ELECTRONIC COUNTERS

Low-Cost, High-Performance Microwave Frequency Counters

Models 5350A, 5351A, 5352A

- 10 Hz - 40 GHz
- 5-year calibration interval
- 80 outputs per second
- −30 dBm sensitivity
- 8-year mean-time-between-failures

HP's lowest cost 20 GHz, 26.5 GHz and 40 GHz Microwave Counters

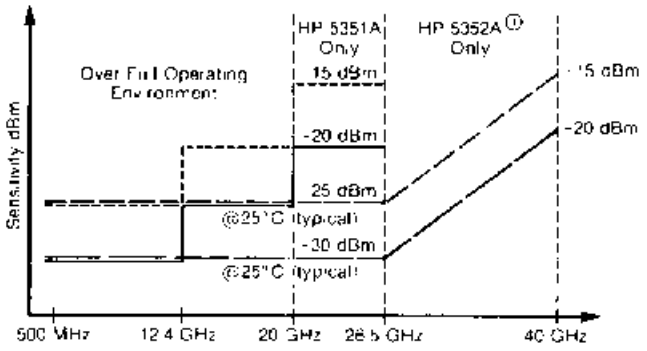
Description

Performance, ease of use and quality are key in the design of these new products. All the basic capability you will need for less cost.
Sensitivity is outstanding at −30 dBm through the use of Gallium Arsenide sampling circuits and integration of the microwave elements.
High speed data output, with over 80 readings-per-second, is ideal for systems applications, making increased productivity a reality.
Low cost of ownership comes from low parts count, high reliability and a design that reduces the temperature effects on components.
Extended calibration and long MTBF ensure maximum up time for your test station or engineering bench.

HP 5350A/5351A/5352A Specifications:

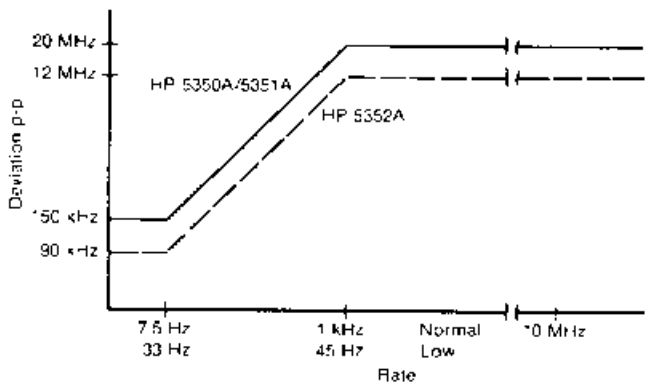
Input 1:
Frequency range: HP 5350A: 10 Hz to 20 GHz
HP 5351A: 10 Hz to 26.5 GHz
HP 5352A: 10 Hz to 40 GHz
Sensitivity:
HP 5350A/5351A: 500 MHz to 12.4 GHz: −25 dBm (−30 dBm typ @ 25°C);
Option 002 −24 dBm; Option 006 −22 dBm.
HP 5350/5351A: 12.4 GHz to 20 GHz −20 dBm (−25 dBm typical @ 25°C);
Option 002 −18 dBm; Option 006 −16 dBm.
HP 5351A: 20 GHz to 26.5 GHz −15 dBm (−20 dBm typical @ 25°C);
Option 002 −12 dBm; Option 006 −10 dBm.
HP 5352A: 500 MHz to 26.5 GHz −25 dBm (−30 dBm typ @ 25°C); 26.5 GHz to 40 GHz linear decrease to −15 dBm (−20 dBm @ 25°C).
Maximum input: +7 dBm.
Damage level: +25 dBm; HP 5350A/5351A Option 006: 500 MHz to 6 GHz +39 dBm; 6 GHz to 18 GHz +36 dBm; 18 GHz to 26.5 GHz +34.8 dBm.
SWR (typical): 500 MHz to 10 GHz 2:1; Option 002/006 2.5:1
10 GHz to 26.5 GHz 3:1; Option 002/006 3.5:1
26.5 GHz to 40 GHz 3.5:1.
Coupling: DC to 50 ohm termination, AC to instrument.
Accuracy: ± 1 count ± time base X frequency.
Residual stability: when counter and source use common 10 MHz time base or counter uses external higher stability time base, 1 LSD (.3 LSD typical) rms for resolution 1 Hz – 1 kHz at 25 degrees C; HP 5352A 1.4 LSD (.7 LSD typical) 26.5 – 40 GHz; LSD = least significant digit.
Resolution: selectable 1 Hz to 1 MHz.
FM Tolerance:
Maximum deviation: 20 MHz p-p; HP 5352A: 12 MHz.
Maximum FM rate: 10 MHz
FM rate tolerance: Normal/low (see data sheet).
Normal: 1 MHz/s maximum drift rate.
Low: 80 kHz/s maximum drift rate.

Sensitivity Graph



①HP 5352A Sensitivity dBm = 0.741 F/GHz − 44.6
@ 25°C Sensitivity dBm = 0.711 F/GHz −49.6

FM Rate Tolerance Graph



AM tolerance: any modulation index provided the minimum signal level is not less than the sensivitity specification.
Modes of Operation:
Automatic: automatic amplitude discrimination is used to determine and display the frequency.
Manual: center frequency must be entered to within ±20 MHz of input frequency; ±3 MHz below 1 GHz; increases measurement and data output rate.
Automatic amplitude discrimination: automatically measures the largest of all signals present, providing that signal is >6 dB (typical) above any signal within 500 MHz; >20 dB (typical) above any signal within 500 MHz to 20 (40) GHz.
Acquisition Time:
Automatic Mode:
Normal FM rate: 200 ms.
Low FM rate: 1300 ms.
Manual Mode: 40 ms after entering center frequency.

Input 2: HP 5350A/5351A/5352A.
Frequency range: 10 Hz to 525 MHz.
Mode of Operation:
50 ohm: 10 MHz to 525 MHz
1M ohm: 10 Hz to 80 MHz.
Sensitivity: full operating environment:
50 ohm: 10 MHz to 525 MHz, 25mV rms: 15 mV typical @ 25°C;
1M ohm: 10 Hz to 80 MHz, 25mV rms. 15 mV typical @ 25°C;
Gate Time = 1/resolution: 1 ms minimum.
Resolution: selectable 1 Hz to 1 MHz.
High resolution: 1M ohm mode: 0.001 Hz for <100 kHz input; 0.01 Hz for <1 MHz input; 0.1 Hz for <10 MHz input; 1 Hz for >10MHz input: 1 second gate.
Accuracy: ±1 count

$$\left(\frac{\pm 1.4 \times \text{Trigger Error}^{(1)} + \text{Time Base}}{\text{Gate Time}} \right) \times \text{Frequency}$$

Impedance: selectable 1M ohm nominal shunted by <70 pF or 50 ohm nominal.
Coupling: AC.
Connector: replaceable fuse, type BNC female.
Maximum input: 50 ohm: +10 dBm; 1M ohm: 1V rms.
Damage level: 50 ohm or 1M ohm DC - 5 kHz: 250V (DC + AC peak); >5 kHz: 5.5V rms (+ 28 dBm) − 1.25 X 10^6 V rms/FREQ.
Panel label: 5.5V rms (+ 28 dBm).
Time base output: 10 MHz and 1 MHz, 2.4 V square wave AC coupled into 1k ohm: 1.5V p-p into 50 ohm; available from rear panel BNC connectors whenever the instrument has AC power connected.
External time base: 1,2,5 or 10 MHz, 0.7V min to 8V max. p-p sine wave or square wave into > 1K ohm shunted by < 30 pF, via rear panel BNC connector. External reference automatically selected when signal is present.

Time Base (10 MHz)

	TCXO	Option 001	Option 010
Aging Rate	1X10⁻⁷ per month	5X10⁻¹⁰ per day	2X10⁻⁸ per year
Short Term	1X10⁻⁹ per s	1X10⁻¹¹ per s	1X10⁻¹¹ per s
Temperature 0 - 50	1X10⁻⁸	1X10⁻⁹	1X10⁻⁸
Line 10% change	1X10⁻¹⁰	1X10⁻¹¹	1X10⁻¹⁰
Warm up to 5X10⁻⁹ @ 25°C		10 minutes	10 minutes

General

Display: segmented 24-character alphanumeric LCD (backlighted).
Keyboard: set-up stored in STBY mode.
Self-check: tests for correct circuit operation.
Diagnostics: front panel or HP-IB selectable, Display and Keyboard Lockout, Service Diagnostics and User Information.
Data output: over HP-IB bus; varies with Frequency and Resolution.
Manual mode: >80 readings per second formatted at 10 kHz resolution, no math functions "DUMP MODE".
Math functions: result = measurement X scale + offset.
Offset: measurement is offset by entered value.
Scale: measurement is multiplied by entered value
Smooth: displayed resolution is determined using exponential averaging; displays only stable digits.
Sample rate: variable from less than 50 ms between measurements to HOLD, which holds the display indefinitely or until trigger occurs.
Display rate: 1-2/s, variable over HP-IB.
Overload indication: "OVRLOAD" A user message.
Sleep mode: input 1 emissions reduced to < -70 dBm typical when sleep mode or input 2 is selected.
IF output: rear panel BNC provides 30 - 110 MHz down-converted microwave signal at > −20 dBm into 50 ohm, AC coupled.
HP-IB: functions and diagnostics are programmable; address-set at front panel, default switches on rear panel; teach/learn programming; IEEE 728 compatible command structure; function subset SH1, AH1, T5, RF1, RL1, PP0, DC1, DT1, C0, E1.
Reset/local: returns to local control.
Operation temperature: 0 degrees C to 50 degrees C.
Power requirements: 100 VA max
Line select: 100V (90–105 VAC rms; 47.5 - 440 Hz)
115/120 (104/126 VAC rms; 47.5 - 440 Hz)
220V (198-231 VAC rms; 47.5 – 66 Hz)
230/240V (207–252 VAC rms; 47.5 - 66 Hz)
Accessories furnished: power cord, manual
Size: 5¼"H X 16"W X 14"D/33 mmH X 407 MMW X 358 mmD.
Weight: 24 lbs. / 11 kg.

Ordering Information

Option 001 Oven Time Base	$750
Option 002 Rear Panel Inputs (HP 5350A/51A only)	$300
Option 006 Microwave Level Limiter (HP 5350A/51A only)	$500
Option 010 High Stability Oven Time Base	$1,500
Option 910 Additional Operating & Service Manual	$40
Option 908 Rack Mount Kit for use with front handles removed	$55
Option 913 Rack Mount Kit for use with supplied front handles	$55
Option W30 2 year extended hardware support	$160
Additional Equipment Available:	
Transit case	9211-2643
Waveguide (3" straight) adapter WR28-APC3.5	05356-20217
Waveguide (3" straight) to coaxial adapter WR42-APC3.5	05356-20216
Adapter - In series APC 3.5 Male to Male	1250-1748
Adapter - In series APC 3.5 Female to female	1250-1749

HP 5350A 20 GHz Microwave Frequency Counter	**$5,000**
HP 5351A 26.5 GHz Microwave Frequency Counter	**$6,000**
HP 5352A 40 GHz Microwave Frequency Counter	**$10,000**

(1) Trigger Error $= \frac{\sqrt{e_i^2 + e_n^2}}{\text{Input Slew Rate in V/s at Trigger Point}}$ s rms

Where e_i = effective rms noise of counter's input channel (100 µV typical)
e_n = rms noise of the input signal for a 500 MHz bandwidth