

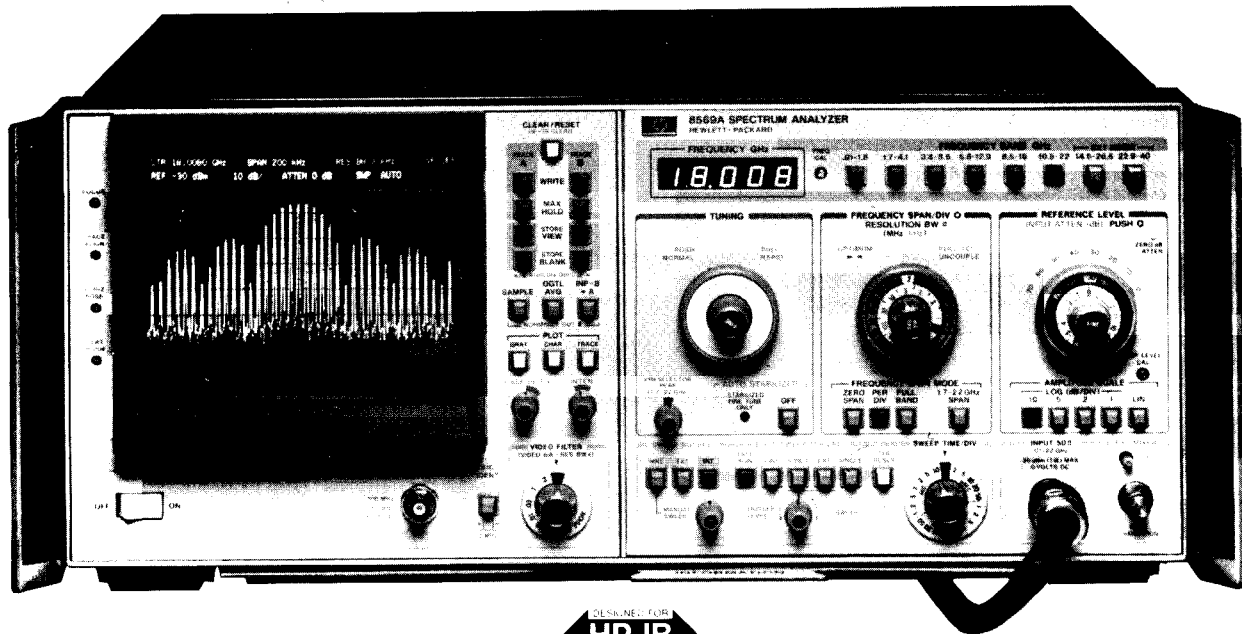
SIGNAL ANALYZERS

Microwave Spectrum Analyzer, 10 MHz to 40 GHz

Model 8569A

- 10 MHz to 22 GHz, external mixing to 170 GHz
- Simplified three knob operation
- Internal preselection, 1.7 to 22 GHz

- Wide resolution range, 100 Hz to 3 MHz
- Digital display of traces, control settings
- Unique HP-IB display interface



8569A Spectrum Analyzer

High performance and simple operation are combined with unique new microprocessor-controlled capabilities in the 8569A Microwave Spectrum Analyzer. Excellent sensitivity and internal preselection assure the wide, spurious-free measurement range necessary for production applications, while the digital display and coupled controls speed measurement routines. The internal frequency range of 10 MHz to 22 GHz is extendable to 40 GHz using the 11517A Opt. E03 External Mixer and to 170 GHz with other commercially available external mixers as described in Application Note 150-14. For semi-automatic operation, connect a desktop computer to the 8569A via HP-IB to allow access to the displayed trace data and the control settings necessary to analyze or record measurements, or display operator messages and prompts on the CRT. Direct, hard copy output to a digital plotter is possible without the need of a controller or programming.

Wide Range of Signal Resolution

Optimum resolution is possible for a wide range of signal characteristics with ten IF filters available from 100 Hz to 3 MHz. Fully automatic stabilization in narrow spans reduces residual FM to allow accurate measurements of closely spaced signals using the narrow bandwidths. The wide 1 and 3 MHz resolution bandwidths allow fast sweeps in wide spans and increased dynamic range for pulsed RF applications. All resolution filters are Gaussian-shaped for repeatable measurements, faster non-distortion sweep speeds, and best pulse response.

High Accuracy and Wide Dynamic Range

Absolute signal levels from -123 to +30 dBm are easily and accurately measured using IF substitution because the 8569A displays the reference level value directly on the CRT above the graticule. Damage to the mixer is prevented for signal levels of +30 dBm with a built-in limiter below 1.8 GHz and a preselector from 1.7 to 22 GHz. The internal preselector also assures maximum use of this wide measurement range by reducing internal distortion products as much as 120 dB. In addition, flat frequency response insures accuracy for relative as well as absolute power measurements.

Convenient Operation with Digital Display

Preset the 8569A to the color-coded, "basic operation," settings and use the coupled controls to make most measurements in three easy

steps: tune to the signal, select a span and raise it to the reference level. While in the AUTO sweeptime position, a calibrated amplitude display is insured. However, the microprocessor also monitors manually-selected sweeptimes and displays a warning if the sweep speed chosen is too fast for calibrated measurements. Signals are displayed on either of two independent digitally stored traces with all major control settings annotated above the graticule area. Display processing capabilities include Max Hold, digital averaging and trace normalization for extended measurement capability.

HP-IB Includes Direct Plotter Control

A hard-copy record of the displayed traces, control settings and graticule can be made on a digital plotter via HP-IB quickly and simply using the 8569A's front-panel pushbuttons without need for a controller. For maximum capability, attach a controller to the 8569A to read the trace data and control settings for a measurement analysis or recording on tape. Also, you can illustrate the test parameters for each measurement with display lines and instruct the operator with messages on the CRT. The controller can verify correct control settings before taking the test data or going on to the next step.

8444A Option 059 Tracking Generator

Characterize the frequency response of devices up to 1500 MHz by using the 8444A Option 059 Tracking Generator with the 8569A. Dynamic range is greater than 90 dB and system response errors can be removed using trace normalization. In addition, increase the analyzer's frequency accuracy to ± 10 kHz using a counter with the tracking generator. To configure a stimulus response system above 1500 MHz see Application Note 150-13.

8569A Specifications

Frequency Specifications

Frequency range: 0.01 to 22 GHz with internal mixer, 14.5 to 40 GHz with HP 11517A Opt. E03 External Mixer. Extendable to 170 GHz with commercially available mixers.

Tuning accuracy (digital frequency readout in any span mode)

Internal mixing, 0.01 to 22 GHz: ± 5 MHz or 0.2% of center frequency, whichever is greater, +20% of Frequency Span/Div).

External mixing, 14.5 to 40 GHz: $\pm (0.7\%$ of center frequency +20% of Frequency Span/Div).



Frequency Spans

1.7 to 22 GHz: multiband span from 1.7 to 22 GHz in one sweep.

Full band: displays spectrum of entire band selected.

Per division: 1 kHz to 500 MHz/div in a 1, 2, 5 sequence.

Span width accuracy: $\pm 5\%$, 500 MHz to 20 kHz/div unstabilized; $\pm 15\%$, 100 kHz to 1 kHz/div, stabilized.

Zero span: analyzer becomes a manually tuned receiver.

Spectral Resolution and Stability

Resolution bandwidths: resolution (3 dB) bandwidths from 100 Hz to 3 MHz in 1, 3, sequence. Bandwidth and span width are independently variable or may be coupled for optimum display when control markers are aligned ($\blacktriangleright\blacktriangleleft$).

Resolution bandwidth accuracy: 3 dB points are $\pm 15\%$.

Selectivity: (60 dB/3 dB bandwidth ratio): $<11:1$, 100 Hz to 1 kHz; $<15:1$, 3 kHz to 3 MHz.

Total residual FM: (fundamental mixing 0.01 to 4.1 GHz): <100 Hz p-p in 0.1 sec. First LO automatically stabilized for frequency spans ≤ 100 kHz/div.

Noise sidebands: > 75 dB down, ≥ 30 kHz from signal in a 1 kHz Res. Bandwidth and a 10 Hz (0.01) Video Filter.

Amplitude Specifications

Amplitude Range—Internal Mixer

Total power: +30 dBm, +137 dB μ V (1 watt).

Damage levels: (50 ohm nominal source impedance):

dc: 0 V with 0 dB input attenuation (1 amp), ± 7 V with ≥ 10 dB input attenuation (0.14 amp).

Peak pulse power: +50 dBm (<10 μ sec pulse width, 0.01% duty cycle with ≥ 20 dB input attenuation).

Gain compression: <1 dB for -7 dBm signal, 0 dB input atten.

Average noise level: see table below for max. avg. noise level with 1 kHz Res. bandwidth (0 dB Atten. and 3 Hz video filter).

Frequency Band (GHz)	First IF in MHz	Harmonic Mode	Noise Level (dBm)	Frequency Response* (\pm dB max)
0.01-1.8	2050	1-	-113	1.2
1.7-4.1	321.4	1-	-110	1.5
3.8-8.5	321.4	2-	-107	2.5
5.8-12.9	321.4	3-	-100	2.5
8.5-18	321.4	4+	-95	3.0
10.5-22	321.4	5+	-90	4.5

*Frequency response includes input attenuator, preselector and mixer frequency response plus mixing mode gain variation (band to band).

Amplitude Range—HP 11517A Opt. E03 External Mixer

Measurement range: saturation (gain compression <1 dB), -15 dBm. Damage level >0 dBm or 0.1 erg static discharge.

Sensitivity: (Average noise level in a 10 kHz IF bandwidth): 14.5-18 GHz: <-80 dBm, 18-26.5 GHz: <-70 dBm, 26.5-40 GHz: <-60 dBm. Typical sensitivity is 10 dB better for each band.

Reference Level

Reference level range: +60 dBm (+30 dBm max. input) to -112 dBm in 10 dB steps and continuous 0 to -12 dB calibrated vernier.

Reference level accuracy: Auto Sweep setting of Sweep Time/Div control insures a calibrated display within these limits:

Calibrator output: (100 MHz ± 10 kHz): -10 dBm ± 0.3 dB.

Reference level variation: (input atten. at 0 dB): 10 dB steps $< \pm 0.5$ dB, -10 to -70 dBm; $< \pm 1.0$ dB, -10 to -100 dBm).

Vernier: (0 to -12 dB continuous); maximum error ± 0.5 dB.

Input attenuator: 0-70 dB in 10 dB steps.

Step size variation: ± 1.0 dB, 0.01 to 18 GHz; ± 1.5 dB, 0.01 to 22 GHz. Maximum cumulative error: ± 2.5 dB.

Frequency response: see table above.

Switching between bandwidths: 3 MHz to 100 Hz, ± 1.0 dB.

Calibrated Display Range

Log: 1, 2, 5, and 10 dB/div over 8 divisions.

Linear: 0.56 μ V to 224 V in 50 ohm.

Display accuracy

Log: ± 0.1 dB/dB; maximum cumulative error: ± 1.5 dB.

Linear: $< \pm 3\%$ over full 8 division deflection.

Residual responses: (no signal present at input): <-90 dBm.

Signal Identifier: available over full tuning range.

Signal Input Characteristics

Input SWR (input impedance 50 ohm nominal)

Input atten. at 0 dB: <1.5 , 0.01-1.8 GHz; <2.0 , 1.7-22 GHz.

Input atten. at ≥ 10 dB: <1.3 , 0.01-1.8 GHz; <2.0 , 1.7-22 GHz.

LO Emission: (1.4 to 5.2 GHz): <-60 dBm, 0.01 to 1.8 GHz; <-80 dBm, 1.7 to 22 GHz.

Input protection: (for input signals from 0.01 to 22 GHz)

0.01 to 1.8 GHz: internal diode limiter.

1.7 to 22 GHz: preselector protects mixer to +30 dBm.

External mixer input: SMA female connector is a port for LO power transfer, bias current and IF return.

Sweep Specifications

Sweep Time

Auto: sweep time is automatically controlled by Frequency Span/Div, Resolution Bandwidth and Video Filter controls to maintain an absolute amplitude calibrated display.

Calibrated sweep times: 2 μ sec to 10 sec/div in 1, 2, 5 sequence.

Digital Display

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

Control readout: major control settings annotated on the CRT include Center or Marker frequency, Frequency Span/Div, Resolution BW, Video Filter, Reference Level, Scale Factor, RF Input Attenuator and Sweep Time/Div.

Signal processing: Max Hold, trace normalization, sample detection mode, digital avg. and dB μ V Reference Level readout.

Internal service routines: front-panel pushbuttons access test patterns 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 an 8569A with a controller.

Control readout: all displayed control settings can be transferred to a controller to check measurement conditions.

Input messages: controller-input instructions or annotation can be displayed within two 63 character lines on the CRT.

Sweep control: sweeps can be initiated and monitored.

Note: HP-IB cables are not supplied with the 8569A.

General Specifications

Temperature range: operating 0° to $+55^\circ$ C, storage -40° to $+75^\circ$ C.

Humidity range: (Operating): 95% R.H., 0° C to 40° C.

EMI: Conducted and radiated interference is in compliance with MIL-STD 461A Methods CE03 and RE02, CISPR Publication 11 (1975), and Messemphaenger-Postverfuegung 526/527/79 (Kennzeichnung Mit F-Nummer/Funkschutzzeichen).

Power requirements: 48-66 Hz, 100, 120, 220 or 240 volts (-10% to $+5\%$, 280 VA max (400 Hz operation available as Opt 400).

Size: 188 H x 426 W x 552 mm D (7" x 16.8" x 21.8").

Weight: net 29.2 kg (64 lb). Shipping 41 kg (90 lb).

Standard Options Available

Opt 001, Internal Comb Generator: 100 MHz comb signals visible through 22 GHz for increased frequency accuracy (error $<0.007\%$) and preselector peaking verification.

Opt 002, Delete 100, 300 Hz Bandwidths: standard specifications apply except minimum resolution bandwidth is 1 kHz with 15:1 shape factor, residual FM <200 Hz when stabilized.

Opt 400-400 Hz Power Supply.

Part No. 1450-0654—Transit Case: Order Part No. 1490-0913 also for castors.

Ordering Information

8569A Spectrum Analyzer **Price**

Opt 001: Internal Comb Generator **\$26,500**

Opt 002: Delete 100, 300 Hz Bandwidths **\$1,425**

Opt 400: Internal 50 to 400 Hz Power Supply **less \$800**

Opt 908: Rack Flange Kit Without Handles **\$350**

Opt 910: Extra Operating & Service Manual **\$30**

Opt 913: Rack Flange Kit with Handles **\$50**

11517A Opt E03 External Mixer (taper sect. req'd) **\$33**

11518A: E03 Section, 12.4 to 18.0 GHz **\$450**

11519A: Taper Section, 18.0 to 26.5 GHz **\$195**

11520A: Taper Section, 26.5 to 40.0 GHz **\$195**

8444A Opt 059 Tracking Generator **\$4,450**