

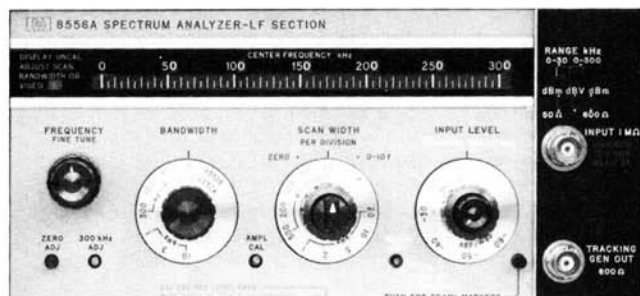
# SIGNAL ANALYZERS

## 141T Spectrum Analyzer System: 20 Hz to 300 kHz

### Model 8556A

- Accurate signal level measurements ( $\pm 0.95$  dB)
- Accurate frequency measurements ( $\pm 3$  Hz)

- High sensitivity ( $-152$  dBV)
- Built-in tracking generator



8556A

### General Purpose Measurement Flexibility

The 8556A Spectrum Analyzer covers the frequency range from 20 Hz to 300 kHz. It was designed to accommodate the variety of characteristic impedances and amplitude units used in making audio measurements. Balanced or unbalanced inputs are available, and open circuit voltages (dBV or linear) or power (dBm) in several characteristic impedances may be measured. The analyzer is capable of high resolution; frequencies can be measured very accurately. A built-in tracking generator further increases the instrument's utility.

### Frequency Range

The 8556A has two frequency scales, 0–300 kHz for full coverage and 0–30 kHz for better resolution at low frequencies. The analyzer may be swept symmetrically about a tunable center frequency, swept from 0 Hz to a selectable end point, or operated as a fixed tuned receiver. 20 kHz crystal markers (accurate to 0.01%) can be generated on the CRT to make very accurate frequency measurements.

### Absolute Amplitude Calibration

The 8556A is calibrated for dBm in 600 $\Omega$ , dBm in 50 $\Omega$ , dBV, and volts. The very accurate reference level control ( $\pm 0.2$  dB) and vernier ( $\pm 0.25$  dB) allow the IF substitution technique to be used to improve amplitude measurement accuracy.

### Low Distortion

Careful design has decreased analyzer distortion to the extent that a full 70 dB dynamic range is achieved. This allows small signals, such as harmonic or intermodulation distortion, to be measured in the presence of large ones.

### Resolution—Sensitivity

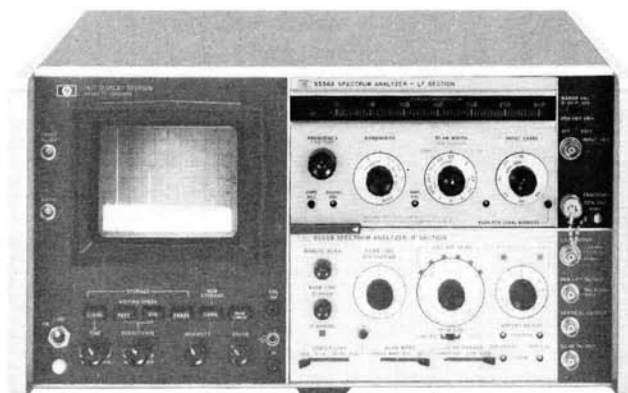
Resolution bandwidths from 10 Hz to 10 kHz are provided on the 8556A. Using the narrow bandwidth, 50 or 60 Hz line related sidebands can be measured. The analyzer's extremely low noise figure together with its narrow bandwidths makes the 8556A very sensitive. Signals as low as  $-152$  dBV (25 nV) can be measured in a 10 Hz bandwidth. The 8556A may be used to measure EMI, such as interference conducted along an ac power line.

### Isolated Input

The isolated input eliminates the possibility of spurious signal pickup which could be caused by line related ground currents flowing in the ground connections between the analyzer and signal source. The input impedance (1 M $\Omega$ ) is high enough so that a scope probe may be used with a minimum of loading. An optional balanced input is available which is transformer coupled for isolation and high common mode rejection. The input impedance is 15 k $\Omega$ , and the analyzer is calibrated for either dBm-135 $\Omega$  or dBm-150 $\Omega$  as well as dBm-600 $\Omega$  and dBm-900 $\Omega$ . Balance (symmetry) is 80 dB at 50 Hz and typically 50 dB at 300 kHz.

### Tracking Generator

A tracking generator is built into the 8556A. If an external counter is connected to the tracking generator, frequencies can be measured to an accuracy of  $\pm 3$  Hz. Swept insertion loss or return loss measure



ments can be made on a device such as an amplifier or filter. A 140 dB measurement range is possible using the narrowest resolution bandwidth. The tracking generator also provides a convenient signal for compensating an oscilloscope probe used with the 8556A.

### Other Applications

The combination of a tracking generator and spectrum analyzer in this frequency range is valuable in applications such as receiver testing and fault location.

## Specifications—with 8552B IF Section

### Frequency Specifications

**Frequency range:** 20 Hz to 300 kHz. Tuning dial ranges of 0–30 kHz and 0–300 kHz.

**Scan width:** (on a 10-division CRT horizontal axis)

**Per division:** 10 calibrated scan widths from 20 Hz/div to 20 kHz/div in a 1, 2, 5 sequence.

**0–10 f:** 10 calibrated preset scans, from 200 Hz to 200 kHz in a 1, 2, 5 sequence. Analyzer scans from zero frequency to ten times the scan width per division setting.

**Zero:** analyzer is a fixed tuned receiver.

### Frequency accuracy

**Center frequency accuracy:** 0–30 kHz Range:  $\pm 500$  Hz; 0–300 kHz Range:  $\pm 3$  kHz.

**Marker accuracy:** RF markers every 20 kHz accurate to within  $\pm 0.01\%$ . Markers controlled by front panel on/off switch.

**Scan width accuracy:** frequency error between any two points on the display is less than  $\pm 3\%$  of the indicated frequency separation.

### Stability

**Residual FM:** sidebands  $>60$  dB down 50 Hz or more from CW signal, scan time  $\geq 1$  sec/div, 10 Hz bandwidth.

**Noise sidebands:** more than 90 dB below CW signal, 3 kHz away from signal, with a 100 Hz IF bandwidth.

**Frequency drift:** less than 200 Hz/10 min.

### Resolution

**Bandwidth ranges:** IF bandwidths of 10 Hz to 10 kHz are provided in a 1, 3, 10 sequence.

**Bandwidth accuracy:** individual IF bandwidth 3 dB points calibrated to  $\pm 20\%$  (10 kHz bandwidth  $\pm 5\%$ ).

**Bandwidth selectivity:** 60 dB/3 dB IF bandwidth ratios, with IF section:  $<11:1$  for IF bandwidths from 10 Hz to 3 kHz;  $<20:1$  for 10 kHz bandwidth. For 10 Hz bandwidth, 60 dB points are separated by less than 100 Hz.

### Amplitude Specifications

#### Absolute amplitude calibration

##### Log calibration modes

dBV	0 dBV = 1 V rms
dBm-600 $\Omega$	0 dBm = 1 mW-600 $\Omega$
dBm-50 $\Omega$	0 dBm = 1 mW-50 $\Omega$

Input impedance is 1 M $\Omega$ . dBm ranges are referenced with input properly terminated externally.





**Log calibration range:** from -150 dBm/dBV to +10 dBm/dBV.  
**Log display range:** 10 dB/div on a 70 dB display, or 2 dB/div on a 16 dB display.

**Linear sensitivity:** from 0.1  $\mu$ V/div to 1 V/div in a 1, 2, 10 sequence. Linear sensitivity vernier X1 to X0.25 continuously.

#### Dynamic range

**INPUT LEVEL control:** -10 to -60 dBm/dBV in 10 dB steps. Accuracy  $\pm 0.2$  dB. Marking indicates maximum input levels for 70 dB spurious-free dynamic range.

**Average noise level:** (specified with a 600 $\Omega$  or less source impedance and INPUT LEVEL at -60 dBm/dBV)

Mode	1 kHz IF Bandwidth	10 Hz IF Bandwidth
dBm-50 $\Omega$	<-122 dBm (180 nV)	<-142 dBm (18 nV)
dBm-600 $\Omega$	<-130 dBm (250 nV)	<-150 dBm (25 nV)
dBV	<-132 dBV (250 nV)	<-152 dBV (25 nV)
Linear	<400 nV	<40 nV

**Video filter:** averages displayed noise; bandwidth of 10 kHz, 100 Hz, and 10 Hz. Bandwidth accuracy  $\pm 20\%$ .

**Spurious responses:** input signal level  $\leq$  INPUT LEVEL setting; out of band mixing responses, harmonic and intermodulation distortion products are all more than 70 dB below the input signal level 5 kHz to 300 kHz; 60 dB, 20 Hz to 5 kHz. Third order intermodulation products are more than 70 dB below the input signal level, 5 kHz to 300 kHz with signal separation  $>300$  Hz.

**Residual responses (no signal present at input):** With the INPUT LEVEL at -60 dBm/dBV and the input terminated with 600 $\Omega$  or less, all line related residual responses from 0 to 500 Hz are below -120 dBm/dBV. All other residual responses are below -130 dBm/dBV.

Amplitude accuracy:	Log	Linear
Frequency response	$\pm 0.2$ dB	$\pm 2.3\%$
Amplitude display	$\pm 0.25$ dB/dB but not more than $\pm 1.5$ dB over 70 dB display range	$\pm 2.8\%$ of full 8 div display

**Log reference level control:** provides 90 dB IF gain control in 10 dB steps. Accurate to  $\pm 0.2$  dB ( $\pm 2.3\%$ ).

**Log reference level vernier:** provides continuous 12dB range. Accurate to  $\pm 0.1$  dB ( $\pm 1.2\%$ ) in 0, -6, -12 dB positions; otherwise  $\pm 0.25$  dB ( $\pm 2.8\%$ ).

**Amplitude measurement accuracy:**  $\pm 0.95$  dB with proper technique.

#### General

**Scan time:** 16 internal scan rates from 0.1 ms/div to 10 sec/div in a 1, 2, 5 sequence.

#### Scan mode

**Int:** analyzer repetitively scanned internally.

**Ext:** scan determined by 0 to +8 volt external signal.

**Single:** single scan actuated by front panel button.

**Manual:** scan determined by front panel control.

**Input level:** provides 50 dB control of input preamplification and attenuation to prevent input overload. INPUT LEVEL markings of

-60 dBm/dBV to -10 dBm/dBV indicate maximum input level for a minimum of 70 dB spurious-free dynamic range. Accuracy  $\pm 0.2$  dB (2.3%).

**Input impedance:** 1 M $\Omega$  shunted by  $\approx 32$  pF.

**Maximum input level:** 10 V rms,  $\pm 200$  V dc. Ground terminals of BNC input connectors are isolated from the analyzer chassis ground to minimize ground loop pickup at low frequencies.

**Maximum voltage, isolated ground to chassis ground:**  $\pm 100$  V dc.

**Isolated ground to chassis ground impedance:** 100 k $\Omega$  shunted by approximately 0.3  $\mu$ F.

**Gain compression:** for input signal level 20 dB above INPUT LEVEL setting, gain compression is less than 1 dB.

#### Tracking Generator Specifications

**Frequency range:** tracks the analyzer tuning, 20 Hz to 300 kHz.

**Amplitude range:** continuously variable from 100 mV rms to greater than 3 V rms into an open circuit.

**Amplitude accuracy:** with TRACKING GEN LEVEL in CAL position and 20 kHz markers off, output level at 100 kHz is 100 mV  $\pm 0.3$  dB into an open circuit.

**Frequency response:**  $\pm 0.25$  dB 50 Hz to 300 kHz.

**Output impedance:** 600 $\Omega$ .

**Residual FM:**  $<1$  Hz peak-to-peak.

**Power requirements:** 100, 120, 200, or 240 V  $\pm 5\%$ , -10%, 50 to 60 Hz, normally less than 225 watts.

**Weight:** Model 8556A LF section: net, 3.7 kg (8 lb). Shipping, 5.3 kg (12 lb).

**Size:** 102 H, 226 W, 344 mm D (4" x 8 $\frac{7}{8}$ " x 13 $\frac{1}{2}$ ").

#### Specifications with 8556A Options 001, 002-balanced Input

##### Amplitude

**Log calibration modes-balanced (bridged) input**

dBm-135 $\Omega$ (Option 001)	0 dBm = 1mW-135 $\Omega$
dBm-150 $\Omega$ (Option 002)	0 dBm = 1mW-150 $\Omega$
dBm-600 $\Omega$	0 dBm = 1mW-600 $\Omega$
dBm-900 $\Omega$	0 dBm = 1mW-900 $\Omega$

Input impedance is typically 15 k $\Omega$ . dBm ranges are referenced with input properly terminated externally.

##### Input

**Maximum input levels:** normal Mode,  $\pm 20$  V rms or  $\pm 150$  V dc for normal mode (symmetrical) signals between input signal connectors; Common Mode, 200 V rms at 60 Hz or  $\pm 500$  V dc for common mode (asymmetrical) voltages between input signal connectors and GUARD or instrument chassis; Guard,  $\pm 100$  V dc from GUARD to instrument chassis. (GUARD to chassis impedance is approximately 100 k $\Omega$  shunted by 0.3 $\mu$ F.)

**Balance (Symmetry):** 0 -30kHz Range, greater than 80 dB, 50 Hz to 1 kHz; 1 -300 kHz range, greater than 60 dB, 1 kHz to 20 kHz.

#### Ordering Information

**8556A RF Section**

**Opt 001:** Balanced input

**Opt 002:** Balanced input

#### Price

\$2525

add \$220

add \$220