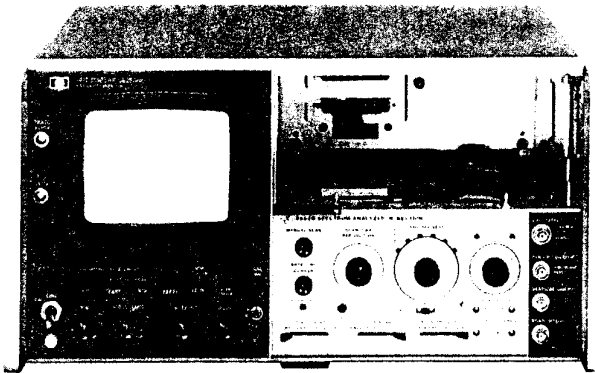


# SIGNAL ANALYZERS

Plug-in spectrum analyzer system, 20 Hz to 40 GHz

Model 141T system

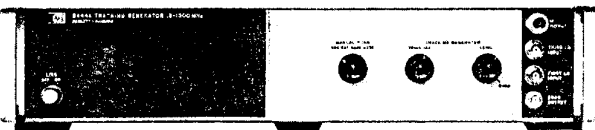
- 20 Hz to 40 GHz with just a tuning section change
- Advantages of fully calibrated solid state system
- Add measurement capability to your system as needed
- Tracking generator expands measurement capability
- Increase dynamic range with tracking preselector
- Storage-normalizer adds digital storage



141T, 8552B



8443A



8444A

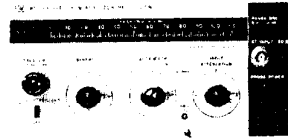


8445B Opt 002, 003

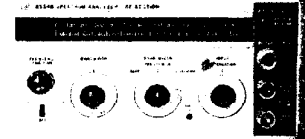
Hewlett-Packard's high performance plug-in spectrum analyzer family makes frequency domain measurements from 20 Hz to 40 GHz. Because of the system's modularity, the user need purchase only analyzer components necessary to meet immediate production or laboratory measurement requirements. Then, as broader frequency capability is required, additional tuning sections or companion instruments can be added.

The models 8553B, 8554B, 8555A, and 8556A are tuning sections which plug into a 141T display mainframe along with an 8552B IF section to form a member of the Hewlett-Packard high performance spectrum analyzer family. Each tuning section covers a frequency range convenient for equipment design or spectrum surveillance: 8556A, 20 Hz to 300 kHz; 8553B, 1 kHz to 110 MHz; 8554B, 100 kHz to 1250 MHz; and 8555A, 10 MHz to 40 GHz. The IF section plug-in which is used with each tuning section, serves to condition the measurement signal for proper display on the CRT. Two IF sections are available, the 8552B high performance model and the 8552A model for economy. The spectrum analyzer specifications included in this catalog assume the use of the 8552B.

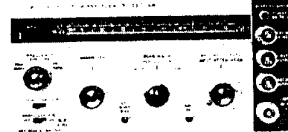
The 8443A and 8444A are tracking generators complementing the basic spectrum analyzer function with an RF source locked to the tuning frequency. The 8445B is an automatic preselector which enhances the dynamic range of the 10 MHz to 40 GHz 8555A tuning section analyzer.



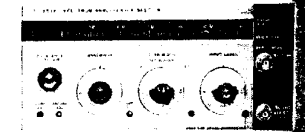
8553B



8554B



8555A



8556A

The 141T based spectrum analyzer features absolute calibration of frequency and amplitude, high resolution and sensitivity, wide dynamic range, and simple to interpret display output.

The following pages cover spectrum analyzer performance with each of the tuning sections and companion tracking generator/preselector.

### Absolute amplitude calibration

For ease and speed of measurement, full frequency band amplitude calibration allows direct interpretation of signal power or voltage from the CRT display. A choice of logarithmic or linear scaling calibrates the CRT in dBm or  $\mu$ V respectively. Front panel settings set the top horizontal graticule on the CRT as the reference power in the logarithmic mode; all other CRT measurements can be made relative to this reference. In linear scaling the CRT is calibrated in voltage per division using front panel settings. The bottom graticule is zero voltage.

When a combination of frequency scan, bandwidth, or video filter settings are chosen such that the display becomes uncalibrated, warning light indicates the condition.

### High resolution frequency calibration

The frequency measurement capability of the spectrum analyzer is responsive to user need, making spectrum measurements simply and accurately with three frequency scan modes.

First is the FULL scan mode, which displays the entire tuning section frequency band on the 10 cm horizontal CRT graticule. This mode is effective in viewing broadband effects of circuit adjustment and refinements as they are made. In FULL scan a marker on the CRT corresponds in frequency to the position of the pointer on the tuning section frequency scale, so signals can be readily identified.

The second mode, PER DIVISION scan, centers the display about the frequency indicated by the tuning section pointer. In this mode narrow, calibrated scan per division and automatic frequency stabilization make high resolution measurements for analysis of signal purity, sidebands, and low deviation FM.

In the third mode, ZERO scan, the analyzer becomes a receiver tuned to the frequency indicated on the scale. Modulation in an input signal at the tuned frequency is displayed on the CRT in the time domain. The scan time control provides a calibrated time base.

### High resolution

The ability to resolve close-in signal sidebands, such as line rate modulation, is important in frequency domain analysis. The Hewlett-Packard 141T plug-in spectrum analyzers each have narrow bandwidths for such resolution. Up to 110 MHz, the analyzers offer 10 Hz bandwidths and 18 GHz, 100 Hz bandwidths. The frequency stabilization feature already mentioned ensures high resolution by maintaining a jitter-free display.

### Wide dynamic range, sensitive

Confidence in signal identification is given by the analyzer's ability to measure wide amplitude differentials without distortion products and to measure very low-level signals. The plug-in spectrum analyzers have typically 70 dB of distortion free dynamic range; that is, the capability of measuring 0.03% signal distortion from the CRT display. With the 8445B preselector the 8555A has a spurious-free range of 100 dB. The CRT displays full dynamic range on a linear, easy to read scale.

Signals at as low a level as -142 dBm (20 nanovolts, 50 ohms) can be detected by the spectrum analyzer with 10 Hz bandwidth. At high frequencies and with 100 Hz bandwidth, -125 dBm signals can be measured.

### A parallax free, storable display

The 141T spectrum analyzer mainframe and display features a variable persistence CRT which enables response storage for any measurement. With very narrow bandwidth measurements, extremely slow sweeps are necessary to maintain amplitude calibration (allowing band-pass filters time to respond). A recording CRT is necessary to save this response for viewing. Of course, any response can be stored for a display ready to be photographed. Another display mainframe, the 140T, is available with standard persistence.

Interpretation of response levels on the CRT is free from parallax since the graticule is etched on the inside of the display screen adjacent to the phosphor.

### IF section adds convenience features

The high resolution 8552B or the economic 8552A IF section features video filtering, recorder outputs and an internal calibration signal to make the spectrum analyzer easier to use. Video filtering is a low-pass filter which averages noise amplitude response for easier small signal readings. It also makes wide band noise measurements easier.

Recorder outputs, including pen lift, allow hard copy duplication of the CRT display. Manual scan allows setting up of accessories, such as X-Y recorders, adjusting signals on screen during slow scans and measuring frequencies with a counter.

The internal calibration standard is a very stable -30 dBm, 30 MHz signal for quick front panel calibration.

### Tracking generators for each frequency band

Either available internally, or as a companion instrument, are leveled signal sources designed to track the swept tuning frequency of the spectrum analyzer. Amplifiers, filters or any circuit which requires an input signal can be characterized to 1300 MHz, with typically wider dynamic range and more precise frequency accuracy than with the spectrum analyzer alone.

The 8556A low frequency tuning section has an internal tracking generator, standard with the instrument. The 8553B and 8554B/8555A use separate generators namely 8443A and 8444A respectively.

### 8750A Storage-Normalizer

You can add digital storage to the 140-series spectrum analyzer with the 8750A (Opt. 001) and an external oscilloscope. Digital storage provides a flicker-free display regardless of the analyzer sweep speed and facilitates trace comparisons of two traces. If a tracking generator is employed, the normalization feature significantly reduces frequency response variations. The 8750A Storage-Normalizer is a versatile accessory which may be used directly with other HP spectrum and network analyzers. (See Page 24.24).

### General specifications

#### 141T spectrum analyzer system

**Input impedance:** 50Ω nominal. 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.

**Attenuator:** 0 to 50 dB in 10 dB steps.

**Scan time:** 16 internal scan rates from 0.1 ms/div to 10 sec/div in a 1, 2, 5 sequence, and manual scan (8552B only).

#### Scan time accuracy

0.1 ms/div to 20 ms/div: ±10%.

50 ms/div to 10 s/div: ±20%.

#### Scan mode

**Int:** analyzer repetitively scanned by internally generated ramp; synchronization selected by scan trigger

**Single:** single scan with front panel reset.

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

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

**Scan trigger:** for internal scan mode, select between

**Auto:** scan free-runs.

**Line:** scan synchronized with power line frequency.

**Ext:** scan synchronized with >2 volt (20 volt max.) signal.

**Video:** scan internally synchronized to envelope of RF input.

#### Auxiliary outputs:

**Vertical output:** 0 to -0.8 V for full deflection.

**Scan output:** -5 V to +5 V for 10 div CRT deflection.

**Pen lift output:** 0 to 14 V (0 V, pen down).

### Display characteristics

#### 141T, 140T

**Plug-ins:** accepts Models 8552A/B, 8553B, 8554B, 8555A and 8556A and Model 1400-series Oscilloscope plug-ins.

#### Cathode-ray tube type

**Model 141T:** post-accelerator storage tube, 9000 volt accelerating potential; aluminized P31 phosphor.

**Model 140T:** post-accelerator, 7300 volt potential medium-short persistence (P7) phosphor.

#### Cathode-ray tube graticule

**Model 141T:** 8 x 10 division (approx. 7.1 cm x 8.9 cm parallax-free internal graticule).

#### Persistence, model 141T only

**Normal:** natural persistence of P31 phosphor (0.1 second).

#### Variable

**Normal writing rate mode:** continuously variable from less than 0.2 second to more than one minute.

**Maximum writing rate mode:** from 0.2 second to 15 seconds.

**Erase:** manual; erasure takes approximately 350 ms.

**Storage time model 141T only:** normal writing rate; more than 2 hours at reduced brightness (typically 4 hours).

**Fast writing speed, model 141T only:** more than 15 minutes.

**Functions used with oscilloscope plug-ins only.** Intensity modulation, calibrator; beam finder.

**EMI:** conducted and radiated interference is within requirements of MIL-I-16910C and MIL-1-6181D and methods CEO3, and REO2 of MIL-STD-461 (except 35 to 40 kHz) when appropriate RF tuning section and 8552A or 8552B are combined in a 140T or 141T Display Section.

**Temperature range:** operating, 0°C to +55°C; storage, -40°C to +75°C.

**Power requirements:** 100, 120, 220, or 240V +5% -10%. 50 to 60 Hz, normally less than 225 watts (includes plug-ins used).

#### Weight

**Model 8552A or 8552B IF section:** net, 4.1 kg (9 lb). Shipping 6.4 kg (14 lb).

**Model 140T display section:** net, 16.8 kg (37 lb). Shipping, 20 kg (45 lb).

**Model 141T display section:** net, 18 kg (40 lb). Shipping, 23 kg (51 lb).

**Tuning section:** see following pages.

**Size:** model 140T or 141T with plug-ins: 221 H x 425 W x 416 mm D (8¾" x 16¾" x 16¾").

**Special order:** chassis slides and adapter kit.

#### Ordering information

140T Normal Persistence Display

Opt 908: Rack Flange Kit

141T Variable Persistence Display

Opt 908: Rack Flange Kit

8552A Economy IF Section

8552B High Resolution IF Section

#### Price

\$1800

add \$15

\$2600

add \$15

\$3175

\$4025