HEWLETT hp PACKARD

SPECTRUM ANALYZER
0.01 to 40 GHz

model 8565A

TECHNICAL DATA 1 MAR 77

ACCURACY PLUS CONVENIENCE
in Spectrum Analysis 0.01 to 22 GHz

to 40 GHz with external mixer

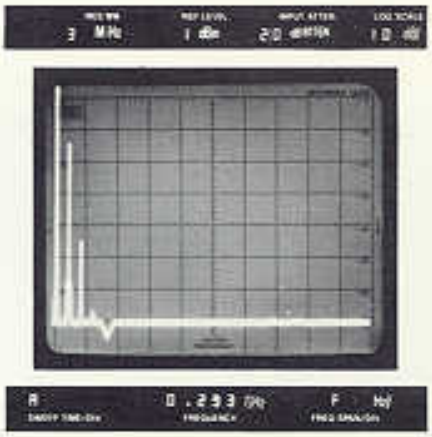
Wide range spurious-free displays for confidence in measurements. Well-suited for lab, production or field measurements from IF through microwave.

WIDE FREQUENCY COVERAGE

10 MHz to 22 GHz in two spans

Plus octave-wide bands for rapid signal location prior to close-in analysis.

Gives you full frequency coverage necessary for evaluating all portions of your microwave system. Digital frequency display of tunable marker also works in Full Spans for individual octave-plus Frequency Bands.

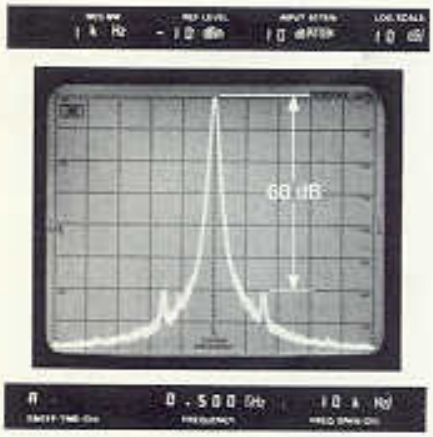


10 MHz to 1.8 GHz

1.7 to 22 GHz

Microwave Satellite Down Link IF (above) and Carrier (right).

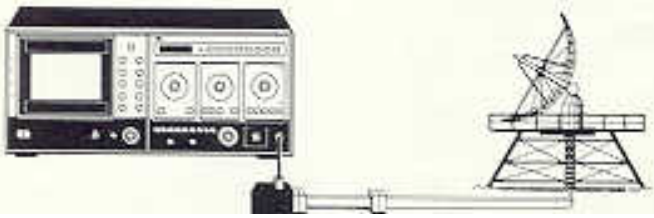
Zoom-in for detailed analysis

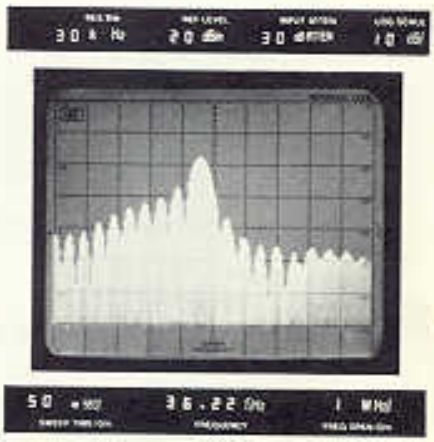


Start with spans as wide as 500 MHz/Div and then narrow down to 1 kHz/Div. No need to re-adjust resolution since the eight resolution bandwidths from 3 MHz to 1 kHz in a 1, 3, 10 sequence can be coupled to the Frequency Span/Div control to automatically give the optimum display: wide bandwidths for rapid sweeps over broad frequency spans; narrow bandwidths for measurement of closely spaced signals. All are gaussian type filters for repeatable measurements with faster non-distorting sweeps and best pulse response. Resolution bandwidths need not always be coupled to frequency span (yet optimum sweep time is automatically retained). For example, using the HP 8565A as a receiver in Zero Span with a 3 MHz bandwidth you can accommodate signals with wide transmission and modulation bandwidths. Low internal noise sidebands let you make full use of resolution selectivity. Fully automatic stabilization in narrow spans holds residual FM to less than 200 Hz (fundamental mixing). You can see low-level sidebands that are close-in to the carrier. Here we can clearly see a pair of 15 kHz sidebands 60 dB down on an oscillator.

Extended coverage to 40 GHz with the HP 11517A external mixer

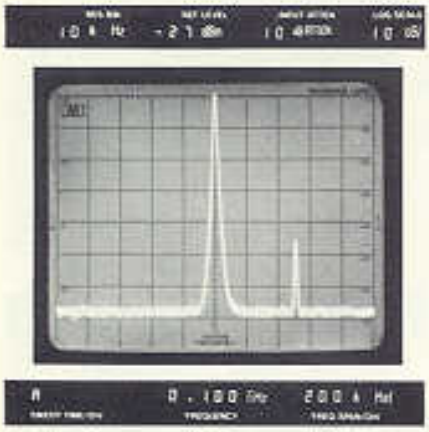
Direct frequency readout and Signal Identifier provide confidence in measurements. By using the wide 3 and 1 MHz bandwidths you gain increased sensitivity for narrow pulse (< 10 nsec) measurements.





ACCURATE AMPLITUDE MEASUREMENTS

Absolute amplitude calibration



Power Reference Level is automatically displayed in dBm for all Input attenuator and IF gain settings. Therefore, a direct reading of signal power can be made on the CRT.

ACCURACY

Furthermore, IF substitution can be used to place signals as low as −102 dBm on the Reference Level, taking advantage of the accuracy inherent in the HP 8565A.

Accuracy to minimize the uncertainty of power measurements

Frequency Range	Total Uncertainty is within
0.01 to 1.8 GHz	±2.5 dB
0.01 to 4.1 GHz	±3.0 dB
0.01 to 8.5 GHz	±3.5 dB
0.01 to 12.9 GHz	±3.8 dB
0.01 to 18.0 GHz	±4.3 dB
0.01 to 22.0 GHz	±5.8 dB

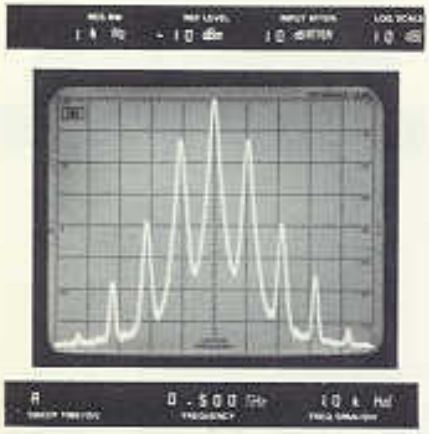
Excellent Frequency Response...

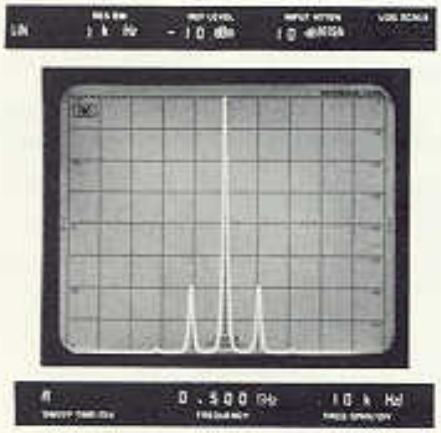
. . . Including *all* input circuitry (RF attenuator, preselector and mixer) as well as Frequency Band gain variations:

Frequency Range	Flatness is within
0.01 to 1.8 GHz	±1.2 dB
0.01 to 4.1 GHz	±1.7 dB
0.01 to 8.5 GHz	±2.2 dB
0.01 to 12.9 GHz	±2.5 dB
0.01 to 18.0 GHz	±3.0 dB
0.01 to 22.0 GHz	±4.5 dB

All signal level comparisons benefit from this flat frequency response.

Choice of scale factors

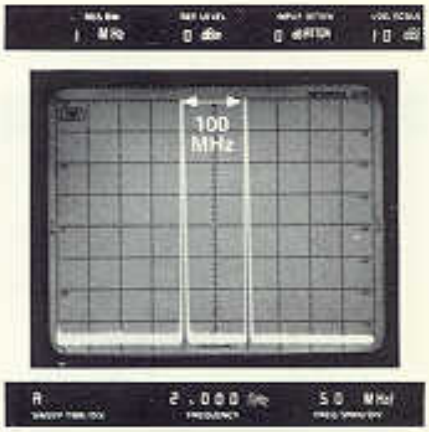




Relative measurements are easier with a choice of 10, 5, 2, 1 dB/Div and linear amplitude scale factors. In addition, the Reference Level remains constant so that absolute power comparisons can be made with enhanced amplitude resolution.

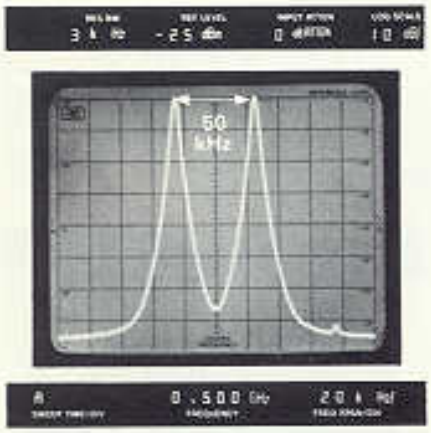
WIDE DYNAMIC RANGE

Amplitude measurement over a 140 dB range +30 dBm to -110 dBm.



Internal preselection

Measure distortion products as small as 100 dB down. The Signal Identifier, available on all bands 0.01 to 40 GHz, allows identification of all applied signals.

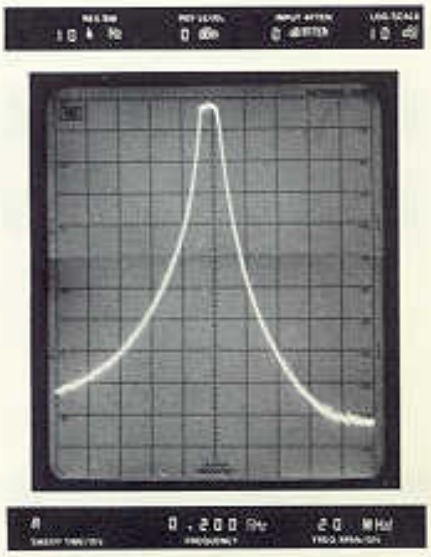


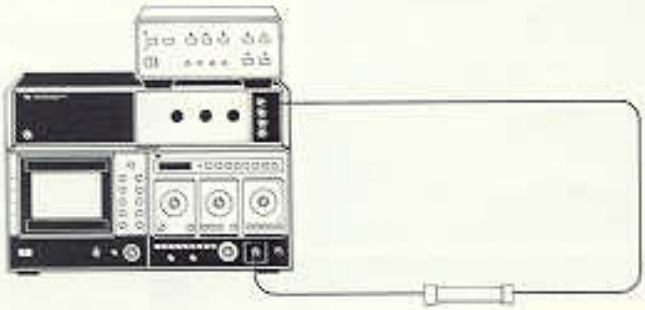
Low distortion

All internal distortion products are greater than 70 dB down for the entire 0.01 to 22 GHz range. You are assured of this capability even for 1 watt input signals with the 70 dB input attenuator.

Swept Frequency Response

A companion tracking generator, the HP 8444A Opt 058 (10 to 1300 MHz), acts as a known source whose output is flat to ±0.5 dB. Because it tracks with the HP 8565A Spectrum Analyzer tuning, you can perform swept transmission measurements over greater than a 90 dB range as well as swept reflection measurements. Both of these measurements are free from effects of harmonics and other spurious responses. This composite photo shows the response of a 200 MHz Bandpass filter using the digital storage provided by the HP 8750A Storage-Normalizer.





DESIGNED FOR CONVENIENCE

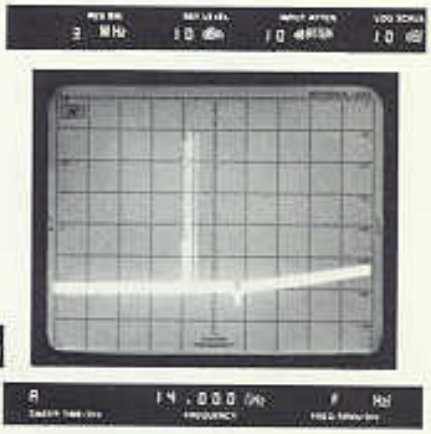
Three knob operation

Coupled controls to make most measurements in three simple steps.

Green color coded settings on other controls preset the 8565A for normal operation.

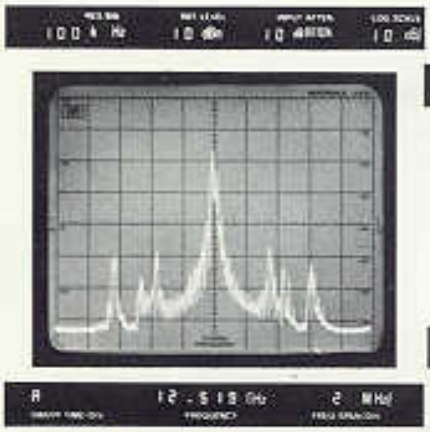
1 TUNE TO SIGNAL

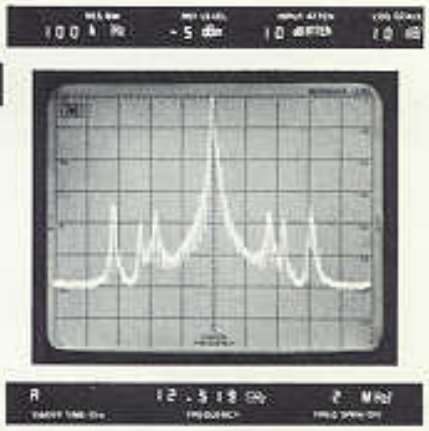
Scan a full band and center marker notch under signal with the tuning control. Marker (and signal) frequency is then given by both the panel and CRT Bezel readouts.



2 ZOOM-IN...

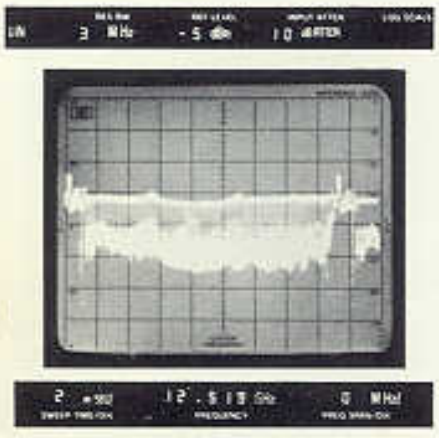
... by reducing to desired frequency span, Resolution Bandwidth, Sweep Time and Video Filtering are automatically set to maintain a calibrated display. Tuning control can be used to refine signal tuning.





3 SET AMPLITUDE LEVEL

Raise the signal to the reference line on the CRT with the Reference Level control. Read its amplitude at the Reference Level control or from the Ref Level LED's at the top center of the CRT bezel. This example shows a microwave relay signal measured at 12.519 GHz (±.025 GHz) and −5 dBm (±3.8 dB).



CALIBRATED SWEEP TIMES

Zero Span mode permits recovery of modulation waveforms in the time domain. Calibrated sweep times range from 10 sec/Div to 2μsec/Div. Here the analyzer displays the demodulated microwave relay signal.

PULL-OUT INFORMATION CARD

A concise source of operating instructions and control terminology is available to assist the operator. It also presents information on front panel calibration, CRT photography and linear (voltage) measurements.

SPECIFICATIONS

The following is a listing of information on the HP 8565A Spectrum Analyzer. Sections titled as specifications describe the instrument's guaranteed performance. Those sections titled as characteristics are intended to expand the specifications by giving typical performance parameters and to provide information useful in applying the instrument.

SPECIFICATIONS SUMMARY

FREQUENCY SPECIFICATIONS

FREQUENCY RANGE

0.01 to 22 GHz with internal mixer
14.5 to 40 GHz with HP 11517A external mixer

INTERNAL PRESELECTION

Input preselection is achieved by a low pass filter for the 0.01 to 1.8 GHz Frequency Band and by an automatic tracking preselector for the other internal mixer Frequency Bands from 1.7 to 22 GHz.

FREQUENCY SPANS

Mode:

1.7 to 22 GHz span: 1.7 to 22 GHz is spanned in one sweep.

Full Band and F (Full): Entire Frequency Band selected is spanned in one sweep.

Per Division: 1 kHz to 500 MHz/Div in a 1, 2, 5 sequence.

Zero Span: Analyzer becomes fixed-tuned receiver.

Accuracy:

Tuning (internal mixing)

0.01 to 2.5 GHz $<$ ±5 MHz ±20% of Frequency Span/Div

2.5 to 22 GHz $<$ ±0.2% ±20% of Frequency Span/Div

Stability (fundamental mixing up to 4.1 GHz)

Residual FM: Less Than 200 Hz p-p

Noise sidebands: greater than 70 dB below, 30 kHz or more from carrier in 1 kHz bandwidth with 0.01 (10 Hz) video filter.

RESOLUTION BANDWIDTHS

Bandwidth range: 1 kHz to 3 MHz in 1, 3, 10 sequence

Bandwidth shape: synchronously tuned (approximately gaussian)

Selectivity: 60 dB/3 dB ratio for all filters is $<$ 15:1

AMPLITUDE SPECIFICATIONS

MEASUREMENT RANGE

Maximum input: +30 dBm damage level

Average noise level: $<$ −106 dBm up to 4.1 GHz (in a 1 kHz bandwidth)

AMPLITUDE ACCURACY

Overall accuracy is a function of measurement technique. With the appropriate technique, the achievable absolute amplitude accuracy is the sum of:

Frequency Range (GHz)	Frequency Response (± dB max)	IF Gain Variation* (± dB max)	Calibrator Output (± dB max)	Total (± dB max)
0.01 to 1.8	1.2	1.0	0.3	2.5
1.7 to 4.1	1.7	1.0	0.3	3.0
3.8 to 8.5	2.2	1.0	0.3	3.5
5.8 to 12.9	2.5	1.0	0.3	3.8
8.5 to 18	3.0	1.0	0.3	4.3
10.5 to 22	4.5	1.0	0.3	5.8

*Over a 70 dB range.

DYNAMIC RANGE

Internal preselector (1.7 to 22 GHz) limits second harmonic distortion to greater than 100 dB below a 0 dBm signal.

INPUT CHARACTERISTICS

Input impedance: *50 ohms*

LO emission (2.00 to 4.46 GHz):

.01 to 1.8 GHz Frequency Band $<$ −50 dBm;
1.7 to 22 GHz Frequency Bands $<$ −85 dBm.

SWEEP TIME SPECIFICATIONS

Sweep time: 18 calibrated sweep times from 2 μsec/Div to 10 sec/Div in 1, 2, 5, 10 sequence. "Auto" position automatically selects the proper sweep time as a function of Frequency Span/Div, Resolution Bandwidth, and Video Filter settings to maintain a calibrated amplitude display.

DISPLAY CHARACTERISTICS

CATHODE RAY TUBE (CRT)

Persistence:

Conventional: *Natural persistence of P31 phosphor (typically 40 μs).*

Write: *Variable from approx. 0.1 sec to more than one minute.*

Storage time: *Maximum storage $>$ 30 minutes.*

CRT BEZEL READOUT

LEDs in CRT bezel indicate the value of the following settings: Tuning Frequency, Resolution Bandwidth, Frequency Span/Div, Reference Level power, Amplitude Scale factor, Sweep Time/Div, and Input Attenuation.

GENERAL SPECIFICATIONS

Power cord furnished: 2.29 m (7.5 ft) power cable is shipped with mains plug to match destination requirements.

SPECIFICATIONS

FREQUENCY SPECIFICATIONS

FREQUENCY RANGE

Internal mixer 0.01 to 22 GHz
covered in six ranges selectable by Frequency Band pushbuttons (in GHz): 0.01 to 1.8; 1.7 to 4.1; 3.8 to 8.5; 5.8 to 12.9; 8.5 to 18; 10.5 to 22.

External mixer HP 11517A 14.5 to 40 GHz
covered in two ranges selectable by Frequency Band pushbuttons (in GHz): 14.5 to 26.6 (6th harmonic mode); 22.9 to 40 (10th harmonic mode). Specifications for the HP 8565A Spectrum Analyzer with the HP 11517A External Mixer are given on page 15.

Tuning Accuracy
The overall tuning accuracy of the digital Frequency readout in any span mode:

Internal mixing
0.01 to 2.5 GHz < ±5 MHz ±20% of Frequency Span/Div
2.5 to 22 GHz < ±0.2% ±20% of Frequency Span/Div

External mixing
14.5 to 40 GHz < ±0.7% ±20% of Frequency Span/Div

Digital readout resolution (included in tuning accuracy)
Internal mixing 1 MHz; External mixing 10 MHz

FREQUENCY SPANS (on a 10 division CRT horizontal axis)

1.7 to 22 GHz
Multiband span of spectrum from 1.7 to 22 GHz in one sweep. The frequency (position) corresponding to the tuning marker is set by the Tuning control and indicated in GHz by the digital Frequency displays on the front panel and the CRT bezel.

Full Band
Displays spectrum of entire Frequency Band selected. Tuning marker displayed in Full Band mode (becomes center frequency when Per Division mode is selected). Marker frequency is given on the digital displays.

Per Division
Eighteen calibrated spans from 1 kHz/div to 500 MHz/Div in a 1, 2, 5, 10 sequence. In "F" position the entire Frequency Band selected is spanned.

Span width accuracy
The frequency error for any two points on the display for spans from 500 MHz to 20 kHz/Div is less than ±5% of the indicated separation; for stabilized spans 100 kHz/Div and less, the error is less than ±15%.

Center Frequency
The center frequency represented by the CRT is indicated in GHz by the digital Frequency displays on the front panel and the CRT bezel.

Zero Span
Analyzer becomes a manually tuned receiver (for the time domain display of signal modulation) set to the frequency indicated in GHz by the digital Frequency displays.

SPECTRAL RESOLUTION AND STABILITY

Resolution Bandwidths
Resolution (3 dB) Bandwidths from 1 kHz to 3 MHz in 1, 3, 10 sequence. Bandwidth may be varied independently or coupled to Frequency Span/Div control. Optimum coupling (best ratio of Frequency Span/Div to Resolution Bandwidth) is indicated by alignment of markers (▶◀) on both controls. Uncoupled, the controls for Freq Span/Div and Resolution Bandwidth may be independently set so any resolution bandwidth (3 MHz to 1 kHz) may be used with any span width (F and 500 MHz to 1 kHz/Div).

Resolution Bandwidth accuracy
Individual resolution bandwidth 3 dB points: < ±15%.
Selectivity: (60 dB/3 dB bandwidth ratio) < 15:1 for bandwidths 1 kHz to 3 MHz.

Stability (fundamental mixing .01 to 4.1 GHz)
Total residual FM
Stabilized < 200 Hz p-p in 0.1 sec
Unstabilized < 10 kHz p-p in 0.1 sec
Stabilization range: First LO automatically stabilized (unless auto stabilizer is OFF) for frequency spans 100 kHz/div or less.
First LO residual FM typically 30 Hz p-p when stabilized.
Noise sidebands: At least 70 dB down, greater than 30 kHz from center of CW signal when set to a 1 kHz Resolution Bandwidth and a 10 Hz (0.01) Video Filter.

Video Filter
Post detection low-pass filter used to average displayed noise for a smooth trace. Nominal settings are given as decimal fractions of the Resolution Bandwidth: OFF, 0.3, 0.1, 0.03, 0.01, and 0.003. A 1 Hz NOISE AVG (noise averaging) setting is provided for noise level measurement.

INTERNAL PRESELECTOR

Frequency Range	Description	Rejection
0.01 to 1.8 GHz	Low-pass filter	> 50 dB above 2.05 GHz
1.7 to 22 GHz	Tracking YIG tuned filter	> 70 dB greater than 642.8 MHz from center of pass band 1.7 to 18GHz, > 60 dB from 18 to 22 GHz

FREQUENCY CHARACTERISTICS

FREQUENCY SPANS

1.7 to 22 GHz
When this mode is selected the analyzer displays the entire spectrum from 1.7 to 22 GHz. A 3 MHz Resolution Bandwidth, 9 kHz Video Filter, and 100 msec/div Sweep Time are automatically selected.

Full Band
When selected by panel pushbutton, analyzer displays spectrum of Frequency Band chosen. This automatically selects a 3 MHz Resolution Bandwidth and a 9 kHz Video Filter. Sweep Time/Div varies from approximately 10 msec to 100 msec/div depending on which Frequency Band is chosen. Tuning marker frequency (position) indicates where analyzer tuning will be centered if a Per Division span mode is chosen.

Per Division
In "F" position (full band), the entire range of the Frequency Band selected is spanned, thus allowing the use of Resolution Bandwidth and Video Filter settings other than those chosen when the Full Band push button is depressed. Center frequency of the analyzer's display is set by the tuning control and indicated by the LED readouts. The Fre-

quency CAL control to the right of the display window on the front panel is used to set the LED readout to agree with the actual center frequency of the CRT display (normally set using the 100 MHz CAL OUT as a 0.100 GHz frequency reference).

Out-of-range blanking

The out-of-range portion of the CRT trace is automatically blanked whenever the analyzer is swept beyond a band edge.

RESOLUTION

Bandwidth Ranges

See Figure 1 for curves of typical analyzer resolution using different IF bandwidths.

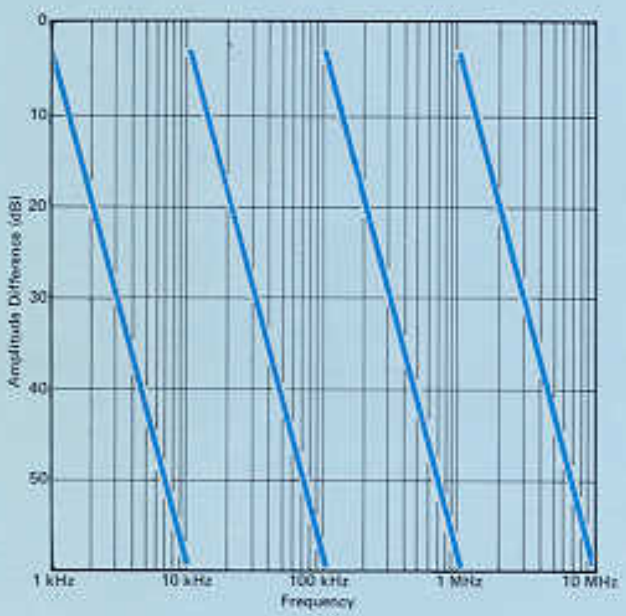


FIGURE 1. Typical Spectrum Analyzer Resolution

IF Bandwidth shape: *Approximately gaussian (synchronously tuned, 4-pole filter)*

Frequency drift (fundamental mixing, 0.01-4.1 GHz)

long term

At fixed center frequency after 2 hours warm-up:

Stabilized $< \pm 3.0$ *kHz/10 minutes*

Unstabilized $< \pm 25$ *kHz/10 minutes*

Temperature drift

Stabilized < 10 *kHz/°C*

Unstabilized < 200 *kHz/°C*

Auto stabilizer may be disabled in narrow spans (<100 kHz/Div) by depressing front panel pushbutton switch to "OFF" position.

VIDEO FILTER

Video Filter bandwidths typically ±20% of nominal value.

TRACKING PRESELECTOR

Preselector skirt roll-off: *Characteristics of a three-pole filter (nominally 18 dB/octave), 3 dB bandwidth typically varies from 25 MHz (at 1.7 GHz) to 70 MHz (at 22 GHz).*

AMPLITUDE SPECIFICATIONS

AMPLITUDE RANGE — Internal mixer

(for data on the HP 11517A external mixer, see page 15).

Measurement range:

Damage levels:

Total power: +30 dBm (1 watt)

dc: 0V with 0 dB Input attenuation

± 7V with ≥ 10 dB Input attenuation

ac: (<50Ω nominal source impedance):

0V with 0 dB Input attenuation

10V peak with ≥ 10 dB Input attenuation

Gain compression:

For signal levels below MAXIMUM input setting, gain compression is less than 1 dB.

Average noise level:

Sensitivity (minimum discernible signal) is given by the signal level which is equal to the average noise level, causing approximately a 3 dB peak above the noise. Maximum average noise level with 1 kHz Resolution Bandwidth (0 dB attenuation and 0.003 (3 Hz) video filter) is given in the table below:

Frequency Band (GHz)	First IF in MHz	Harmonic Mode	Avg. Noise Level (dBm)
.01-1.8	2050	1–	–110
1.7-4.1	321.4	1–	–106
3.8-8.5	321.4	2–	–102
5.8-12.9	321.4	3–	–92
8.5-18	321.4	4+	–83
10.5-22	321.4	5+	–72

Reference Level

Reference Level range: +70 dBm[1] to –102 dBm in 10 dB steps and continuous 0 to –12 dB calibrated vernier.

Reference Level accuracy:

With Sweep Time/Division control in Auto setting, the optimum sweep rate is selected automatically for any combination of Frequency Span/Div, Resolution Bandwidth and Video Filter settings. Thus, the Auto Sweep setting insures a calibrated amplitude display within the following limits:

Calibrator output

–10 dBm ± 0.3 dB

100 MHz ± 10 kHz

Reference Level variation (Input attenuator at 0 dB)

10 dB steps < ±0.5 dB (0 to –70 dBm)

< ±1.0 dB (0 to –90 dBm)

Vernier (0 to –12 dB) continuous: Maximum error < ±0.5 dB, when read from Reference Level Fine control.

Input Attenuator (at preselector input, 70 dB range 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 over the 0 to 70 dB range:

< ±2.1 dB 0.01 to 12.4 GHz

< ±2.8 dB 0.01 to 18 GHz

< ±4.0 dB 0.01 to 22 GHz

Frequency Response (with 0 or 10 dB of Input Attenuation)

Frequency response includes input attenuator, preselector

[1]Input level not to exceed +30 dBm damage level.

SPECIFICATIONS

and mixer frequency response plus mixing mode gain variation (band to band).

Frequency Band (GHz)	Frequency Response (± dB MAX.)
0.01 to 1.8	1.2
1.7 to 4.1	1.7
3.8 to 8.5	2.2
5.8 to 12.9	2.5
8.5 to 18	3.0
10.5 to 22	4.5

Switching between bandwidths: 3 MHz to 300 kHz, ±0.5 dB; 3 MHz to 1 kHz, ±1.0 dB[2].

Calibrated display range

Log — expanded from reference level down:
70 dB with 10 dB/Div scale factor
40 dB with 5 dB/Div scale factor
16 dB with 2 dB/Div scale factor
8 dB with 1 dB/Div scale factor

Linear. Full scale from 56 μV (−102 dBm across 50 ohms to 707 volts (+70 dBm)[1] in 10 dB steps and continuous 0 to −12 dB vernier. Full scale signals in linear translate to approximately full scale signals in the log modes.

Display accuracy
Log: < ±0.1 dB/dB but not more than ±1.5 dB over full 70 dB display range.
Linear: < ±0.1 division over full 8 division deflection

Residual responses (no signal present at input):
With 0 dB input attenuation on fundamental mixing (0.01 to 4.1 GHz) < −90 dBm.
Signal Identifier: Provided on all Frequency Bands in 1 MHz/Div frequency span for signal identification (reads incorrectly for 100 MHz Cal Output signal)

AMPLITUDE CHARACTERISTICS

DYNAMIC RANGE

Maximum power ratio of two signals simultaneously present at the input that may be measured within the limits of specified accuracy, sensitivity and distortion (i.e., spurious responses): 0.01 to 22 GHz > 70 dB.

***Spurious responses:** (Input attenuator set to 0 dB)*

Second harmonic distortion

Frequency Range	Input Power	Relative Distortion
0.01-1.8 GHz	−40 dBm	−70 dB
1.7-22 GHz	0 dBm	−100 dB*

[1]Input level not to exceed +30 dBm damage level.
[2]100 kHz BW limited to 90% RH.
*May be below average noise level.

Third order intermodulation

Frequency Range	For Two Input Signals With		Relative Distortion
	Input Power	Signal Sep.	
0.01-22 GHz	−25 dBm	50 kHz	70 dB
1.7-12.9 GHz	0 dBm	70 MHz	100 dB*
1.7-22 GHz	0 dBm	100 MHz	100 dB*

For typical harmonic and third order intermodulation distortion, see Figure 2.

Image and Multiple Responses:

Frequency	Image (out of band)	Multiple (in-band)
0.01-1.8 GHz	−50 dB	non-existent
1.7-18 GHz	−70 dB	−70 dB
18-22 GHz	−60 dB	−60 dB

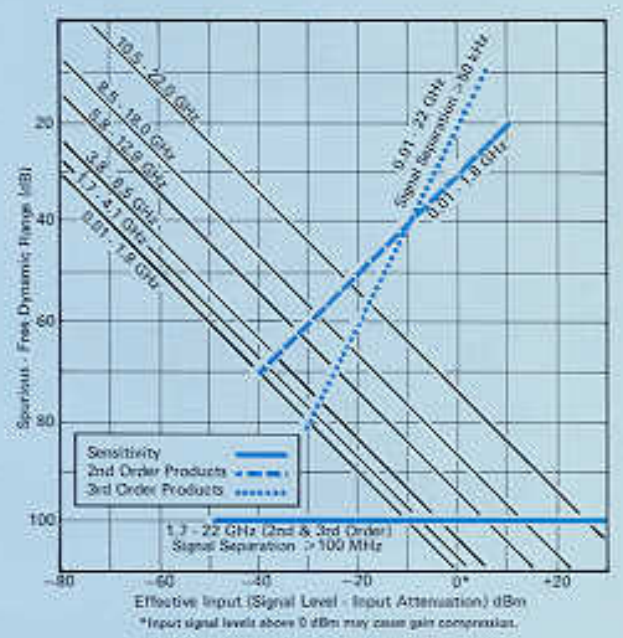


FIGURE 2. Optimum Dynamic Range Chart

AMPLITUDE ACCURACY

The overall amplitude accuracy of a measurement depends on an analyzer's performance and the measurement technique used. Applying IF substitution eliminates errors due to the display, bandwidth gain variation, scale factor and input attenuator step size. Only IF gain variation (reference level change with input attenuation constant: < ±1.0 dB), calibrator amplitude (< ±0.3 dB) and frequency response remain. In brief, IF substitution minimizes error by minimizing control changes from the reference measurement (e.g., calibration).

For measurements in the Frequency Bands covering 1.7 to 22 GHz that don't require the best possible accuracy, the front panel preselector peak may be left centered in its "green" setting. This adds typically < ±1.0 dB of error to the reference level value at room temp.

Reference Level Variation (For any change of scale factor): < ±1 dB.

FREQUENCY RESPONSE AND SENSITIVITY

For typical sensitivity and frequency response versus input frequency, see Figure 3.

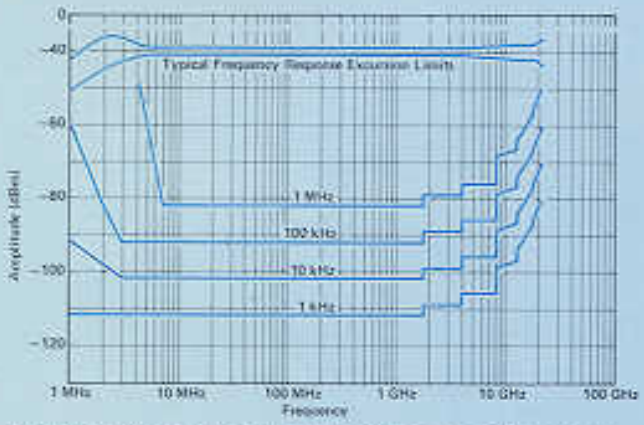


FIGURE 3. Average Noise Level and Frequency Response vs. Input Frequency

SIGNAL INPUT CHARACTERISTICS

INPUT 50Ω 0.01 TO 22 GHz

Input connector: *Precision Type N female*

Input Impedance

Input attenuator at 0 dB: *50 ohms nominal*

SWR: <1.5 *0.01 to 1.8 GHz*
<2.0 *1.7 to 22 GHz (at analyzer tuned frequency)*

Input attenuator at 10 dB or more: *50 ohms nominal*

SWR: <1.3 *0.01 to 1.8 GHz*
<2.0 *1.7 to 22 GHz*

LO Emission (2.00 to 4.46 GHz):
—50 dBm 0.01 to 1.8 GHz
—85 dBm 1.7 to 22 GHz

Input Protection (For input signals from .01 to 22 GHz)
0.01 to 1.8 GHz Frequency Band: *Internal diode limiter.*
1.7 to 22 GHz Frequency Bands: *Saturation of YIG filter (preselector) occurs at total input signal power levels below input mixer damage.*

EXTERNAL MIXER INPUT

BNC 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: 21 internal sweep times from 2 μsec/Div to 10 sec/Div in 1, 2, 5, 10 sequence. Sweep time accuracy ±10% except for 2, 5, and 10 sec/Div which are ±20%. Swept frequency modes use sweep times 2 msec/Div through 10 sec/Div. When operated as a fixed tuned receiver (Zero Span) the full range of sweep times(2 μsec to 10 sec/Div) may be used to display modulation waveforms.

SWEEP CHARACTERISTICS

SWEEP SOURCE

Manual: *Sweep determined by front panel control; continuously settable across CRT in either direction.*

External: *Sweep determined by 0 to + 10V external signal applied to External Sweep Input on rear panel. Blanking is controlled by signal at Blanking Input.*

Internal: *Sweep generated from internal sweep generator.*

SWEEP TRIGGER

Free Run: *Sweep triggered repetitively by internal source.*

Line: *Sweep triggered by power line frequency.*

Video: *Sweep internally triggered by detected waveform of input signal (signal amplitude of 0.5 division peak-to-peak required on CRT display).*

Trigger Level: *Functions in the Video and Ext Trigger modes to set the level of the displayed trace or Ext Trigger Input which will trigger the sweep.*

External Trigger: *Sweep triggering determined by signal input (between +1 and +10 volts) to rear panel BNC connector.*

Single: *Sweep triggered or reset by front panel Start/Reset button.*

Start/reset: *Also can reset any internal sweep to left edge of display.*

REAR PANEL INPUT AND OUTPUT CHARACTERISTICS

X, Y, AND Z Axis Outputs

These rear panel outputs are compatible with and may be used to drive all current HP XY recorders (using positive pencoils or TTL penlift input) and CRT monitors.

Horizontal Sweep Output (X axis): *A voltage proportional to the horizontal sweep of the CRT trace which ranges from —.5 V for the left edge to +.5 V for the right edge. Output impedance is 5kΩ.*

Vertical Output (Y axis): *Detected video output proportional to vertical deflection of the CRT trace. Output increases 100 mV/div from 0 to 800 mV (from a 50Ω source) for a full 8 division deflection. Output impedance is 50Ω.*

Blank (Penlift or Z axis) Output: *A blanking output, 15 V from 10 kΩ which occurs during CRT retrace or when sweeping beyond band edges. Otherwise output is low at 0 V with a 10Ω output impedance for a normal or unblanked trace (pen down).*

Blanking Input: *Permits remote Z axis control of CRT with TTL Levels; normal <0.5V or open circuit, blanked >2V.*

Caution: *maximum input ± 40V. 10 kΩ input impedance.*

External Sweep Input: *When the front panel Sweep Source switch is set to the EXT mode, a 0 to 10V ramp will sweep the analyzer through the frequency range determined by front*

SPECIFICATIONS

panel Tuning and Frequency Span/Div controls. 100 kΩ input impedance. **Caution:** *maximum input ±40 V.*

External Trigger Input: *With the Sweep Trigger in EXT mode, a signal will trigger a sweep on the signal's positive slope between +1 and +10 volts according to the setting of the Trigger Level control. 100 kΩ input impedance, dc coupled.* **Caution:** *maximum input ±40V.*

21.4 MHz IF Output: *A 50 ohm, 21.4 MHz output linearly related to the RF input to the analyzer. Bandwidth controlled by the analyzer's Resolution Bandwidth setting; amplitude controlled by the Input Attenuator, IF gain vernier and first 6 IF Reference Level step gain positions (0 through −50 dBm level with 0 dB input attenuation). Output is approximately −10 dBm from 50Ω for full scale signals on the CRT.*

First LO Output: *2.00 to 4.46 GHz typically at +8 dBm. Terminate in a 50Ω load when not in use.*

Aux A: *Interconnection for use with 8750A normalizer.*

Aux B: *Used during factory calibration.*

DISPLAY CHARACTERISTICS

CATHODE RAY TUBE

Type: *Post deflection accelerator, approximately 8.5 kV accelerating potential, aluminized P31 phosphor, electrostatic focus and deflection.*

Graticule: ***8 x 10 div internal graticule, 1 div equals 0.90 cm (0.35 inches) with 5 subdivisions per major division.***

Persistence

Conventional: *Natural persistence of P31 phosphor (approximately 40 μsec).*

Write: *Continuously adjustable from 0.2 sec to full storage.*

Storage time: *> 1 minute at full brightness in Write mode extending to > 30 minutes in Store mode at lower brightness. Storage time (Store Intensity) in Store mode is continuously adjustable from 1 minute (full brightness) to >30 minutes (minimum brightness).*

Baseline Clipper: *Adjusts the vertical level below which the CRT is blanked. Helps prevent blooming by blanking the bright baseline area on the CRT. Eases analysis of pulsed RF and transient signals.*

Scale: *Turns on internal scale illumination for photography after erasing CRT. Frequency readout is frozen.*

Scale Intensity: *Adjusts scale illumination.*

CRT BEZEL READOUT

Light emitting diodes in the bezel display the following measurement data: (included in CRT photographs taken with the HP 197A Option 006 Oscilloscope Camera).

Top Line

Amplitude Scale: *The vertical scale factor chosen; linear (LIN), 10, 5, 2, or 1 dB/Div.*

Reference Level: *Given in 1 dB increments from +70 dBm* to −102 dBm.*

Input Attenuation

Resolution Bandwidth

Bottom line

Sweep Time/Div: *A for Auto otherwise sweep times given in sec, msec, or μsec per division.*

Frequency: *Marker frequency displayed in 1.7-22 GHz and full band modes. Center frequency displayed for Per Div and Zero Span modes.*

Freq Span/Div: *F for full band spans and 1.7-22 span, or horizontal calibration in MHz or kHz per division.*

GENERAL SPECIFICATIONS

TEMPERATURE RANGE:

Operating 0°C to 55°C, storage −40° to +75°C.

HUMIDITY RANGE (Operating):

< 95% R.H. 0°C to 40°C.

EMI:

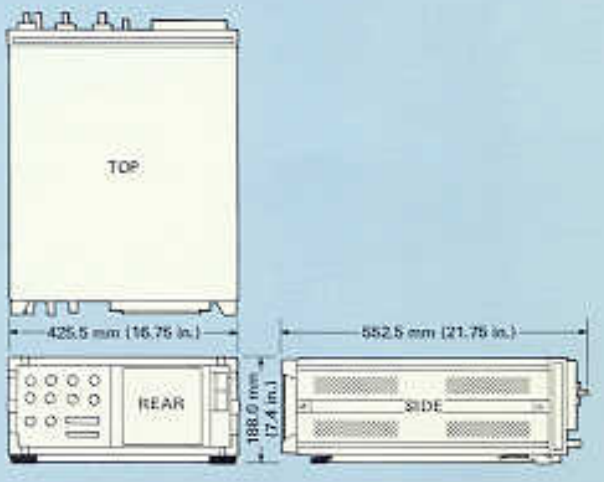
Conducted and radiated interference is within the requirements of methods CE03 and RE02 of MIL STD 461A, VDE 0871 and CISPR pub'n 1, 2, and 4.

POWER REQUIREMENTS

48-66 Hz, 100, 120, 200 or 240 volts (−10% to +5%) 220 VA maximum (400 Hz operation available as option 400, see page 15). Fan cooled.

DIMENSIONS

426 mm wide, 188 mm high, 552 mm deep
(16¾ in. x 7⅜ in. x 21¾ in.).



WEIGHT: 30.4 kg (60 lbs.)

ACCESSORIES REQUIRED FOR SERVICE

Service Kit, HP Part number 08565-60100 includes extender boards, cables and other hardware.

*Maximum RF input +30 dBm.

STANDARD OPTIONS AVAILABLE

OPTION 200, CALIBRATION IN dBμV

All specifications identical to standard 8565A except: Bezel readout, Top Line, Reference level: Reference level displayed in dBμV given in 1 dB increments from +177[1] dBμV to +5 dBμV.

Front panel controls read in dBm as in standard instrument.

Sensitivity: Average noise level with 1 kHz IF bandwidth:

Band (GHz)	Max. Avg. Noise Level (dBμV)
0.01 to 1.8 GHz	−3
1.7 to 4.1	+1
3.8 to 8.5	+5
5.8 to 12.9	+15
8.5 to 18	+24
10.5 to 22	+35

Log Reference Level range: +177 dBμV[1] to +5 dBμV in 10 dB steps and continuous 0 to −12 dB calibrated vernier.

Calibrated Output: Amplitude +97 dBμV ± 0.3 dB.

[1]**Caution:** damage level +147 dBμV (+30 dBm).

OPTION 400, 400 Hz POWER SUPPLY

Permits operation on 50, 60, or 400 Hz mains.

All specifications identical to standard 8565A except: General specifications

Temperature range (operating): 50-60 Hz 0° to 40°C
400 Hz 0° to 55°C

Power requirements: 220 VA

11517A EXTERNAL MIXER

When used with the 8565A for operation in waveguide 14.5 to 40 GHz:

FREQUENCY RANGE

Waveguide input
14.5 to 40 GHz (using proper adapter section)

LO input
2.05 to 4.1 GHz (from HP 8565A Spectrum Analyzer front panel).

Supplied from front panel BNC connector which simultaneously serves as input for waveguide mixing products.

MEASUREMENT RANGE

Maximum waveguide input: Saturation (gain compression < 1 dB), −15 dBm; Damage Level > 0 dBm or 0.1 erg.

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.

WEIGHT: 250 g (9 oz.)
Supplied with 1.22 m (4 ft.) BNC cable and waveguide flange cap.

ACCESSORY WAVEGUIDE ADAPTERS

11518A	12.4 to 18.0 GHz (useable from 14.5 GHz to 18.0 GHz with 8565A)
11519A	18.0 to 26.5 GHz
11520A	26.5 to 40.0 GHz

ORDERING INFORMATION

MODEL NUMBER AND NAME	Price
8565A Spectrum Analyzer	$17,850
Option 200, Calibration in dBμV	$ 100
Option 400, Internal 50 to 400 Hz Power Supply	$ 250
Option 907, Front Handle Kit	$ 30
Option 908, Rack Flange Kit	$ 20
Option 909, Rack Flange and Front Handle Kit	$ 40
Option 910, Extra Operating and Service Manual	$ 25
Slide Rack Mount, Fixed, Part No. 1494-0017	$ 45
Tilt, Part No. 1494-0026	$ 95
Slide Adapter Kit (adapts slides to non-HP enclosure of adequate depth) Part No. 1494-0023	$ 20

Accessories	
11517A External Mixer (taper section req'd)	$ 250
11518A Taper Section, 12.4 to 18.0 GHz	$ 160
11519A Taper Section, 18.0 to 26.5 GHz	$ 160
11520A Taper Section, 26.5 to 40.0 GHz	$ 160
8444A opt 058 Tracking Generator, 10-1300 MHz	$ 3,800
8750A Storage-Normalizer	$ 1,450
8406A Frequency Comb Generator	$ 875
8447D Pre-Amplifier, 0.1 to 1300 MHz	$ 725
197A Option 006, Oscilloscope Camera	$ 895
Transit Case K01-8565	$ 450
Service Kit Part number 08565-60100	$ 100

Domestic U.S.A. Price Only