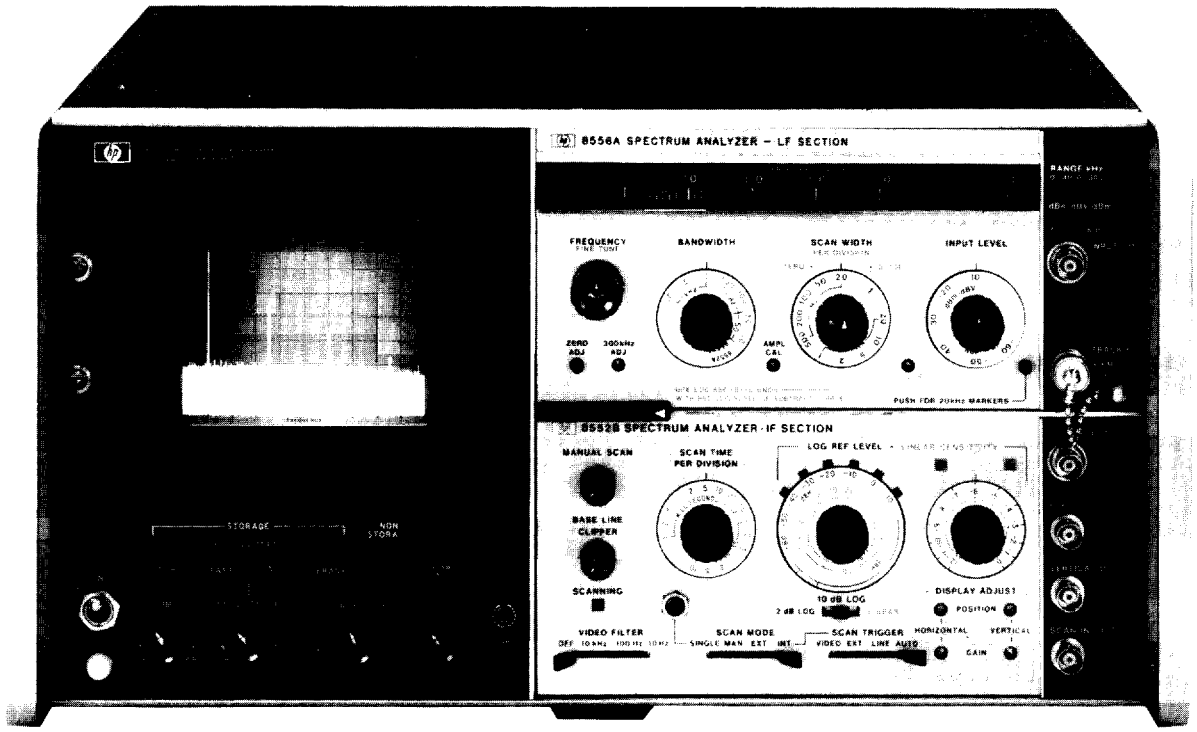
SIGNAL ANALYZERS

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

Model 8556A

- Accurate signal level measurements (±0.95 dB)
- Accurate frequency measurements (±3 Hz)
- High sensitivity (−152 dBV)
- Built-in tracking generator



HP 8556A (141T, 8552B)

Measurement Flexibility

The HP 8556A offers a frequency range of 20 Hz to 300 kHz. It is compatible with impedances normally encountered at audio frequencies. The input may be either balanced or unbalanced and measurement units may be dBV, dBm or Volts.

Frequency Range

In addition to the 300 kHz tuning scale, a 30 kHz tuning scale is provided for greater tuning resolution at low frequencies. The HP 8556A may be swept about the tuned frequency, from 0 Hz to a selectable stop frequency, or fixed tuned to any frequency in its tuning range. Crystal markers with 20 kHz spacing may be selected to ensure accurate frequency measurements.

Amplitude Calibration

The HP 8556A is calibrated for dBm in 600 and 50 ohms, as well as dBV and volts. Accurate reference level control (±0.2 dB) and vernier (±0.25 dB) allow accurate amplitude measurements when using the IF substitution method.

Resolution—Sensitivity

Bandwidths of from 10 Hz to 10 kHz are provided with the HP 8556A. The 10 Hz bandwidth is useful for measurements close to the carrier such as power line sidebands. The 10 Hz bandwidth together with the low noise figure of the HP 8556A, allow signals as low as −152 dBV (25 nV) to be measured.

Isolated Input

The isolated input prevents spurious signal pickup due to ground currents between the analyzer and the signal source. The high input impedance permits the use of an oscilloscope probe. An optional balanced input is transformer coupled to provide isolation and high common mode rejection.

Tracking Generator

The frequency of low level signals can be measured to ±3 Hz accuracy with a frequency counter connected to the output of the built-in tracking generator. Swept insertion loss measurements with 140 dB dynamic range and return loss measurements are also possible using the tracking generator.

Specifications—with HP 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: ±500 Hz; 0–300 kHz Range: ±3 kHz.

Marker accuracy: RF markers every 20 kHz accurate to within ±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 ±3% of the indicated frequency separation.

Stability

Residual FM: sidebands >60 dB down 50 Hz or more from CW signal, scan time ≥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 ±20% (10 kHz bandwidth ±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 Ω	0 dBm = 1 mW-600 Ω
dBm-50 Ω	0 dBm = 1 mW-50 Ω

Input impedance is 1 MΩ. 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 μV/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 ±0.2 dB. Marking indicates maximum input levels for 70 dB spurious-free dynamic range.
Average noise level: (specified with a 600 Ω or less source impedance and INPUT LEVEL at −60 dBm/dBV)

Mode	1 kHz IF Bandwidth	10 Hz IF Bandwidth
dBm–50 Ω	<−122 dBm (180 nV)	<−142 dBm (18 nV)
dBm–600 Ω	<−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 ±20%.
Spurious responses: input signal level ≤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 Ω 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	±0.2 dB	±2.3%
Amplitude display	±0.25 dB/dB but not more than ±1.5 dB over 70 dB display range	±2.8% of full 8 div display

Log reference level control: provides 90 dB IF gain control in 10 dB steps. Accurate to ±0.2 dB (±2.3%).
Log reference level vernier: provides continuous 12 dB range. Accurate to ±0.1 dB (±1.2%) in 0, −6, −12 dB positions; otherwise ±0.25 dB (±2.8%).
Amplitude measurement accuracy: ±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 ±0.2 dB (2.3%).
Input impedance: 1 MΩ shunted by ≈32 pF.
Maximum input level: 10 V rms, ±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: ±100 V dc.
Isolated ground to chassis ground impedance: 100 kΩ shunted by approximately 0.3 μF.
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 ±0.3 dB into an open circuit.
Frequency response: ±0.25 dB 50 Hz to 300 kHz.
Output impedance: 600 Ω.
Residual FM: <1 Hz peak-to-peak.
Power requirements: 100, 120, 200, or 240 V +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 x 226 W x 344 mm D (4″ x 8.9″ x 13.5 ″).

Specifications with HP 8556A Options 001, 002-Balanced Input

Amplitude

Log Calibration Modes-Balanced (bridged) Input

dBm–135 Ω (Option 001)	0 dBm = 1 mW–135 Ω
dBm–150 Ω (Option 002)	0 dBm = 1 mW–150 Ω
dBm–600 Ω (Option 001 or 002)	0 dBm = 1 mW–600 Ω
dBm–900 Ω (Option 001 or 002)	0 dBm = 1 mW–900 Ω

Input impedance is typically 15 kΩ. dBm ranges are referenced with input properly terminated externally.

Input

Maximum input levels: normal Mode, ±20 V rms or ±150 V dc for normal mode (symmetrical) signals between input signal connectors; Common Mode, 200 V rms at 60 Hz or ±500 V dc for common mode (asymmetrical) voltages between input signal connectors and GUARD or instrument chassis; GUARD, ±100 V dc from GUARD to instrument chassis. (GUARD to chassis impedance is approximately 100 kΩ shunted by 0.3 μF.)
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	Price
HP 8556A RF Section	$3395
Opt 001: Balanced input	add $220
Opt 002: Balanced input	add $220