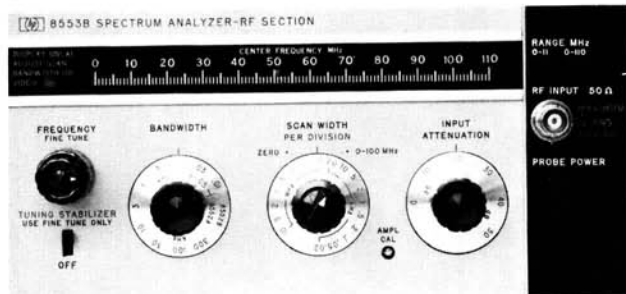


SIGNAL ANALYZERS

141T Spectrum Analyzer System: 1 kHz to 110 MHz

Models 8553B & 8443A

- Wide frequency range
- 10 Hz resolution bandwidth
- High sensitivity (-140 dBm)

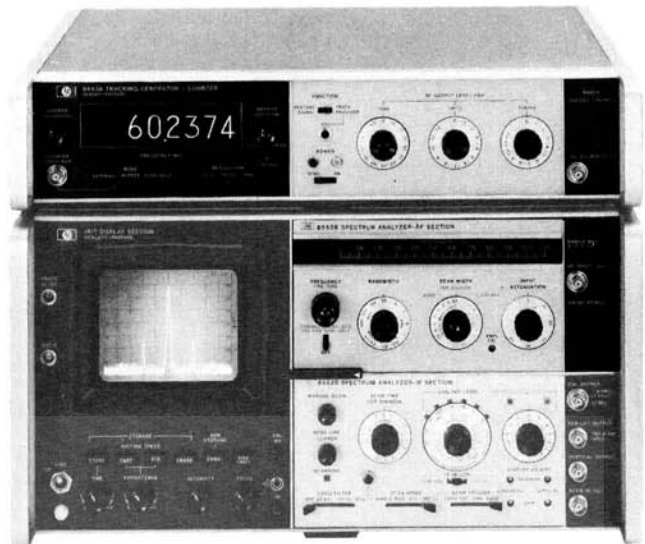


8553B



8443A

- Accurate amplitude measurements (± 1.25 dB)
- 10 Hz frequency accuracy with tracking generator
- 130 dB swept measurement range



General Purpose

The 8553B Spectrum Analyzer makes absolute amplitude and frequency measurements over the 1 kHz to 110 MHz range. This frequency span includes audio, video, navigation aids, telemetry, multiplex communication systems basebands, commercial AM, FM, TV, and land mobile communication. The analyzer features high resolution and stability, low distortion, high sensitivity, and a wide dynamic range. A tracking generator is available which improves the frequency measurement accuracy of the analyzer and can be used to make swept measurements.

Wide Frequency Range

The broad frequency range of 1 kHz to 110 MHz extends from audio through the FM broadcast band. Scan widths from 200 Hz to 100 MHz allow a user to view all or selected parts of the frequency spectrum while the zero scan mode turns the analyzer into a fixed tuned receiver and displays amplitude variations in the time domain. The analyzer has two dial scales, 0–110 MHz for full coverage and 0–11 MHz for better resolution at low frequencies.

Resolution—Stability

The 8553B has resolution bandwidths that range from 300 kHz to 10 Hz. Wide bandwidths are necessary for making measurements on a wideband spectrum such as FM. The extremely high resolution 10 Hz bandwidth allows measurement of 50 Hz sidebands 60 dB down. Such high resolution is made possible by automatic stabilization through phase lock, which reduces residual FM to a negligible level. Good stability is required to measure oscillator residual FM and drift.

Absolute Amplitude Calibration

The 8553B Spectrum Analyzer is absolutely calibrated in both dBm and volts from -142 dBm (18 nV) to $+10$ dBm (0.7 V). This absolute calibration is derived from a built-in calibrator (-30 dBm at 30 MHz) and extremely flat analyzer frequency response (± 0.5 dB). A display uncal. light warns if the display becomes uncalibrated. The probe power output supplies power to a high impedance probe which can be used to make bridging measurements on circuits terminated at both ends.

High Sensitivity

A low analyzer noise figure and narrow bandwidths give the 8553B very high sensitivity. Signal levels as low as -140 dBm can be measured in 10 Hz bandwidth, and a preamplifier is available to further increase sensitivity by 16 dB. Video filtering in 10 kHz, 100 Hz and 10 Hz bandwidths will average the displayed noise. High analyzer

sensitivity is required if distortion in an amplifier or oscillator is to be measured as a function of output level. In EMI studies, field strength can be measured with a calibrated antenna.

70 dB Dynamic Range

The 8553B has a 70 dB dynamic range when the signal level is properly conditioned at the input mixer. A wide dynamic range is necessary to measure small signals in the presence of large ones, such as harmonic or intermodulation distortion or to monitor signals of widely varying amplitudes, such as in EMC, RFI, and surveillance work.

8443A Tracking Generator-Counter

A tracking generator, 8443A, is available which covers the 100 kHz to 110 MHz frequency range of the 8553B. It has a built-in counter, and precision RF attenuators which are useful in making substitution measurements.

Frequency Accuracy

In conjunction with an 8443A Tracking Generator, the 8553B Spectrum Analyzer can measure frequencies to an accuracy of ± 10 Hz. When the 8443A is operated in the "track analyzer" mode, the counter will read the frequency at a tunable marker which is generated on the analyzer CRT. The "restore signal" mode is a more convenient way to measure signal frequencies in wide scans because the counter reads the signal frequency automatically without fine tuning. The 8443A Tracking Generator may also be used externally as a 120 MHz direct reading counter.

Swept Measurements

The 8443A Tracking Generator can be used with the 8553B to make swept insertion loss and return loss measurements over the 100 kHz to 110 MHz frequency range. Because the signal source tracks the analyzer's tuning, up to 130 dB dynamic measurement range is possible (at 10 Hz bandwidth). Excellent system flatness (± 1.0 dB) insures the accurate determination of swept response characteristics.

Specifications—with 8552B IF Section

Frequency Specifications

Frequency range: 1 kHz–110 MHz (0–11 MHz and 0–110 MHz tuning ranges).

Scan width (on 10-division CRT horizontal axis)

Per division: 18 calibrated scan widths from 20 Hz/div to 10 MHz/div in a 1, 2, 5 sequence.

Preset: 0–100 MHz, automatically selects 300 kHz bandwidth IF Filter.

Zero: analyzer is fixed tuned receiver with selectable bandwidth.



Frequency accuracy

Center frequency accuracy: the dial indicates the display center frequency within ± 1 MHz on the 0–110 MHz tuning range; ± 200 kHz on the 0–11 MHz tuning range with FINE TUNE centered, and temperature range of 20°C to 30°C.

Scan width accuracy: scan widths 10 MHz/div to 2 MHz/div and 20 kHz/div to 20 Hz/div: Frequency error between two points on the display is less than $\pm 3\%$ of the indicated frequency separation between the two points. Scan widths 1 MHz/div to 50 kHz/div: Frequency error between two points on the display is less than $\pm 10\%$ of the indicated frequency separation.

Resolution

Residual FM: IF Bandwidths of 10 Hz to 300 kHz are provided in a 1, 3 sequence.

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

Bandwidth selectivity: 60 dB/3 dB IF bandwidth ratios: 10 Hz to 3 kHz bandwidths, $<11:1$, 10 kHz to 300 kHz bandwidths, $<20:1$; 60 dB points on 10 Hz bandwidth separated by <100 Hz.

Stability

Residual FM stabilized: sidebands >60 dB down 50 Hz or more from CW signal, scan time ≥ 1 sec/div, 10 Hz bandwidth (typically less than 1 Hz peak-to-peak).

Residual FM unstabilized: <1 kHz peak-to-peak.

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

Long term drift (after 1-hour warm-up), stabilized: 500 Hz/10 min; unstabilized: 5 kHz/min, 20 kHz/10 min.

Amplitude Specifications

Absolute amplitude calibration range

Log: from -130 to $+10$ dBm, 10 dB/div on a 70 dB display or 2 dB/div on a 16 dB display.

Linear: from $0.1 \mu\text{V/div}$ to 100 mV/div in a 1, 2 sequence on an 8-division display.

Dynamic range

Average noise level: <-110 dBm with 10 kHz IF bandwidth.

Video filter: averages displayed noise; 10 kHz, 100 Hz, and 10 Hz bandwidths.

Spurious responses: are below a -40 dBm signal at the input mixer as follows: All image and out-of-band mixing responses, harmonic and intermodulation distortion more than 70 dB down, 2 MHz to 110 MHz; more than 60 dB down, 1 kHz to 2MHz. Third order intermodulation products more than 70 dB down, 1 kHz to 110 MHz (Signal separation >300 Hz).

Residual responses (no signal present at input): with input attenuation at 0 dB: <-110 dBm (200 kHz to 110 MHz); <-95 dBm (20 kHz to 200 kHz).

Amplitude accuracy:

Frequency response
(Flatness: attenuator settings >10 dB):
1 kHz to 110 MHz
Amplitude Display

	Log	Linear
	± 0.5 dB	$\pm 5.8\%$
	± 0.25 dB/dB	$\pm 2.8\%$ of full 8 div deflection
	but not more than ± 1.5 dB over the full 70 dB display range	

Calibrator amplitude: -30 dBm, ± 0.3 dB

Calibrator 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: ± 1.25 dB with proper technique.

General

Input impedance: 50 Ω nominal, BNC connector. Reflection coefficient <0.13 (1.3 SWR), input attenuator ≥ 10 dB. A special 75 Ω 8553B/8552B is available.

Maximum input level: peak or average power $+13$ dBm (1.4 V ac peak), ± 50 V dc, 1 dB compression point, -10 dBm.

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

Scan mode

Int: analyzer repetitively scanned internally.

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

Manual: scan determined by front panel control.

Attenuator: 0 to 50 dB, in 10 dB increments, coupled to Log Reference Level indicator; automatically maintains absolute calibration. Attenuator accuracy ± 0.2 dB.

Power requirements: 100, 120, 220, or 240 V $\pm 5\%$, -10% , 50 to 60 Hz, normally less than 225 watts.

Weight: Model 8553B RF Section: net, 5.5 kg (12 lb). Shipping, 7.8 kg (17 lb).

Size: 102 mm H x 226 mm W x 334 mm D ($4''$ x $8\frac{7}{8}''$ x $13\frac{1}{2}''$).

Tracking Generator-Counter (8443A)

Frequency range: 100 kHz to 110 MHz.

Amplitude range: <-120 dBm to $+10$ dBm in 10 and 1 dB steps with a continuous 1.2 dB vernier.

Amplitude accuracy

Frequency response (flatness): ± 0.5 dB.

Absolute: 0 dBm at 30 MHz: ± 0.3 dB.

Output impedance: 50 Ω , BNC connector, ac coupled, reflection coefficient ≤ 0.09 (1.2 SWR) with output <0 dBm.

Counter

Display: 7 digits with 1 digit over-range. Reads to ± 10 Hz increments.

Resolution (gate time): 1 kHz (1 ms), 100 Hz (10 ms), 10 Hz (100 ms).

Accuracy: ± 1 count \pm time base accuracy.

Time base aging rate: $<3 \times 10^{-9}$ /day (0.3 Hz/day) after warm-up.

External counter inputs: 10 kHz to 120 MHz, 50 Ω , -10 dBm min.

Power: 100, 120, 220, or 240 V $\pm 5\%$, -10% , 48 to 440 Hz 75 watts.

Weight: Model 8443A: net, 11.04 kg (24 lb, 5 oz). Shipping, 14.47 kg (31 lb, 14 oz).

Size: 88.2 mm H x 425 mm W x 467 mm D ($3\frac{15}{32}''$ x $16\frac{3}{4}''$ x $18\frac{3}{8}''$)

Ordering Information

8553B RF Section

8443A Tracking Generator-Counter

Price

\$3350

\$5000