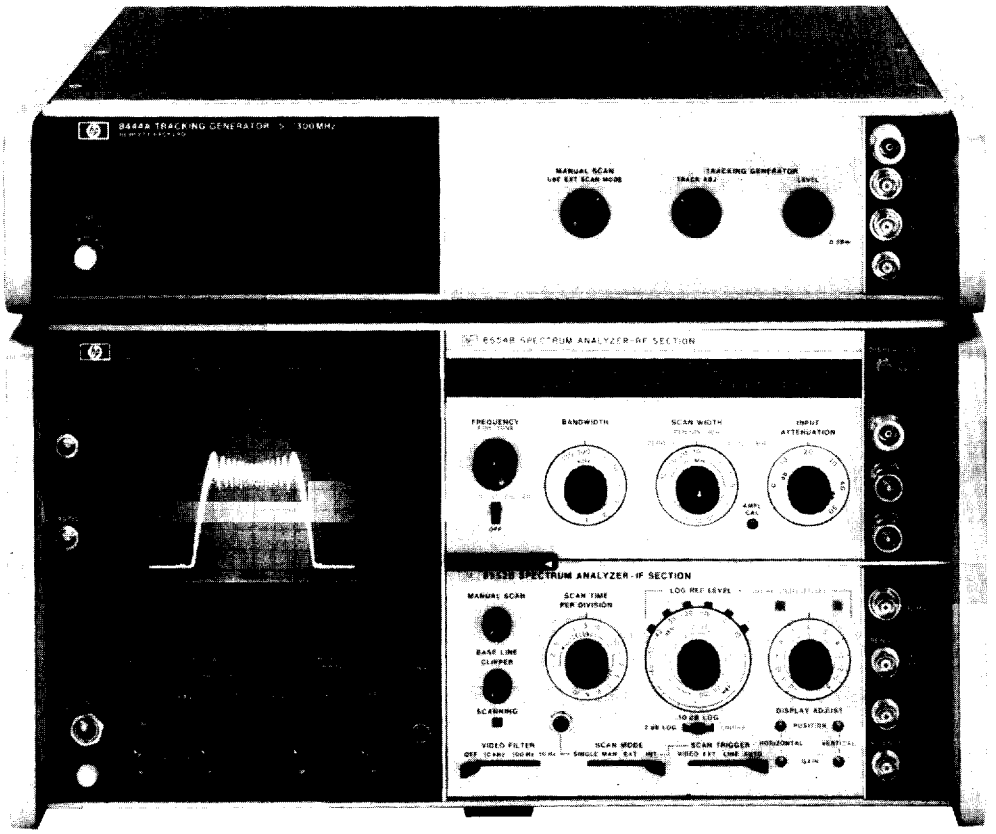
SIGNAL ANALYZERS

HP 141T Spectrum Analyzer System: 100 kHz to 1250 MHz

Models 8554B & 8444A

- High resolution (100 Hz)
- Frequency response ±1 dB
- Companion tracking generator
- Optional internal limiter



HP 8554B (141T, 8552B) 8444A

The HP 8554B RF Section covers the frequency range from 100 kHz to 1250 MHz. This band includes baseband, AM/FM Broadcast, VHF/UHF TV, mobile communications, and VHF/UHF navigation systems. Typical measurements include modulation, intermodulation, harmonics and spurious. Noise power density and carrier to noise ratio can also be measured. The frequency response of filters, amplifiers, mixers or modulators can be measured and displayed when a companion tracking generator is used.

Absolute Calibration

Amplitude measurements can be made with an accuracy of ±2.8 dB over the range +10 to −122 dBm. This accuracy can be improved to ≤ ±1.75 dB with IF substitution techniques. The log display mode (dBm) provides a 70 dB calibrated range, while the linear display mode (volts) provides maximum resolution of 1 μV per division. The calibrated reference level (top graticule line) can be set with IF gain to values from +10 to −72 dBm. An UNCAL light warns of control settings which may cause loss of amplitude calibration.

Frequency Response

Excellent flatness (±1 dB) insures high accuracies for relative amplitude measurements such as harmonic distortion. Full band sweep allows display of the entire tuning range, 100 kHz to 1250 MHz.

Frequency Resolution

Low residual FM allows selection of bandwidths as narrow as 100 Hz. This bandwidth provides the resolution needed to measure close-in sidebands such as those due to power line harmonics or third order intermodulation distortion. Available bandwidths range from 100 Hz to 300 kHz in a 1, 3, 10 sequence. The filters used are synchronously-tuned which have an excellent response to pulsed signals and permit the lowest sweeptime for a given bandwidth.

Sensitivity

High sensitivity (−122 dBm/100 Hz) and low spurious levels (−65 dBc) allow accurate measurements of low level signals such as might be encountered in EMI applications. The sensitivity/spurious performance also provides the dynamic range required for signals with large amplitude separation such as intermodulation distortion or incidental AM.

Frequency Stabilization

Frequency stabilization reduces residual FM to less than 100 Hz peak-to-peak for scans of 200 kHz or less. The stabilization in narrow scans is implemented by phase-locking the local oscillators to a crystal reference.

HP 8444A Tracking Generator

The HP 8444A Tracking Generator utilizes the LOs of the HP 8554B to generate an output signal whose frequency equals the tuned frequency of the HP 8554B. The tracking generator can provide a swept source for frequency response measurements. The HP 8444A also provides control of output signal amplitude to prevent overdriving the DUT.

For precise frequency measurements of low level signals, the tracking generator provides a constant amplitude auxiliary output signal, which can be used to drive a frequency counter.

HP 8554B Specifications—with HP 8552B IF Section

Frequency Specifications

Frequency range: 100 kHz to 1250 MHz.

Scan Width (on 10-division CRT horizontal axis)

Per division: 15 calibrated scan widths from 100 MHz/div to 2 kHz/div in a 1, 2, 5 sequence.

Preset: 0-1250 MHz, automatically selects 300 kHz bandwidth IF filter.

Zero: analyzer is fixed-tuned receiver.

Frequency Accuracy

Center frequency accuracy: the dial indicates the display center frequency within 10 MHz.

Scan width accuracy: frequency error between two points on the display is less than 10% of the indicated separation.

Resolution

Bandwidth: IF bandwidths of 0.1 to 300 kHz 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 ratio <20:1 for IF bandwidths from 10 kHz to 200 kHz. 60 dB/3 dB bandwidth ratio <11:1 for IF bandwidths 100 Hz to 3 kHz.

Stability (residual FM)

Stabilized: <100 Hz peak-to-peak.

Unstabilized: <10 kHz peak-to-peak.

Noise sidebands: more than 70 dB below CW signal, 50 kHz or more away from signal, with 1 kHz IF bandwidth.

Amplitude Specifications

Absolute Amplitude Calibration Range

Log: from −122 to +10 dBm. 10 dB/div on a 70 dB display, or 2 dB/div on a 16 dB display.

Linear: from 0.1 μV/div to 100 mV/div in a 1, 2 sequence on an 8-division display.

Dynamic Range

Average noise level: <−102 dBm with 10 kHz IF bandwidth.

Spurious responses: all image and out-of-band mixing responses, harmonic and intermodulation distortion products are more than 65 dB below a −40 dBm signal at the input mixer.

Residual responses (no signal present at input): with input attenuation at 0 dB: <−100 dBm.

Amplitude Accuracy

	Log	Linear
Frequency response (flatness)		
100 kHz to 1250 MHz	±1 dB	±12%
Switching between bandwidths (at 25°C)	±0.5 dB	±5.8%
Amplitude display	±0.25 dB/dB but not more than ±1.5 dB over the full 70 dB display range.	2.8% of full 8 div deflection

Calibrator Output

Amplitude: −30 dBm, ±0.3 dB.

Frequency: 30 MHz, ±3 kHz.

Log reference level control: provides 70 dB range (60 dB below 200 kHz), in 10 dB steps. Accurate to ±0.2 dB (±2.3%, Linear Sensitivity).

Log reference level vernier: provides continuous 12 dB range. Accurate to ±0.1 dB (±1.2%) in 0, −6, and −12 dB positions; otherwise ±0.25 dB (±2.8%).

Amplitude measurement accuracy: ±1.75 dB with proper technique.

RF Input Specifications

Input impedance: 50 Ω nominal. Typical reflection coefficient <0.30 (1.85 SWR), input attenuator ≥10 dB.

Maximum input level: peak or average power +13 dBm (1.4 V ac peak), ±50 V dc.

General

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

Scan Time Accuracy

0.1 ms/div to 20 ms/div: ±10%.

50 ms/div to 10 s/div: ±20%.

Weight

Model 8554B RF section: net, 4.7 kg (10.3 lb). Shipping 7.8 kg (17 lb).

Size: 102 H x 226 W x 344 mm D (4″ x 8.9″ x 13.5″).

HP 8444A Specifications

Specifications for Swept Frequency Response Measurements

Dynamic range: >90 dB from spectrum analyzer 1 dB gain compression point to average noise level (approximately −10 dBm to −100 dBm). Spurious responses not displayed.

Gain compression: for −10 dBm signal level at the input mixer, gain compression <1 dB.

Absolute Amplitude Calibration Range

Tracking generator (drive level to test device: 0 to −10 dBm continuously variable. 0 dBm absolutely calibrated to ±0.5 dB at 30 MHz.

Frequency range: 500 kHz to 1250 MHz.

Frequency resolution: 1 kHz.

Stability

Residual FM (peak-to-peak): stabilized, <200 Hz; unstabilized, <10 kHz.

Amplitude Accuracy

System frequency response: ±1.50 dB.

Tracking generator calibration: 0 dBm at 30 MHz to ±0.5 dB.

Specifications for Precision Frequency Measurements

Frequency accuracy: for unknown signals ±10 kHz. (Tracking drift typically 50 kHz/10 min after 2-hour warm-up). For points on frequency response curve, counter accuracy ± Residual FM (200 Hz).

Counter Mode of Operation

Manual scan: scan determined either by front panel control of HP 8552B IF Section or by external scan signal provided by the HP 8444A.

Zero scan: analyzer is fixed-tuned receiver. Counter reads center frequency to accuracy of tracking drift.

Counter output level: typically 0.1 V rms.

Specifications for Sweep/CW Generator

Frequency: controlled by spectrum analyzer. Range 500 kHz to 1250 MHz with HP 8554B. Scan widths are as enumerated on this page.

Frequency accuracy. ±10 MHz using spectrum analyzer tuning dial. Can be substantially improved using external counter outout.

Flatness: ±0.5 dB.

Spectral Purity

Residual FM (peak-to-peak): 200 Hz.

Harmonic distortion: 25 dB below output level (typical).

Nonharmonic (spurious) signals: >35 dB below output level.

Long term stability: drift typically less than 30 kHz/hour when stabilized after 2-hour warm-up.

Sweep width: 20 kHz to 1000 MHz.

Sweep rates: selected by Scan Time per Division on spectrum analyzer.

General

Temperature range: operation, 0°C to 55°C, storage −40°C to 75°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: 115 V and 230 V, 48 to 440 Hz, 12 watts max.

Weight: net, 7.1 kg (15.6 lb). Shipping, 9.5 kg (21 lb).

Size: 88.2 H x 425 W x 467 mm D (3.5″ x 16.8″ x 18.4″).