

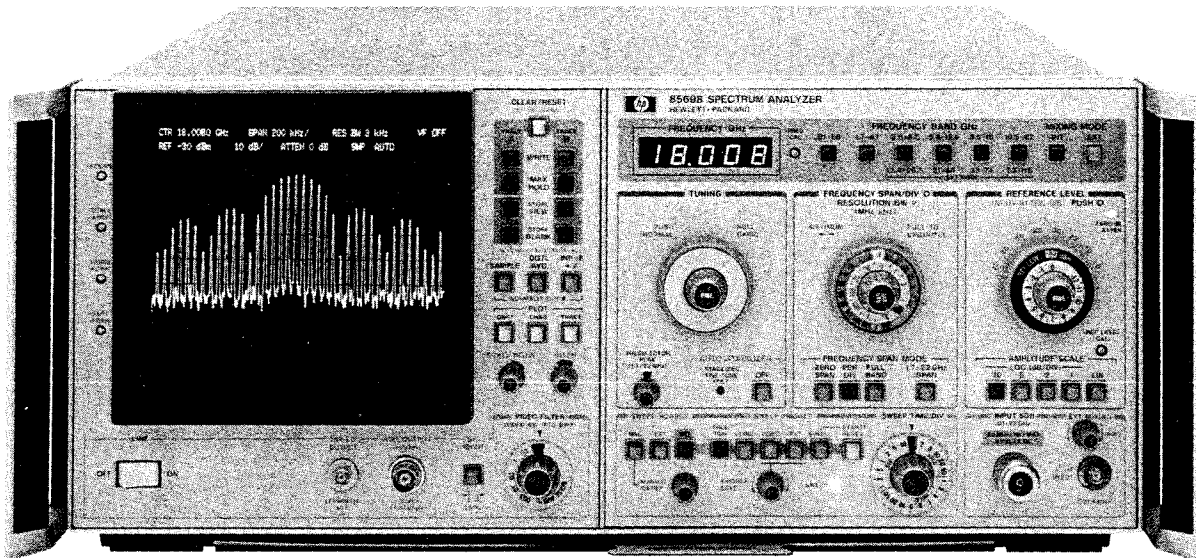
# SIGNAL ANALYZERS

## Microwave Spectrum Analyzer, 10 MHz to 115 GHz

Model 8569B

689  
hp

- 0.01 to 22 GHz, external mixing to 115 GHz & above
- Internal preselection, 1.7 to 22 GHz
- Wide resolution range, 100 Hz to 3 MHz
- Simple three knob operation
- Digital display of dual traces and control settings
- Direct plotter output - no controller needed



HP 8569B



### HP 8569B Spectrum Analyzer

High performance and simple operation are combined with unique microprocessor-controlled capabilities in the HP 8569B 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 extended using external mixers: to 40 GHz in two bands with the HP 8569B Option E02; to 71 GHz with other new HP 11971 series mixers; and to 115 GHz with other commercially available mixers. For more information on external harmonic mixers see page 693. For semi-automatic operation, connect a desktop computer to the HP 8569B 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 any 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 undistorted sweeps, 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 HP 8569B 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 ensures maximum use of this wide measurement range by reducing internal distortion products as much as 120 dB. In addition, flat frequency response ensures accuracy for relative as well as absolute power measurements.

### Convenient Operation with Digital Display

Preset the HP 8569B 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 ensured. 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 HP 8569B's front-panel pushbuttons without need for a controller. For maximum capability, attach a controller to the HP 8569B 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 analyzer CRT. The controller can verify correct control settings before taking the test data or going on to the next step.

### HP 8444A Option 059 Tracking Generator

Characterize the frequency response of devices up to 1500 MHz by using the HP 8444A Option 059 Tracking Generator with the HP 8569B. 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  $\pm 10$  kHz using a counter with the tracking generator.

### HP 8569B Specifications

#### Frequency Specifications

**Frequency range:** 0.01 to 22 GHz with internal mixer. 18 to 40 GHz with HP 8569B Option E02. Extendable to 71 GHz with new HP 11971 Q/U/V Mixers. Extendable to 115 GHz with commercially available mixers. See page 693 for more information on external mixers.

**Tuning Accuracy** (digital frequency readout in any span mode)

**10 MHz to 115 GHz:**  $\pm(5$  MHz or 0.2% of center frequency, whichever is greater, +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 (▶◀).

**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 second. First LO automatically stabilized for frequency spans  $\leq 100$  kHz/div.

**Noise sidebands:**  $> 75$  dB down,  $\geq 30$  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 $\mu$ V (1 watt).

**Damage levels:** (50 ohm nominal source impedance):

**dc:** 0 V with 0 dB input attenuation (1 A),  $\pm 7$  V with  $\geq 10$  dB input attenuation (0.14 A).

**Peak pulse power:** +50 dBm ( $< 10$   $\mu$ s pulse width, 0.01% duty cycle with  $\geq 20$  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
12.4-26.5	321.4	6+	Use HP 11971 Series Mixers to 71 GHz and commercially available mixers to 115 GHz. Refer to page 693.	
21-44	321.4	10+		
33-71	321.4	16+		
53-115	321.4	26+		

\*Frequency response includes input attenuator, preselector and mixer frequency response plus mixing mode gain variation (band to 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  $\pm 10$  kHz):  $-10$  dBm  $\pm 0.3$  dB.

**Reference level variation:** (input atten. at 0 dB, 20° to 30°C):  $-10$  to  $-70$  dBm:  $\pm 0.5$  dB;  $-80$  to  $-100$  dBm:  $\pm 1.0$  dB.

**Vernier:** (0 to  $-12$  dB continuous); maximum error  $\pm 0.5$  dB.

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

**Step size variation:**  $\pm 1.0$  dB, 0.01 to 18 GHz;  $\pm 1.5$  dB, 0.01 to 22 GHz. Maximum cumulative error:  $\pm 2.5$  dB.

**Frequency response:** see table above.

**Switching between bandwidths:** 3 MHz to 100 Hz,  $\pm 1.0$  dB.

### Calibrated Display Range

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

**Linear:** 0.56  $\mu$ V to 224 V in 50 ohm.

### Display Accuracy

**Log:**  $\pm 0.1$  dB/dB; maximum cumulative error  $\pm 1.5$  dB.

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

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

**Signal identifier:** available from 10 MHz to 115 GHz.

### Signal Input/Output 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  $\geq 10$  dB:**  $< 1.3$ , 0.01-1.8 GHz;  $< 2.0$ , 1.7-22 GHz.

**LO emission from RF input** (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.

**321.4 MHz IF input:** SMA female connector is a port for bias current output ( $\pm 5$  mA) and IF return from an external mixer.

**LO output:** 2 to 4.46 GHz with minimum power of +8 dBm.

### 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  $\mu$ s to 10 s/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 $\mu$ 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 by using only front-panel pushbuttons.

#### Controller Interface Functions

**Trace data transfer:** all trace data values can be transferred to or from an HP 8569B 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 analyzer CRT.

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

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

#### HP-IB Interface Functions

AH1, DC1, L4, SH1, T7. For more information on these codes, refer to the HP-IB section of this catalog.

#### General Specifications

**Temperature range:** operating 0° to +55°C, storage -40° to +75°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 Messempfaenger-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  $< 0.007\%$ , typically  $\pm 1$  MHz at 22 GHz) 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 003, High Power LO:** provides  $\geq +14$  dBm for direct use with mixer (e.g. HP 11971 series).

**Opt 400, 50 to 400 Hz Power Supply**

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

#### Ordering Information

HP 8569B Spectrum Analyzer \$31,000

Opt 001: Internal Comb Generator add \$1,425

Opt 002: Delete 100, 300 Hz Bandwidths less \$800

Opt 003: High Power LO Output add \$1,000

Opt 400: 50 to 400 Hz Power Line Operation add \$350

Opt 908: Rack Flange Kit Without Handles add \$35

Opt 910: Extra Operating & Service Manual add \$50

Opt 913: Rack Flange Kit with Handles add \$40

Opt E02: Extend frequency range to 40 GHz add \$4,200

HP 8444A Opt 059 Tracking Generator \$4,760

HP 11971 Series Mixers extend frequency range to 71 GHz. See page 693.