

NEW 2756P

GPB
IEEE-488

The 2756P complies with IEEE Standard 488-1978 and with Tektronix Standard Codes and Formats.

- Covers 10 kHz to 325 GHz, -134 dBm Sensitivity, and 10 Hz to 3 MHz Resolution
- 90 dB Display Dynamic Range
- Built-in High Performance Microwave Frequency Counter
- Excellent Marker and Center Frequency Accuracy (up to 10^{-9}) and External Reference Input for Locking to a System Clock
- Macro Programming Saves Frequently Used Measurement Programs in Non-volatile Instrument Memory
- Intelligent Markers with Signal Processing Functions Using Unique Marker Keypad
- Dedicated Data Keypad for Entry of Key-Control Parameters
- Large, Easy-to-Use Controls
- Internal Preselection
- Push-button Occupied Bandwidth and Noise Normalization Functions
- Nonvolatile Memory for up to Nine Waveforms and Ten Front-Panel Settings
- Plot Data Directly Without a Controller
- Fully GPIB Programmable
- Optional MATE/CIIL Compatibility

Lab Performance at an Affordable Price

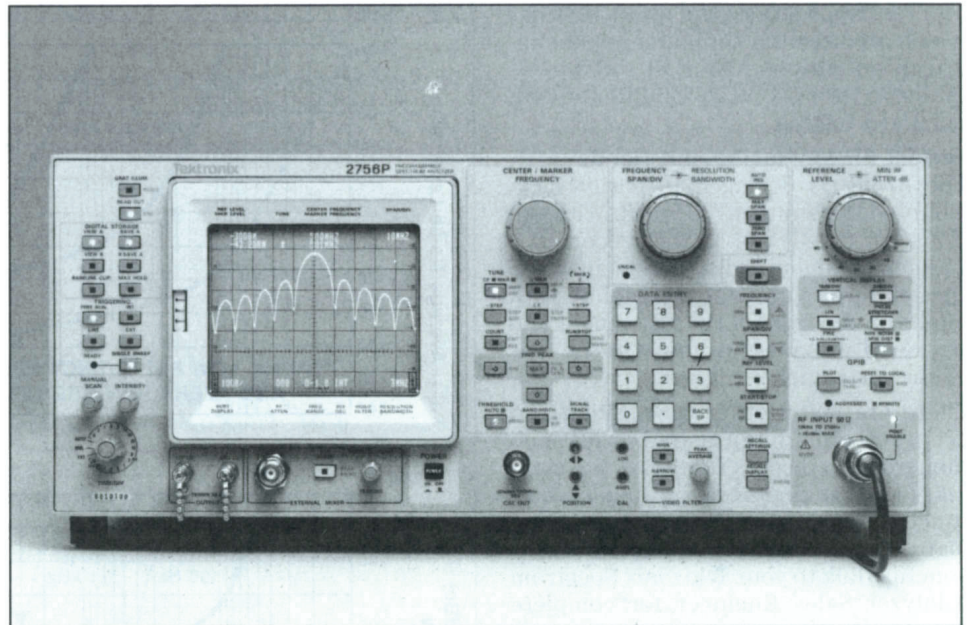
The Tektronix 2756P Spectrum Analyzer offers features essential for laboratory measurements. Offering frequency coverage from 10 kHz to 325 GHz, the 2756P has impressive -134 dBm sensitivity and advanced, intelligent markers with exclusive signal processing capabilities. The 2756P is optimized for use in baseband through millimeter wave measurements, where ability to identify and process signal frequencies and amplitudes over wide dynamic ranges with high accuracy is critical.

Let the 2756P Make the Measurements

Downloadable programming capability lets you execute your frequently used measurement routines from the spectrum analyzer's nonvolatile memory. Tedious and often incorrect conversions from dBm to dBmV, dBV, dBμV, or dB/Hz reference units are no longer required since the 2756P handles it all for you. In addition, the 2756P can store up to ten complete instrument set-ups in nonvolatile RAM for recall at the touch of a few buttons.

An internal high stability reference provides marker or center frequency accuracy approaching 10^{-9} for added confidence in measurements. A built-in microwave signal counter with 144 dB dynamic range means you can determine the exact frequency of

TOP-OF-THE-LINE PERFORMANCE AT AN AFFORDABLE PRICE



marked signals only 10 Hz apart—or count the exact delta frequency between two marked signals—even with greatly differing amplitudes. You also have the flexibility of tying in with a system clock, using the instrument's external reference lock capacity.

A permanent record of CRT displays can be obtained at the push of a button, without a controller, using the direct plot capability.

Intelligent Markers Utilize Advanced Signal Processing

New dynamic markers automatically update frequency and amplitude data with every sweep. When used in conjunction with the 2756P's powerful signal processing intelligence you can use PULSE mode to mark the peak of a main lobe and peaks of side lobes at the push of a button. CW mode locates signals exhibiting CW characteristics and ignores all other signals. SPUR mode marks all signals that meet user-defined or automatic threshold criteria. User-definable threshold criteria are available for all signal processing modes.

The 2756P also offers operator convenience for measuring the bandwidth filters, amplifiers and other networks. Simply enter the desired bandwidth point, select Bandwidth mode and markers automatically update to display the new value.

Dedicated Direct Keypad Data Entry of Major Measurement Parameters

Enables fast, accurate instrument set-up—user is prompted by screen messages for proper keypad inputs—all “valid” keys to

push are illuminated to steer users to proper selections. Unique marker keypad allows for Peak Find, Right and Left Next, Next Higher and Lower, Left and Right ×dB, and Peak Find and Center to be executed direct from the front panel. This makes signal searches much easier.

Meet Your System Needs Fully Automated Spectrum Analysis

The 2756P is a fully GPIB-programmable laboratory spectrum analyzer. It simplifies programming and ensures measurement repeatability. You can operate the 2756P under program control, change front-panel settings, read data from the CRT display, and send waveforms from internal memory to other GPIB devices. Tek's Standard Codes and Formats keep commands clear, consistent, and universally understood.

Millimeter Wave Capability

Using Tek's high performance waveguide mixers, you get calibrated amplitude and frequency coverage from 18 to 325 GHz. Real signals are determined in two sweeps with Tek's accurate millimeter wave identification mode. No costly L.O. amp is needed—just some simple connections and you're ready to measure.

Tektronix Automated Spectrum Analyzer Packages

Convenient to order, these packages are configured around Compaq's PC, Tek's laboratory quality programmable 2750P Series spectrum analyzers. Coupling the PC to the analyzer via the IEEE-488 bus enables the user to take advantage of the

PC's capability, as well as the power and versatility of Tek's spectrum analyzers. A highly versatile General RF Applications Software Package (GRASP) offers many different applications and utility routines which are selected through easy, menu-driven operation. Also EMI software is available for FCC, VDE, CISPR, and MIL Standard testing.

Perfect Fit for Rackmount Needs

The 2756P is designed to easily rack-mounted in a standard 19" rack. With Options 30 or 31 the 2756P becomes a 7" -high rackmounted spectrum analyzer. Option 30 provides for rackmount with inputs on the front of the instrument and Option 31 provides for inputs at the rear of the instrument.

There are many other time-saving and accuracy-enhancing capabilities too numerous to discuss here. See the summary of signal processing and marker functions on page 167 for a more complete idea of the 2756P measurement benefits. Talk to your Tektronix Spectrum Analyzer Sales Engineer for complete details.

CHARACTERISTICS

The following characteristics apply after a 30-minute warm-up period unless otherwise noted.

FREQUENCY RELATED

Frequency Range—10 kHz to 21 GHz in coax, 18 to 325 GHz in external waveguide mixers.

Center and Marker Frequency Accuracy— $\pm [20\%D + (F \times REF) + (2N + 25) \text{ Hz}]$ with Span/Div ≤ 200 kHz for Bands 1 & 5-12 or Span/Div ≤ 100 kHz for Bands 2-4 (phase locked); Otherwise (unlocked) $\pm [20\%D + (F \times REF) + (15N) \text{ kHz}]$.

Where: D= Span/Div or Resolution BW, whichever is greater.

F=Center or Marker Frequency.

N=Harmonic Mixing Number.

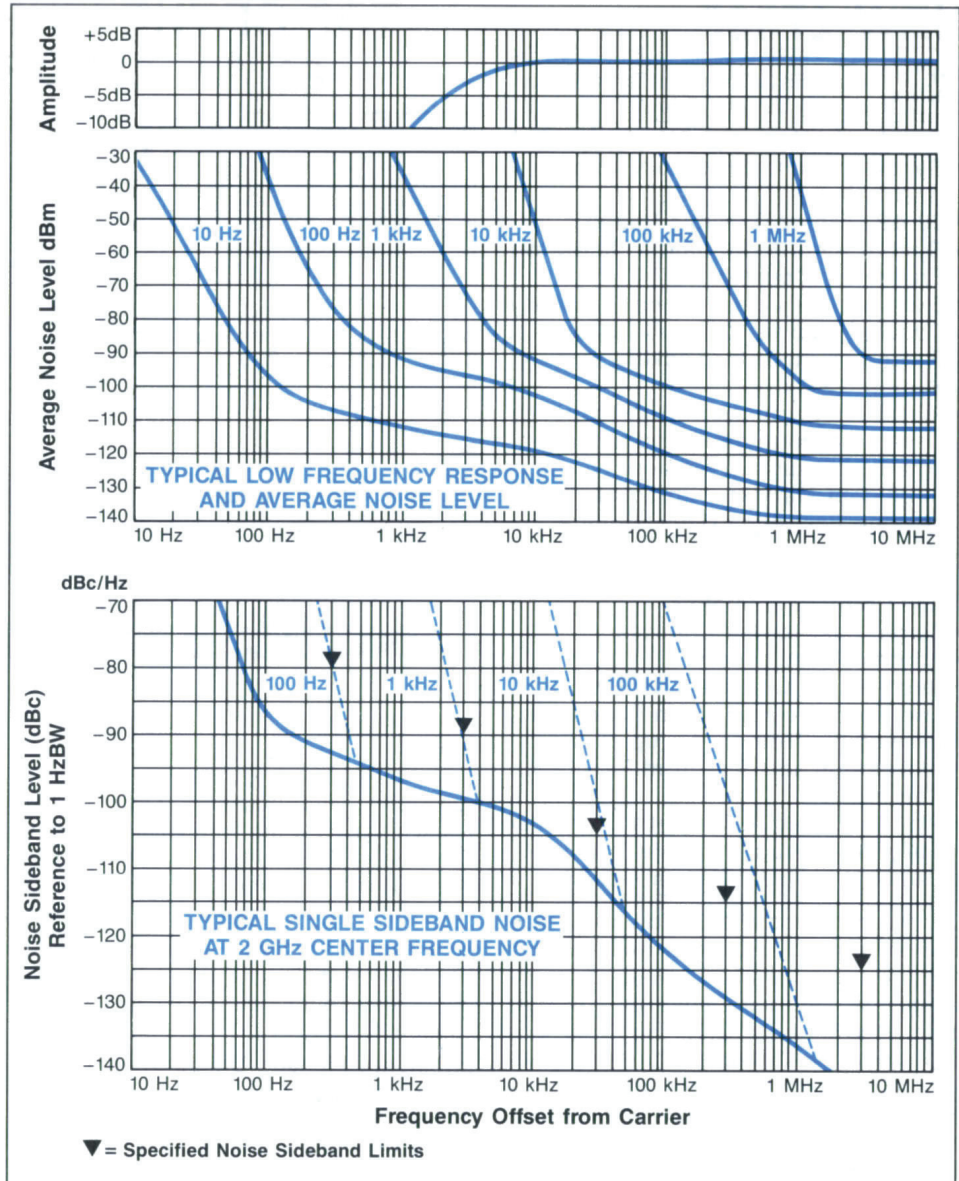
REF=Reference Frequency Error.

Delta Marker Frequency Accuracy— $\pm 1\%$ of Total Span.

Frequency Drift (After 1-hour warm-up)—Span/Div ≤ 200 kHz for Bands 1 & 5-12 or Span/Div ≤ 100 kHz for Bands 2-4 (phase locked): Drift rate ≤ 50 Hz/min. Correction will occur at the end of sweep for sweep times ≥ 5 s/Div. (Drift rate is typically < 20 Hz/min after 1-hour warm-up from 25°C storage.) Span/Div > 200 kHz for Bands 1 & 5-12 or Span/Div > 100 kHz for Band 2-4 (unlocked): Drift rate $< (5 \text{ kHz})N/\text{min}$ (typically $< (25 \text{ kHz})N/\text{min}$ after 30-minute warm-up).

Residual FM— $\leq (5 + N)$ Hz peak-to-peak in 20 msec, Span/Div ≤ 200 kHz for bands 1 & 5-12 or Span/Div ≤ 100 kHz for Bands 2-4 (phase locked); Otherwise (unlocked) $\leq (7 \text{ kHz})N$ peak-to-peak in 20 msec.

Frequency Readout Resolution— $\leq 10\%$ of Span/Div to 1 Hz minimum.



SENSITIVITY AND FREQUENCY RESPONSE

Band and Frequency Range	Harmonic Number	Sensitivity (dBm) at Minimum Resolution	Frequency Response (dB)*1
1 (10 kHz-1.8 GHz)	1	-134	± 1.5
2 (1.7-5.5 GHz)	1	-125	± 2.5
3 (3.0-7.1 GHz)	1	-125	± 2.5
4 (5.4-12 GHz)	3	-111	± 3.5
12.0-18.0 GHz)		-107	
5 (15.0-21.0 GHz)	3	-106	± 5.0
6 (18-27 GHz)	6	-116	± 2.0
7 (26-40 GHz)	10	-111	± 2.0
8 (33-50 GHz)	10	-111	± 2.0
40-60 GHz)			± 2.5
9 (50-90 GHz)	15	-105 at 50 GHz; -95 at 90 GHz	± 3.0
10 (75-140 GHz)*2	23	-100 at 75 GHz; -85 at 140 GHz	± 3.0
11 (110-220 GHz)*2	37	-90 at 100 GHz; -75 at 220 GHz	± 3.0
12 (170-325 GHz)*2	56	-70 at 170 GHz; -55 at 325 GHz	± 3.0

*1 Measured with 10 dB RF Attenuation and peaking optimized. Frequency response is with ± 4.5 dB from 10 kHz to 18 GHz.

*2 Frequency response for any 5-GHz band. Response is within ± 6 dB referenced to 100 MHz.

Reference Frequency Error (Internal)— $\leq 1 \times 10^{-9}$ per day; $\leq 1 \times 10^{-7}$ in the first six months, $\leq 1 \times 10^{-7}$ per year thereafter; Accuracy 30 minutes after power on within 5×10^{-8} of the frequency after 24 hours; Within 2×10^{-8} over the temperature range of -15 to $+55^\circ\text{C}$.

Signal Counter Accuracy— $\pm [(F \times \text{REF}) + (5 + N) \text{ Hz} + 1 \text{ LSD}]$.

Delta Counter Accuracy— $\pm [(\text{Delta } F \times \text{REF}) + (10 + 2N) \text{ Hz} + 1 \text{ LSD}]$

Where: F=Center or Marker Frequency.
REF=Reference Frequency Error.
N=Harmonic Mixing Number.
LSD=Least Significant Digit.

Counter Sensitivity—Signal level must be ≥ 20 dB above the average noise level and within 60 dB of the reference level.

Counter Readout Resolution—Selectable from 1 Hz to 1 GHz in decade steps.

Resolution Filters—10 Hz to 3 MHz; 10 Hz to 1 MHz in decade steps; 6 dB bandwidth $\pm 20\%$; Shape factor $\leq 7.5:1$ except 10 Hz where 60 dB BW ≤ 150 Hz.

Frequency Span/Division—0 Hz (ZERO SPAN pushbutton, knob or keypad data entry); 10 Hz to 10 GHz (in a 1-2-5 sequence) via Span/Div knob; 10 Hz to 15 GHz (to two significant digits) via FREQUENCY or MARKER.

START/STOP or keypad data entry; 180 MHz via power-up or RESET: Full band via knob or MAX SPAN pushbutton; Multiband spans in Bands 2-5 (1.7 to 21 GHz) via START/STOP FREQUENCY mode; accuracy $\pm 5\%$ for Span/Div ≥ 50 Hz, $\pm 10\%$ for Span/Div < 50 Hz.

Frequency Response Sensitivity—See chart on page 172.

AMPLITUDE RELATED

Display Dynamic Range—90 dB Log mode; eight divisions Linear mode.

Reference Level Range—

Log Mode: -117 to $+50$ dBm ($+30$ dBm maximum); -130 to $+37$ dBV ($+17$ dBV maximum); -70 to $+97$ dBmV ($+77$ dBmV maximum); -10 to $+157$ dB μ V ($+137$ dB μ V maximum).
Linear Mode: 39.6 nV/Div to 2.8 V/Div (1 watt or 10 V_{peak} maximum).

Noise Sidebands

dBc/Hz	Offset from Carrier
- 80	300 Hz
- 90	3 kHz
- 105	30 kHz
- 115	300 kHz
- 125	3 MHz

Power Line Related Sidebands— ≤ -55 dBc for line frequencies from 47 to 440 Hz.

TIME RELATED

Sweep Time—20 μ s to 5 s/div (10 s/div in Auto) in a 1-2-5 sequence; accuracy $\pm 5\%$.

Marker Time Accuracy— $\pm 10\%$ (indicates time from start of sweep).

Δ Marker Time Accuracy— $\pm 5\%$ (indicates time between two markers).

INPUT

RF Input—Type "N" female, 50 Ω nominal impedance.

VSWR

Frequency	10 dB Attenuation	(Typical) 0 dB Attenuation
10 kHz to 2.5 GHz	1.3:1 Max 1.2:1 Typical	1.9:1
2.5 to 6.0 GHz	1.7:1 Max 1.5:1 Typical	1.9:1
6.0 to 18 GHz	2.3:1 Max 2.9:1 Typical	2.3:1
18 to 21 GHz	3.5:1 Max 2.7:1 Typical	3.0:1

Maximum Safe Input (0 dB RF Attenuation)— $+30$ dBm (1 W) continuous, 75 W peak, 1 μ sec pulsewidth, 0.001 duty; 0 V dc.

1 dB Gain Compression— -10 dBm with 0 dB RF attenuation in MIN NOISE. -20 dBm with 0 dB RF attenuation in MIN DISTORTION.

External Mixer Input—Front-panel TNC female connector for IF frequency inputs from external mixers covering 18 to 325 GHz.

External Reference Input—Frequency: 1, 2, 5, or 10 MHz with ≤ 5 ppm stability.

Power Range: -15 to $+15$ dBm.
Waveshape: Sine wave, ECL, TTL (Allowable Duty cycle symmetry is 40 to 60%).
Input Impedance: 50 Ω ac, 500 Ω dc; rear-panel BNC input.

CHARACTERISTICS

**50/75 Ω OPTION 07
75 Ω INPUT RELATED**

Provides 75 Ω input and dBmV calibration in addition to the normal 50 Ω input and dBm calibration. The 100 kHz resolution filter is replaced by 300 kHz to optimize the instrument for broadcast and CATV uses.

Center Frequency Range—1 to 1000 MHz.

Frequency Response— ± 2.0 dB from 5 to 1000 MHz; typical response for the 1 to 5 MHz frequency range is < 3 dB down from the 5 MHz response.

Reference Level Range— -68 to $+79$ dBmV ($+89$ dBmV is achievable in MIN NOISE mode) and $+99$ dBmV in Reduced Gain mode.

**Sensitivity (Equivalent Input Noise):
5 to 1000 MHz—75 Ω Input**

Sensitivity dBmV	Resolution Bandwidth
- 81	30 Hz
- 76	100 Hz
- 66	1 kHz
- 56	10 kHz
- 41	300 kHz
- 36	1 MHz

50 Ω RF Input

- 90 (dBm)	300 kHz
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Input Impedance—75 Ω ; VSWR 1.35:1 (17 dB RL) maximum, 5 to 800 MHz; VSWR 1.6:1 (13 dB RL) maximum, 800 to 1000 MHz; BNC female.

Maximum Input Level—With 0 dB attenuation: $+78$ dBmV. With attenuation > 20 dB: $+78$ dBmV, 100 V maximum (dc + ac peak).

Calibrator (Cal Out)— $+20$ dBmV ± 0.5 dB; 75 Ω impedance nominal.

ORDERING INFORMATION

2756P Programmable Spectrum Analyzer. **\$47,995**

Includes: Same as 2753P except operator's manual (070-6317-00); programmer's manual (070-6320-00).

OPTIONS

Option 07—75 Ω input. **+ \$750**

Includes: BNC male to female adaptor connector (013-0126-00); 42-in. BNC to BNC connector 75 Ω coax cable (012-0074-00).

Option 21—18 to 40 GHz High Performance Waveguide Mixer Set. **+ 2,650**

Includes: Diplexer assembly (015-0385-00); BNC-to-SMA adaptor (015-0388-00); power cord clamp (343-0170-00); SMA-to-SMA cable (012-0649-00).

Option 22—18 to 60 GHz High Performance Waveguide Mixer Set. **+ \$4,460**

Includes: Same as Option 21.

Options 23, 24, 25, 26, 28, 29—Bundled software and computer packages available in U.S. only. Contact your local sales representative.

Option 30—Rackmount. **+ \$250**

Option 31—Rackmount with rear-panel input/output connectors. **+ \$450**

Option 39—Replaces Lithium with Silver batteries for instrument memory. **+ \$50**

Option 41—Digital Radio Enhancement. **+ \$450**

Option 42—110 MHz, > 5 MHz bandwidth, IF Output suitable for broadband receiver measurements. **+ \$1,500**

Option 43—Alternate CRT. **+ \$250**

Option 45—MATE/CIIL language interface. **+ \$4,975**

Option 52*—North American 220 V configuration with standard power cord.

Option B1—Service manuals **+ \$50**
(Vol. 1) 070-6306-00.
(Vol. 2) 070-6307-00.

INTERNATIONAL POWER PLUG OPTIONS

Option A1—Universal Euro 220 V, 50 Hz.

Option A2—UK 240 V, 50 Hz.

Option A3—Australian 240 V, 50 Hz.

Option A4—North American 240 V, 60 Hz.

Option A5—Switzerland 220 V, 50 Hz.

WARRANTY-PLUS SERVICE PLANS

See Service section.

Option M1—2 Calibrations. **+ \$2,120**

Option M2—2 Years Service. **+ \$3,770**

Option M3—2 Years Service and 4 Calibrations. **+ \$4,240**

OPTIONAL ACCESSORIES

See page 170 for 2756P optional accessory information.

*1 To order, contact your local Tektronix Sales Office.