



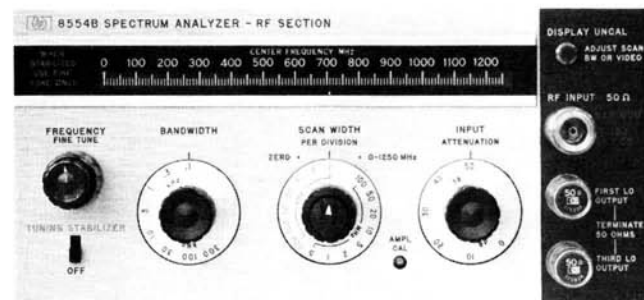
SIGNAL ANALYZERS

141T Spectrum Analyzer System: 100 kHz to 1250 MHz

Models 8554B & 8444A

- High resolution to 100 Hz
- Flat frequency response ± 1 dB
- High sensitivity to -122 dBm (180 nV)

- Variable persistence display
- Companion Tracking Generator
- Optional internal limiter



8554B



8444A

8554B Spectrum Analyzer

The 8554B Spectrum Analyzer RF Section covers the frequency range from 100 kHz to 1250 MHz. This broad frequency coverage allows analysis from baseband through UHF navigation bands. Absolute amplitude calibration is maintained over the entire range. Some typical applications include power and frequency measurements on modulation, distortion and spurious outputs, frequency response measurements of filters, amplifiers, modulators and mixers. The analyzer can also be used to make noise measurements such as noise power density over a specified frequency band, carrier-to-noise ratio or swept noise figure measurement of amplifiers. With a calibrated antenna or current probe the analyzer can characterize broadband and narrowband signals encountered in EMI applications.

Absolute Amplitude Calibration

Absolute amplitude measurements can be made from $+10$ to -122 dBm with ± 2.8 dB accuracy. This accuracy can be improved to ± 1.75 dB using IF substitution. The display is calibrated in log (dBm) to obtain a wide display range and linear (voltage) for measurements requiring maximum resolution. The top graticule line on the CRT is a calibrated reference level which can be changed by the front panel controls from $+10$ to -72 dBm for IF substitution measurements. Amplitude calibration is dependent upon the proper relationship between sweep width, sweep time, resolution bandwidth and video filtering. An uncal warning light is present to indicate an uncalibrated situation.

Flat Frequency Response

In broadband use, the wide bandwidths allow fast sweeping of the entire spectrum. The analyzer is extremely flat (± 1 dB) over its entire range, allowing direct comparisons of signal amplitudes displayed on the CRT. A 0 to 50 dB input attenuator is provided to prevent overdriving the input mixer.

Resolution

The low residual FM (< 100 Hz peak-to-peak) of the 8554B makes possible resolution bandwidths as narrow as 100 Hz. This enables resolving closely spaced signals such as 1 kHz and 400 Hz sidebands. Bandwidths range from 100 Hz to 300 kHz in a 1, 3, 10 sequence making it easy to select an optimum bandwidth to scan width ratio.



The resolution bandwidths consist of synchronously tuned "gaussian" shaped filters to enable faster sweeping for any given bandwidth. In addition, these filters have narrow shape factors making it possible to measure closely spaced signals differing greatly in amplitude.

Sensitivity

The high sensitivity (-122 dBm in 100 Hz bandwidth) and wide spurious-free measurement range (> 65 dB) of the 8554B means accurate measurements can be made on low level signals and signals varying widely in amplitude. For example, modulation as low as 0.2% can be measured. Low level harmonic and intermodulation distortion, spectrum surveillance and EMI are just a few of the measurements possible. A video filter is provided in the IF section to average displayed noise and simplify the measurement of low level signals.

Automatic Tuning Stabilization

The 8554B Spectrum Analyzer is automatically stabilized in narrow scans. This gives the stability (< 100 Hz peak-to-peak residual FM) needed for high resolution analysis. Stabilization is accomplished by phase locking the LOs (local oscillators) to a crystal reference in scan widths 200 kHz/div and below. No signal recentering or checking for stabilization is required because the signal remains on screen when phase locked.

8444A Tracking Generator

The 8444A Tracking Generator is a signal source, which, when connected to the 8554B Spectrum Analyzer, has an output whose frequency is the same as the swept frequency of the analyzer. The tracking generator is used as a signal source to measure the frequency response of a device. It can also be used for precision frequency measurements. An external counter output is provided on the 8444A and the frequency of unknown signals as well as the frequency of any point on a frequency response curve can be measured. The use of the 5300/5305B Counter is suggested for frequency measurements to 1300 MHz.

The tracking generator-spectrum analyzer system can be used as a sweeper to provide test signals for other devices. The sweep widths and sweep rates are controlled from the spectrum analyzer and the output level from the tracking generator.



8554B Specifications—with 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 $\pm 20\%$ (10 kHz bandwidth $\pm 5\%$).

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, 30 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 $0.1 \mu\text{V}$ to 100 mV 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	$\pm 12\%$
Switching between bandwidths (at 20°C)	± 0.5 dB	$\pm 5.8\%$
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 ($\pm 2.3\%$, Linear Sensitivity).

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

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: $\pm 10\%$.

50 ms/div to 10 s/div: $\pm 20\%$.

Weight

Model 8554B RF section: net, 4.7 kg (10 lb, 4 oz). Shipping 7.8 kg (17 lb).

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

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 \pm Residual FM (200 Hz).

Counter mode of operation

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

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 energy is within the requirements of MIL-1-6181D.

Power: 115 V and 230 V, 48 to 440 Hz, 12 watts max.

Weight: net, 7.1 kg (15 lb, 10 oz). Shipping, 9.5 kg (21 lb).

Size: 88.2 H, 425 W, 467 mm D ($3\frac{1}{2}'' \times 16\frac{3}{4}'' \times 18\frac{3}{8}''$).

Ordering Information

8554B RF Section

Opt 003: Internal Limiter

8444A Tracking Generator

Price

\$4975

\$170

\$3675