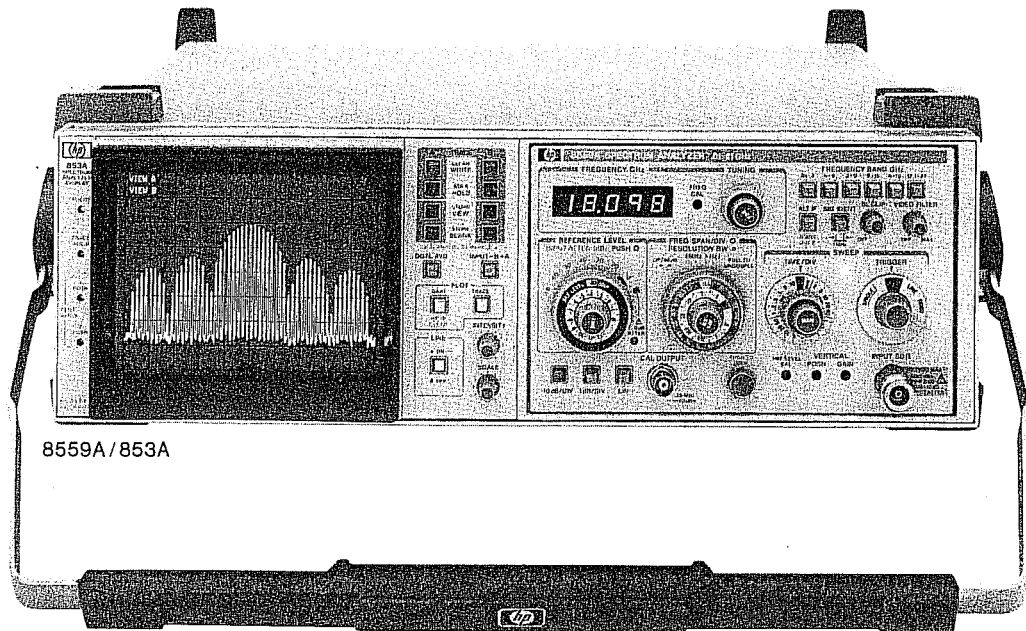


- Rugged portability
- Simple three-knob operation
- Direct plotter control

- Resolution bandwidths from 1 kHz to 3 MHz
- Absolute amplitude calibration in all bands

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8559A/853A

### 8559A Spectrum Analyzer Plug-in Performance Plus Economy

The 8559A is a 0.01 to 21 GHz spectrum analyzer plug-in for use with both the 853A and 180-series display. The high performance and convenient operation of this economical unit is ideally suited for a variety of applications in production, R&D or field service environments.

#### Simple 3-Knob Operation

Preset the 8559A to the color coded, "basic operation" settings, and use the coupled controls to make most measurements in three easy steps. Tune to the signal; the LED readout displays its frequency. Zoom-in on the signal by reducing the span width; the resolution bandwidth, video filter, and sweep time automatically change to an optimum value for a calibrated display. Then, change the reference level to bring the peak of the signal to the top of the screen for the most accurate amplitude measurement. A signal identifier is available in all bands to provide assurance of correct measurements.

#### Absolute Amplitude Calibration

Signal levels can be read directly in dBm from the CRT without the use of external standards or calculations. The signal level represented by the top CRT graticule line is always indicated by the reference level control, and vertical scale factors of 10 dB/Div, 1 dB/Div, or linear can be selected.

#### 11870A Low Pass Filter (dc to 2.6 GHz)

For RF measurement applications needing extended coverage to 2.6 GHz, the 11870A low pass filter will reject signals above 3 GHz by more than 60 dB for image-free measurements over the entire 10 MHz to 2.6 GHz range.

#### 853A Spectrum Analyzer Display Digital Display

The 853A is a digital display mainframe for use with the 8559A spectrum analyzer plug-in. Signals are displayed on either of two independently stored digital traces. Display processing capabilities include maximum hold, digital averaging, and trace normalization for extended measurement capability. A built-in microprocessor manages the display operation and provides access to built-in test routines for display calibration and test (accessible via the front panel).

#### HP-IB Capability Includes Direct Plotter Control

A hard-copy record of the displayed traces and graticule can be made on a digital plotter via HP-IB by simply using the 853A's front-panel pushbuttons; a controller is not required. Although analyzer controls are not programmable, some HP-IB applications include

using a controller for recording trace data or for operator prompts on the 853A CRT. The digital display and processing functions can be remotely programmed, and analyzer sweeps can be initiated via HP-IB.

#### Two Configurations

The display is offered in two styles. The 853A (pictured) is a ruggedized, portable mainframe complete with tilt-bail handle and drip proof, protective front cover. The 853A is ideally suited for rugged, field service environments and any areas where system mobility is required. The 853A Option 001 offers the digital display in a full module bench or rack mount configuration.

### 8559A Specifications

#### Frequency Specifications

**Frequency range:** 0.01 to 21 GHz in six selectable ranges.

#### Frequency Spans

**Fullband:** displays entire spectrum of selected band.

**Per division:** 10 kHz to 200 MHz/div in a 1, 2, 5 sequence.

**Zero span:** analyzer functions as a manually tuned receiver.

#### Frequency Accuracy

**Tuning accuracy:** 0.01 to 3 GHz:  $\leq \pm(1 \text{ MHz} + 0.3\% \text{ of center frequency})$ ; 3 to 21 GHz:  $\leq \pm(5 \text{ MHz} + 0.2\% \text{ of center frequency})$ .

**Frequency span accuracy:**  $< \pm 5\%$  of displayed frequency separation.

#### Spectral Resolution

**Resolution bandwidths:** eight selectable resolution (3-dB) bandwidths from 1 kHz to 3 MHz in a 1, 3 sequence. Bandwidth and frequency span are independently variable or may be coupled for optimum display when control markers are aligned (▶◀).

**Resolution bandwidth accuracy:** 3-dB points are  $\leq \pm 15\%$  (except for 3 MHz bandwidth:  $< \pm 30\%$ ).

**Selectivity:** (60-dB/3-dB bandwidth ratio)  $< 15:1$

**Spectral stability:** (fundamental mixing, bands 0.01–3 GHz and 6–9 GHz)

**Residual FM:**  $< 1 \text{ kHz p-p}$  in 0.1 second.

**Noise sidebands:**  $\geq 70 \text{ dB}$  down,  $\geq 30 \text{ kHz}$  from center of CW signal with 1 kHz resolution bandwidth and full video filtering.

#### Amplitude Specifications

**Amplitude range:**  $-111$  to  $+30 \text{ dBm}$ .

#### Maximum Input (damage) Levels

**Total power:**  $+20 \text{ dBm}$  (100 mW, 2.2 Vrms) with 0 dB input attenuation;  $+30 \text{ dBm}$  (1 watt, 7.1 Vrms) with  $\geq 10 \text{ dB}$  input attenuation.



**DC or AC (<100 Hz):**  $\pm 7.1$  V.

**Peak pulse power:** +50 dBm (100 watts, 10  $\mu$ sec pulse width, 0.01% duty cycle) with  $\geq 30$  dB input attenuation.

**Gain compression:** <0.5 dB for a -10 dBm input level, with 0 dB input attenuation.

**Average noise level:** see table below for maximum average noise level with 1 kHz resolution bandwidth, 0 dB input attenuation, and maximum (MAX) video filtering.

Frequency Range (GHz)	Avg. Noise Level (dBm/1 kHz)	Frequency Response ( $\pm$ dB max.)	Amplitude Accuracy <sup>1</sup> ( $\pm$ dB max.)
0.01-3	-111	1.0	2.3
6.0-9	-108	1.0	2.3
3.0-9	-103	1.5	2.8
9.0-15	-98	1.8	3.1
6.0-15	-93	2.1	3.4
12.1-18	-92	2.3	3.6
18.0-21	-90	3.0	4.3

**Alternate IF:** regular IF at 3.0075 GHz; alternate IF available at 2.9925 GHz for all frequency bands (minimum frequency is 25 MHz).

#### Calibrated Display Range

**Log:** 70 dB with 10 dB/div scale; 8 dB with 1 dB/div scale.

**Linear:** 8 divisions with linear (LIN) amplitude scale.

#### Amplitude Accuracy

**Calibrator:** -10 dBm  $\pm$  0.3 dB (into 50  $\Omega$ ), 35 MHz  $\pm$  400 kHz.

**Reference level:** 10 dB steps and a 12 dB vernier for calibrated adjustment from -112 dBm to +60 dBm<sup>2</sup>.

**Step accuracy (with 0 dB input attenuation):** -10 to -80 dBm:  $\pm 0.5$  dB; -10 to -100 dBm:  $\pm 1.0$  dB.

**Vernier accuracy:**  $\pm 0.5$  dB.

**Frequency response:** see table above; includes input attenuator, mixer flatness, and mixing mode gain variation (band to band), with 0 or 10 dB input attenuation.

**Input attenuator:** 0 to 70 dB, selectable in 10 dB steps.

**Step accuracy:**  $< \pm 1.0$  dB per 10 dB step (0 to 60 dB, 0.01 to 18 GHz).

**Maximum cumulative error:**  $< \pm 2.4$  dB (0 to 60 dB, 0.01 to 18 GHz).

#### Bandwidth Switching (amplitude variation)

**3 MHz to 300 kHz:**  $< \pm 0.5$  dB.

**3 MHz to 1 kHz:**  $< \pm 1.0$  dB.

#### Display Fidelity

**Log incremental accuracy:**  $\pm 0.1$  dB/dB from Reference Level.

**Log maximum cumulative error:**  $\leq \pm 1.5$  dB over 70 dB range.

**Linear accuracy:**  $\pm 3\%$  of Reference Level.

#### Spurious Responses

**Second harmonic distortion:** typically >70 dB below a -40 dBm signal with 0 dB input attenuation.

**Third order intermodulation distortion:** typically >70 dB below two -30 dBm input signals separated by  $\geq 50$  kHz with 0 dB input attenuation.

**Residual responses:**  $< -90$  dBm with 0 dB input attenuation and no signal present at input (0.01<sup>3</sup>-3 GHz, 6-9 GHz).

**Signal identifier:** available in all frequency bands and spans, useable from 10 MHz to 100 kHz/div.

#### Sweep Characteristics

##### Sweep Time

**Automatic:** sweep time is automatically adjusted to maintain absolute amplitude calibration for any combination of frequency span, resolution bandwidth and video filter bandwidth.

**Calibrated sweep times:** 2  $\mu$ sec to 10 sec/div in a 1, 2, 5 sequence (except 2 sec/div),  $\pm 10\%$  accuracy ( $\pm 20\%$  for 5/10 sec/div).

**Manual sweep:** spectrum analyzer may be swept manually in either direction with front panel control.

#### Signal Input Characteristics

**Input impedance:** 50  $\Omega$  nominal; precision type-N female connector.

**Input SWR:** typically <2.0, 0 dB input attenuation; <1.3, 10 dB input attenuation.

#### Output Characteristics

**Vertical output, AUX A:** BNC output (50  $\Omega$ ) provides detected video from 0 to 0.8 V for 8 division deflection on CRT display.

**Penlift/blinking, AUX B:** BNC output provides 0 V pen down/unblinking signal at low impedance; 15 V penlift/blinking at 10 k $\Omega$  impedance.

**21.4 MHz IF output, AUX C:** BNC output (50  $\Omega$ ) provides a signal which is proportional to the RF input. Level is about -10 dBm (into 50  $\Omega$ ) with a signal displayed at the Reference Level. Output is controlled by setting of Resolution BW, Input Atten, and Reference Level.

**Horizontal output, AUX D:** BNC output (5 k $\Omega$ ) provides horizontal sweep from -5 to +5 V for full 10 division CRT horizontal deflection.

## 853A Characteristics

### Digital Display

**Traces:** dual trace, digitally stored display with resolution of 481 horizontal by 801 vertical points for each trace.

**Signal processing:** maximum hold, digital averaging, and trace normalization.

**Internal service routines:** front panel pushbuttons access test routines to perform maintenance of digital hardware.

### HP-IB

**Direct plotter control:** all displayed information can be transferred to an HP-IB plotter with front panel pushbuttons.

### Controller Interface Functions

**Trace data transfer:** all trace data values can be transferred to or from 853A with a controller.

**Input messages:** controller-input instructions or annotation can be displayed on either of two 60 character lines.

**Display control:** all trace processing functions can be remotely controlled.

**Sweep control:** analyzer sweeps can be initiated and monitored.

## General

### General Specifications

**180-Series compatibility:** the HP 8559A Spectrum Analyzer is compatible with the 180T-Series displays as well as the 853A<sup>4</sup>. The 182T is a normal persistence cabinet style display; the 181T offers variable persistence and storage; the 181TR is a rack mount configuration with normal persistence. All 180T-Series displays provide non-buffered, rear panel, auxiliary outputs (for unattenuated vertical, horizontal, and penlift outputs). However, they do not offer the digital display, HP-IB and direct plotter control, nor the portability features of the 853A.

**Temperature range** operating 0° to +55°C; storage -40° to +75°C.

**EMI:** conducted and radiated interference is within requirements of methods CE03 and RE02 of MIL-STD 461A, CISPR Publication 11 (1975), and Messemphaenger Postverfuegung 526/527/79 (Kennzeichnung Mit F-Nummer/Funkschutzzeichen).

**Power:** <200 VA with display, 48 to 440 Hz (48 to 66 Hz at 220 or 240 Vac); with 853A: 100, 120, 220, or 240 Vac, +5%, -10%; with 180 series: 115 or 230 Vac,  $\pm 10\%$ .

### Weight

**Model 8559A:** net, 5.5 kg (12.1 lb). Shipping 9.1 kg (20 lb).

**Model 853A:** net, 15.9 kg (35 lb). Shipping 18.6 kg (41 lb).

**Model 853A Opt 001:** net, 14.5 kg (32 lb). Shipping, 17.3 kg (38 lb).

### Size

**Model 853A/8559A:** 158.8 H x 501.7 W x 524.3 mm D (6.25" x 19.75" x 20.65").

**Model 853A Opt 001/8559A:** 133 H x 425.5 W x 473.7 mm D (5.25" x 16.75" x 18.65").

### Ordering Information

**8559A Spectrum Analyzer** \$11,825

**Opt 910:** Extra Operating and Service Manual add \$20

**853A Portable Spectrum Analyzer Display** \$5,550

**Opt 001:** Full Module Bench/Rack Configuration less \$200

**Opt. 910:** Extra Operation and Service Manual \$25

**182T Cabinet Style, Normal Persistence Display** \$3,030

**180TR Rack Mount Normal Persistence Display** \$3,210

**181T Cabinet Style, Variable Persistence Display** \$4,130

**181TR Rack Mount 181T Display** \$4,460

<sup>1</sup>Using IF substitution, total accuracy is sum of frequency response, calibration, and reference level errors.

<sup>2</sup>Input level not to exceed maximum levels.

<sup>3</sup>0.02 GHz with Alternate IF ON.

<sup>4</sup>A simple modification is required for 8559A plug-ins with serial prefix 2208A and lower (modification kit, HP part number 00853-60059).