBm      |
| HP 8591 E (Opt. 011) | 100 dB                     | ≤-57.24 dBmV   |
| HP 8593E (> 400 kHz) | 111 dB                     | ≤-112 dBm      |
| HP 8594E (> 400 kHz) | 106 dB                     | ≤-107 dBm      |
| (> 5 MHz)            | 111 dB                     | ≤-112 dBm      |
| HP 8595E (>400 kHz)  | 109 dB                     | ≤-110 dBm      |
| HP 8596E (> 400 kHz) | 109 dB                     | ≤-110 dBm      |

5. Maximum output level minus TG feedthrough.

6. Up to 1 V<sub>s</sub> jitter due to 1 μs resolution of gate delay clock.

7. With GATE ON enabled and triggered, CW Signal, Peak Detector Mode.

## Power Sweep

### Range

|                         |                                                  |
|-------------------------|--------------------------------------------------|
| HP 8591E                | (-15 dBm to 0 dBm) -(source attenuator setting)  |
| HP 8591E (Opt 011)      | (+27.8 to 42.8 dBmV)-(source attenuator setting) |
| HP 8593E, 94E, 95E, 96E | (-10 dBm to -1 dBm)-(source attenuator setting)  |

### Resolution

0.1 dB

## Option 103 Quasi-Peak Detector

Amplitude response conforms with Publication 16 of Comité International Spécial des Perturbations Radioélectriques (CISPR) Section 1, Clause 2.

## Option 105 Time Gated Spectrum Analysis

### Gate Delay

|                                                           |                                                   |
|-----------------------------------------------------------|---------------------------------------------------|
| Range                                                     | 1 μs to 65.535 ms                                 |
| Resolution                                                | 1 μs                                              |
| Accuracy                                                  | ±(1 μs + 0.01% x Gate Delay Readout) <sup>6</sup> |
| (From Gate Trigger Input to positive edge of Gate Output) |                                                   |

### Gate Length

|                                                      |                                           |
|------------------------------------------------------|-------------------------------------------|
| Range                                                | 1 μs to 65.535 ms                         |
| Resolution                                           | 1 μs                                      |
| Accuracy                                             | ±(0.2 μs + (0.01% x Gate Length Readout)) |
| (From positive edge to negative edge of Gate Output) |                                           |

## Additional Gate Amplitude Error<sup>7</sup>

|           |       |         |
|-----------|-------|---------|
| Log Scale | <2 μs | ±0.8 dB |
|           | ≥2 μs | ±0.5 dB |

## General Specification

### Temperature Range

|           |                |
|-----------|----------------|
| Operating | 0°C to +55°C   |
| Storage   | -40°C to +75°C |

### EMI Compatibility

Conducted and radiated interference  
CISPR Pub. 11 and Messempepaenger  
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<br>195 to 250 V rms, 47 to 66 Hz<br>Power consumption <500 VA; <180W |
| Standby (Line 0) | Power consumption <7 W                                                                             |

### User Program Memory

238 Kbytes non-volatile RAM

### Data Storage (nominal)

|                         |                        |
|-------------------------|------------------------|
| Internal                | 24 traces or 32 states |
| External                | 50 traces, 8 states    |
| Memory card (HP 85700A) | 32 Kbytes              |

## Inputs/Outputs

### Front Panel Connectors

|                  |                                                 |
|------------------|-------------------------------------------------|
| Input            | 50 $\Omega$ Type N                              |
| (Opt 001)        | 75 $\Omega$ BNC female                          |
| (Opt 026)        | APC 3.5 mm male                                 |
| (Opt 027)        | 50 $\Omega$ Type N female                       |
| Cal Output       | 50 $\Omega$ BNC, -20 dBm, 300 MHz               |
| 100 MHz Comb Out | 100 MHz $\pm 0.007\%$ , SMA                     |
| Probe Power      | +15 Vdc, -12.6 Vdc, and Gnd<br>(150mA max each) |

### Rear Panel Connectors

|                                        |                                                                                                                                                                                                     |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Earphone (Opt 102 and 103)             | 1/8 inch monaural jack                                                                                                                                                                              |
| LO Output (Opt 009)                    | 50 $\Omega$ SMA Female, 3.0 to 6.8214 GHz                                                                                                                                                           |
| TV Trigger Output<br>(Opt 101 and 102) | BNC, TTL levels, negative edge<br>trigger after sync pulse                                                                                                                                          |
| Gate Trigger Input (Opt 105)           | 50 $\Omega$ BNC, Pulsewidth >30 ns (TTL)                                                                                                                                                            |
| Gate Output (Opt 105)                  | 50 $\Omega$ BNC (TTL)                                                                                                                                                                               |
| SWEEP + Tune Output<br>(Opt 009)       | 2 k $\Omega$ BNC, 0 to +10V,<br>0.36V/GHz of CF                                                                                                                                                     |
| Ext. ALC Input 1 MW,<br>Sweep Output   | -66 dBV to +6 dBV                                                                                                                                                                                   |
| High Sweep In/Out                      | BNC, 5 k W, 0 to +10 V ramp<br>BNC, high TTL = sweep,<br>low TTL = Retrace                                                                                                                          |
| Aux Video Out                          | 50 $\Omega$ BNC, 0-1 V Uncalibrated                                                                                                                                                                 |
| Aux IF Output                          | 50 $\Omega$ BNC, -10 to -60 dBm, 21.4 MHz                                                                                                                                                           |
| Keyboard (Opt. 041 or 043)             | 5 Pin mini-DIN, compatible with<br>HP C1405B and most IBM/AT keyboards                                                                                                                              |
| Ext. Trigger Input                     | BNC, TTL levels, positive edge trigger                                                                                                                                                              |
| HPiB and Parallel (Opt 041)            | SH1, AH1, T6, L4, ST1, RL1, PPO,<br>DC1, C1 C2, C3, & C28 and 25 Pin<br>subminiature D-shell female for parallel                                                                                    |
| RS-232 and Parallel (Opt 043)          | 9 Pin subminiature D-shell female and<br>25 Pin subminiature D-shell female<br>for parallel                                                                                                         |
| Ext Ref In                             | 50 $\Omega$ BNC, 10 MHz, -2 to +10 dBm                                                                                                                                                              |
| 10 MHz Ref Output                      | 50 $\Omega$ BNC, 10 MHz, 0 dBm                                                                                                                                                                      |
| Aux Interface                          | 9 pin 'D' subminiature<br>Pin 1-4, TTL Output<br>Pin 5 TTL Input<br>Pin 6 Gnd<br>Pin 7 -15 vdc $\pm 5\%$ ; 150 mA max<br>Pin 8 +5 vdc $\pm 5\%$ ; 150 mA max<br>Pin 9 +15vdc $\pm 5\%$ ; 150 mA max |
| Monitor Out                            | 50 $\Omega$ BNC,                                                                                                                                                                                    |
| Selectable Format                      | NTSC, 15.75 kHz, 60 Hz<br>PAL, 15.625 kHz, 50 Hz                                                                                                                                                    |

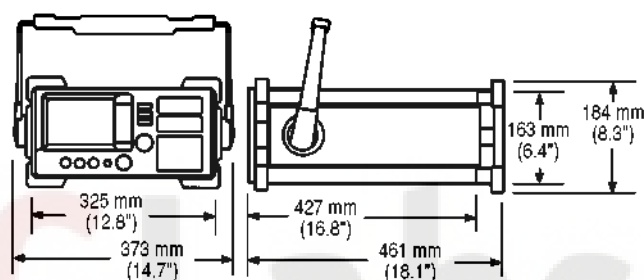
### Dimensions (Nominal)

(Without handle, feet,  
or cover) 163 mm (H) x 325 mm (W)  
x 427 mm (D)

(Overall) 184 mm (H) x 373 mm (W)  
X 461 mm (D)

### Weight (Nominal)

|          |                 |
|----------|-----------------|
| HP 8591E | 15.4 kg (34 lb) |
| HP 8593E | 16.4 kg (36 lb) |
| HP 8594E | 16.4 kg (36 lb) |
| HP 8595E | 16.4 kg (36 lb) |
| HP 8596E | 16.4 kg (36 lb) |





## Literature Reference Index

### General Purpose Information

|                                                |            |
|------------------------------------------------|------------|
| HP 8590L and HP 8592L Product Overview         | 5962-7275E |
| HP 8590C/E/L and EM Series Configuration Guide | 5963-6858E |
| HP 8590 E-Series Brochure                      | 5963-6908E |

### Product Feature Briefs

|                                                                |            |
|----------------------------------------------------------------|------------|
| Analog + Display                                               | 5091-4054E |
| Transmitter Power Measurements (ACP, OBW)                      | 5091-4055E |
| Zoom Window                                                    | 5091-4051E |
| Measuring AM with FFT                                          | 5091-4049E |
| Time Gated Spectrum Analysis                                   | 5091-4053E |
| Editing Keyboard                                               | 5091-4048E |
| Marker and Peaks Table                                         | 5091-4050E |
| Third Order Intermodulation,<br>N & B Bandwidth and Percent AM | 5091-4052E |

### Product Notes

|                                                                  |            |
|------------------------------------------------------------------|------------|
| Time-Gated Spectrum Analysis (HP 8590-2)                         | 5952-3685  |
| Analog + Display                                                 | 5091-2364E |
| Maximizing Accuracy in Noise<br>Figure Measurements (HP 85791-1) | 5091-4801E |

### Application Notes

|                                            |           |
|--------------------------------------------|-----------|
| Spectrum Analysis Basics (150)             | 5952-0292 |
| Amplitude and Frequency Modulation (150-1) | 5954-9130 |

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