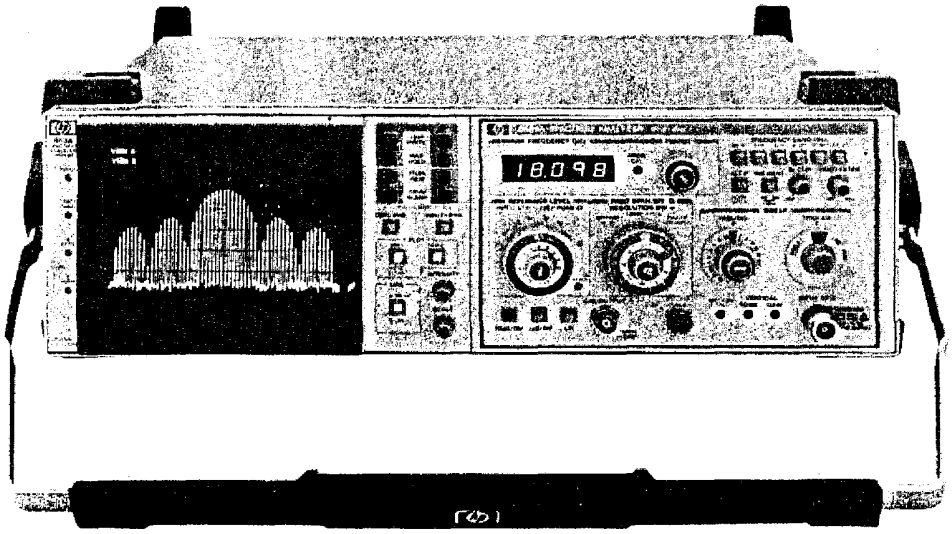
SIGNAL ANALYZERS

Microwave Spectrum Analyzer, 10 MHz to 21 GHz

Model 8559A and 853A

- Portable
- Simple three-knob operation
- Direct plotter control
- Display annotation and storage
- Digital display with trace arithmetic
- Resolution bandwidths from 1 kHz to 3 MHz



HP 8559A and 853A

DESIGNED FOR HP-IB SYSTEMS

HP 8559A/853A Spectrum Analyzer

Performance Plus Economy

The excellent performance and convenient operation of this economical spectrum analyzer make it ideal for a variety of applications in production, R & D, and field-service measurements. The HP 8559A/853A covers the frequency range from 10 MHz to 21 GHz.

Simple 3-Knob Operation

Preset this spectrum analyzer to color-coded, "basic-operation" settings and use the coupled controls to make most measurements in three easy steps. Tune to a signal; the LED readout displays its frequency. Zoom in on the signal by reducing span width; the resolution bandwidth, video filter, and sweeptime automatically change to an optimum value for a calibrated display. Then, adjust the reference level to bring the peak of the signal to the top of the screen for the most accurate amplitude measurement.

Digital Display

The HP 853A is a digital display mainframe for use with the HP 8557A, 8558B, and 8559A spectrum analyzer plug-ins. 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 (via the front panel) to built-in test routines for display calibration and testing.

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 using the front-panel buttons of the HP 853A. A controller is not required. Although analyzer controls are not themselves programmable, the HP-IB can be used for applications that include using a controller to record trace data and to prompt the operator on the HP 853A CRT. The digital display and processing functions can be remotely programmed, and the analyzer sweeps can be initiated over the HP-IB.

Two Configurations

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

HP 11870A Low Pass Filter

For RF measurement applications needing extended coverage to 2.6 GHz, the HP 11870A Low Pass Filter rejects signals above 3 GHz by more than 60 dB for image-free measurements over the entire 10 MHz to 26 GHz range.

HP 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, $<\pm$(1 MHz + 0.3% of center frequency); 3 to 21 GHz, $<\pm$(5 MHz + 0.2% of center frequency).
Frequency span accuracy: $<\pm$5% of displayed frequency separation.

Spectral Resolution

Resolution bandwidths: 8 selectable, 3-dB resolution 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 $<\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: <2 kHz p-p in 0.1 second.
Noise sidebands: $\geq$70 dB down, $\geq$30 kHz from center of CW signal with 1 kHz resolution bandwidth and video filter at Max.

SIGNAL ANALYZERS

Microwave Spectrum Analyzer, 10 MHz to 21 GHz (cont'd)

Model 8559A and 853A

Amplitude Specifications

Amplitude range: −111 to +30 dBm.

Maximum Input (Safe) Levels

Total power: +20 dBm (100 mW, 2.2 V RMS) with 0 dB input attenuation; +30 dBm (1 W, 7.1 V RMS) with ≥10 dB input attenuation.

Voltage: ±7.1 V dc or 7.1 V RMS (<100 Hz).

Peak pulse power: +50 dBm (100 W, 10 sec pulse width, 0.01% duty cycle) with ≥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 video filtering at MAX.

Frequency Range (GHz)	Avg. Noise Level (dBm/1 kHz)	Frequency Response (± dB max.)	Amplitude Accuracy[1] (± 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 ±0.3 dB (into 50 ohms), 35 MHz ±400 kHz.

Reference level: 10 dB steps and 12 dB vernier for calibrated adjustment from −112 dBm to +60 dBm[2].

Step accuracy (with 0 dB input attenuation): −10 to −80 dBm, ±0.5 dB; −10 to −100 dBm, ±0.5 dB.

Vernier accuracy: ±0.5 dB.

Frequency Response: see table above; includes input attenuator, mixer flatness, and mixer-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: <±1.0 dB per 10 dB step (0 to 60 dB, 0.01 to 18 GHz).

Maximum cumulative error: <±2.4 dB (0 to 60 dB, 0.01 to 18 GHz).

Bandwidth Switching (Amplitude Variation)

3 MHz to 300 kHz: <±0.5 dB.

3 MHz to 1 kHz: <±1.0 dB.

Display Fidelity

Log incremental accuracy: ±0.1 dB/dB from Reference Level.

Log maximum cumulative error: ≤±1.5 dB over 70 dB range.

Linear accuracy: ±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 ≥50 kHz with 0 dB input attenuation.

Residual responses: <−90 dBm with 0 dB input attenuation and no signal present at input (0.01[3]-3 GHz, 6-9 GHz).

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

Sweep Characteristics

Sweep Time

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

Calibrated sweep times: 2 usec to 10 sec/div in a 1,2,5 sequence (except 2 sec/div), ±10% accuracy (±20% for 5/10 sec/div).

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

Signal Input Characteristics

Input Impedance: 50 ohm nominal, precision type-N female connector.

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

Digital Display

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

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

Internal service routines: front-panel buttons access test routines for maintenance of digital hardware.

HP-IB

Direct plotter control: all displayed information transferable to HP-IB plotter using front-panel buttons.

Controller interface functions:

Trace data transfer: all trace data values are transferable to or from HP 853A with 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.

HP-IB interface functions: SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0, and E2.

Output Characteristics (Rear Panel)

Vertical output, AUX A: BNC output (50 ohms) provides detected video from 0 to 0.8 V for 8 divisions deflection on CRT display.

Penlift/blanking, AUX B: BNC output provides 0 V pendown/blanking signal at low impedence; 15 V penlift/unblanking at 10 k-ohm impedance.

21.4 MHz IF output, AUX C: BNC output (50 ohms) provides signal proportional to RF input. Level is about −10 dBm (into 50 ohms) with signal displayed at Reference Level. Output controlled by settings of RES BW, Input Atten, and Ref Level.

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

HP-IB interface port: 24-pin connector provides digital interface for IEEE 488-1978 standard parallel bus.

General

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 Messemfaenger 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 HP 853A: 100, 120, 220, or 240 Vac, +5%, −10%.

Weight

HP 8559A: net, 5.5 kg (12 lb). Shipping, 9.1 kg (20 lb).

HP 853A: net, 15.9 kg (35 lb). Shipping, 17.3 kg (38 lb).

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

Size

HP 853A/Plug-in: 158.8mm H x 501.7mm W x 524.5mm D (6.25" x 19.75" x 20.65").

HP 853A Opt. 011/Plug-in: 133mm H x 425.5mm W x 473.3mm D (5.25" x 16.75" x 18.65").

Ordering Information

	Price
HP 8559A Spectrum Analyzer	$12,345
Opt. 910: extra Operating and Service Manual	add $20
HP 853A Portable Spectrum Analyzer Display	$6,000
Opt. 001: full module bench/rack configuration	less $200
Opt. 910: extra Operating and Service Manual	$10

[1] Using IF substitution, total accuracy is sum of frequency response, calibration, and reference level errors.

[2] Input level not to exceed maximum levels.

[3] 25 MHz with Alternate IF ON.