**SIGNAL ANALYZERS**

Microwave Spectrum Analyzer, 10 MHz to 115 GHz

Model 8569B

- 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 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: 40 GHz in two bands with the HP 8569B Option E02, 71 GHz with 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 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 the 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 sweep 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 1.500 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 ±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: ±(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, 0.5 MHz, 5 MHz (in 1, 1, 2 sequence). 20 kHz/div unstabilized; 0.5 MHz, 100 kHz to 2 kHz/div stabilized.
Zero span: analyzer becomes a manually tuned receiver.

Spectral Resolution and Stability
Resolution bandwidth: resolution (3 dB) bandwidths from 100 Hz to 3 MHz in 1, 1, 2 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 ±15%.
Selectivity: (60 dB/3 dB bandwidth ratio): <11.1, 100 Hz to 1 kHz, <15, 1.5 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 frequencies span 100 kHz/div.
Noise sidebands: >75 dB down, ≥30 kHz frequency 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 dBmV (1 watt).
Damage levels: (50 ohm nominal source impedance):
dc 0 V with 0 dB input attenuation (A1), >7 V with ≥10 dB input attenuation (A14).
Peak pulse power: +50 dBm (<10 μs 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. average noise level with 1 kHz Res. bandwidth (0 dB attenu. and 3 Hz video filter).

<table>
<thead>
<tr>
<th>Frequency Band (GHz)</th>
<th>First IF in MHz</th>
<th>Harmonic Mode</th>
<th>Noise Level (dBm)</th>
<th>Frequency Response (dB max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01-1.8</td>
<td>2050</td>
<td>1</td>
<td>–113</td>
<td>12</td>
</tr>
<tr>
<td>1.2-5</td>
<td>3214</td>
<td>1</td>
<td>–110</td>
<td>1.5</td>
</tr>
<tr>
<td>3.8-8</td>
<td>3214</td>
<td>2</td>
<td>–129</td>
<td>10.5</td>
</tr>
<tr>
<td>5.3-12</td>
<td>3214</td>
<td>3</td>
<td>–100</td>
<td>≥20 dB input attenuation</td>
</tr>
<tr>
<td>8.5-13</td>
<td>3214</td>
<td>4</td>
<td>–95</td>
<td>≤20 dB input attenuation</td>
</tr>
<tr>
<td>10.5-22</td>
<td>3214</td>
<td>5</td>
<td>–90</td>
<td>≥20 dB input attenuation</td>
</tr>
<tr>
<td>12.4-19</td>
<td>3214</td>
<td>6</td>
<td>–90</td>
<td>≥20 dB input attenuation</td>
</tr>
<tr>
<td>21-24</td>
<td>3214</td>
<td>10</td>
<td>–95</td>
<td>≤20 dB input attenuation</td>
</tr>
<tr>
<td>33-71</td>
<td>3214</td>
<td>16</td>
<td>–115</td>
<td>≥20 dB input attenuation</td>
</tr>
<tr>
<td>53-115</td>
<td>3214</td>
<td>26</td>
<td>–95</td>
<td>≤20 dB input attenuation</td>
</tr>
</tbody>
</table>

*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 ± 10 kHz): –10 dBm ±0.3 dB.
Reference level variation: (input atten. at 0 dB, 20° to 30°C): –10 to –70 dBm: ±0.5 dB, –80 to –100 dBm: ±1.0 dB.
Vernier: (0 to –12 dB continuous); maximum error ±0.5 dB.
Input attenuator: 0 to 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 accuracy: 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 μV to 224 V in 50 ohm.
Display Accuracy
Log: ±0.1 dB: maximum cumulative error ±1.5 dB.
Linear: ±2% 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 ≥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.
35 MHz IF input SMA female connector is a port for bias current output (≤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 Spans/Div, Resolution Bandwidth and Video Filter controls to maintain an absolute amplitude calibrated display.
Calibrated sweep times: 2 μs to 10 s/div in 1, 2, 5 sequence.

Digital Display
Traces: dual trace, digitally stored display with a resolution of 481 horizontal by 501 vertical points for each trace.
Control readout: major control settings annotated on the CRT include Center or Marker frequency, Frequency Spans/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 dBV 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 Messenphaser-Postverfung 526/527/79 (Kennzeichnung Mit F-Nummer/Funkschutzzeichen).
Power requirements: 85–265 V, 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 ±1 MHz at 22 GHz) and preselector peaking verification.
Opt 002, Delete 100, 300 Hz Bandwidth: 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 ≥14 dBm for direct use with mixer (e.g. HP 11971 series).
Opt 400, 50 to 400 Hz Power Supply
HP Part No. 1450–0854—Transit Case: Order HP Part No. 1490–0913 also for castors.

Ordering Information
HP 8569B Spectrum Analyzer
Price
– $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: 90 to 400 Hz Power Line Operation
add $350
Opt 89: Rack Flange Kit Without Handles
add $50
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.