Hewlett Packard
HP5385A
Frequency Counter
Specifications

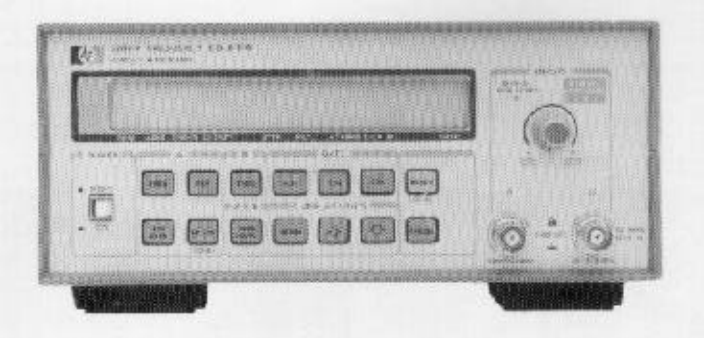

Table 1-1. Models HP 5384A and HP 5385A Specifications

GENERAL

Check: 10 MHz Self-test
Gate Times: 0.1, 1, or 10 seconds, (NOMINAL).
Display: 12-digit alphanumeric liquid crystal.
Display Digits (variable): Frequency, 3 to 11; Period, 3 to 8.
Timebase Output: 10 MHz, 25 mV pk-pk (NOMINAL) into 50 ohm load.
External Timebase Input: 10 MHz, .5V rms into 500 ohms; 15V (dc - ac pk) max.
Operating Temperature: 0° to 50°C
Power Requirements:
AC Operation: Selectable 18 VA max.
115V + 10%, -25%, 48-66 Hz
230V + 10%, -15% 48-66 Hz
115V ±10%, 380-420 Hz
DC Operation: 9 - 15V dc, 1.0 A max.
Weight: Net, 2.2 kg (4.8 lbs.); Shipping, 4.1 kg (9 lbs.)
Dimensions: 216 mm W × 88 mm H × 276 mm D (8⅜ × 3½ × 10¾ in.)

INPUT CHARACTERISTICS (Channel A HP 5384A/HP 5385A)

Range: 10 Hz to 100 MHz
Sensitivity: (MAN LEVEL) off
15 mV rms sine wave 50 Hz to 100 MHz
25 mV rms sine wave 10 Hz to 50 Hz
45 mV pk-pk 5 ns minimum pulse width
Dynamic Range: 45 mV to 4V pk-pk × attenuator setting.
Coupling: AC
Impedence:
X1: 1 MΩ NOMINAL || < 25 pF
X20: 500 kΩ NOMINAL || < 25 pF
Attenuator: X1 or X20 NOMINAL,
X20 increases to X40 NOMINAL below 50 Hz.
Low Pass Filter: 100 kHz NOMINAL 3 dB point
Trigger Level:
(MAN LEVEL) ON: variable from -0.1V to +0.1V × attenuator setting about average signal value.
(MAN LEVEL) OFF: automatically set to average value of signal.
⚠ **Damage Level:**
X1:
10 - 200 Hz 350V (dc + ac peak)
0.2 - 420 kHz 170V (dc + ac peak)
0.42 - 10 MHz (5×10^7V rms Hz)/FREQ
>10 MHz 5V rms
X20:
<1 MHz, Same as X1
>1 MHz, 50V rms

(Channel B HP 5384A)

Range: 50 to 225 MHz
Sensitivity: 10 mV rms 50 to 200 MHz
15 mV rms 200 to 225 MHz
Dynamic Range: 10 mV to 1V rms
Coupling: AC
Impedance: 50 ohm NOMINAL
Attenuator Level:
Manual: variable from X1 to X5 (0 to 14 dB) NOMINAL.
Auto: AGC mode for improved noise suppression.
Damage Level: 350V dc + 5V rms ac

(Channel B HP 5385A)

Fuse protected. Front panel accessible.
Range: 90 to 1000 MHz
Sensitivity: 15 mV rms sine wave 90-100 MHz
10 mV rms sine wave 100-1000 MHz
Dynamic Range: 10 mV to 7V rms (-27 to +30 dBm)
Coupling: AC
Impedance: 50 ohm NOMINAL
Attenuator Level:
Manual: variable from X1 to X18 (0 to 25 dB) NOMINAL.
Auto: AGC mode for improved noise suppression.
⚠ **Damage Level:**
AC >1 MHz +30 dBm (7V rms)
AC <1 MHz 2V rms
DC ±5V

⚠ TIMEBASE HP 5384A

Frequency: 10 MHz
Aging Rate: $<3 \times 10^{-7}$/mo.
Temperature: $\pm 5 \times 10^{-6}$, 0° to 50°C.ref. to 25°C.
Line Voltage: $<1 \times 10^{-7}$ for ±10% variation.

⚠ TIMEBASE HP 5385A (TCXO)

Frequency: 10 MHz
Aging Rate: $<1 \times 10^{-7}$/mo.
Temperature: $\pm 1 \times 10^{-6}$, 0° to 40°C. ref. to 25°C.
Line Voltage: $<5 \times 10^{-8}$ for ±10% variation.

FREQUENCY A and B

Range Channel A: 10 Hz - 100 MHz
Range Channel B:
5384A: 50 MHz - 225 MHz
5385A: 90 MHz - 1.0 GHz
LSD Displayed: 10 Hz to 1 nHz

LSD $\frac{4 \text{ ns}}{\text{Gate Time}} \times \text{FREQ}$

Resolution: ±1 LSD

$\pm \frac{(1.4 \times \text{Trigger Error} + 1 \text{ ns rms})}{\text{Gate Time}} \times \text{Freq}$

Accuracy: ± Resolution ± Time Base Error × Frequency

Table 1-1. Models HP 5384A and HP 5385A Specifications (Continued)

PERIOD A

Range: 10 ns to 0.1 s

LSD Displayed: .001 fs to 10 ns

LSD: $\frac{4\text{ ns}}{\text{Gate Time}} \times \text{period}$

Resolution: ± LSD

$\pm \frac{(1.4 \times \text{Trigger Error} + 1\text{ ns rms})}{\text{Gate Time}} \times \text{Per}$

Accuracy: ± Resolution ± Time Base Error × Period

OPTIONS

Option 001 (HP 5384A), TXCO Timebase

Frequency: 10 MHz

Aging Rate: $<1 \times 10^{-7}$/mo.

Temperature: $\pm 1 \times 10^{-6}$, 0° to 40°C ref. to 25°C.

Line Voltage: $<5 \times 10^{-8}$ for ±10% variation.

Option 003, HP-IL

All HP-IL programmable functions, controls, and operations are the same as those for HP-IB except for interface functions Auto Address and Parallel Poll, which are also included. R, AH, SH1, D, L1, (T1-5), C0, DC2, DT1, PP1, SR2, AA1, RL2, PD0, DD1.

Option 004, Oven Timebase

Frequency: 10 MHz

Aging Rate: $<3 \times 10^{-8}$/mo. (2)

Temperature: $\pm 1 \times 10^{-7}$, 0° to 50°C ref. to 25°C.

Line Voltage: $<2 \times 10^{-9}$ for a ±10% variation.

Battery Operation: The instrument operates for 3 hours (typical) with option 004.

Option 005, Battery

Type: Sealed Lead-acid; not covered under instrument warranty.

Capacity: Typically 4 hours of operation at 25°C (1).

Recharge Time: Typically 16 hours to 98% of full charge in instrument STBY (Standby) mode.

Battery Low Annunciator: Enabled 20 minutes prior to instrument shutdown nominally.

Line Failure Protection: Instrument automatically switches to battery in case of line failure.

Weight: Option 005 adds 1.4 kg. (3 lbs.) to weight of instrument. (1) without Option 004 installed. HP-IL replaces HP-IB when Option 005 is ordered from the factory.

HP-IB I/O Interface

Programmable Functions: Frequency A, Frequency B, Period A.

Programmable Controls: X20 Attn A, FILTER A, MAN LEVEL A/B, Gate Time.

Display: Normal, Increment, Decrement, Remote, Local

Miscellaneous Functions and Operating Commands: Diagnostics, 10 MHz Check, reset, initialize, Wait To Send ON/OFF Device ID.

Interface Functions: Device Clear, Group Execute Trigger Interface Clear, Local, Local Lockout, Send Status, Remote, Service Request.
SH1, AH1, T5, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT1, C0, E1.

Data Output:
Output will be maximum resolution for the gate time selected and is not affected by the front panel Display Digits keys.

Format: 17 characters plus CR and LF (blanks may be inserted).

Rate: 4 readings/s maximum at .1 s gate.

Talk only: Set with address switch=31.

DEFINITIONS

Measurement Gate Time: Selected value ±15% + up to 1 period of input.

Dynamic Range: Minimum to maximum input voltage swing allowed for correct frequency counting.

LSD Displayed: Dependent on gate time, input signal, and DISPLAY DIGITS control. In NORM mode, 8 digits are displayed. Using the display control, up to 11 digits may be present for frequency measurements, 8 digits maximum for period.

LSD: Unit value of least significant digit rounded to the nearest decade, i.e., 4 Hz→1 Hz, 6 Hz→10 Hz.

Trigger Error:

Channel A:

$\frac{\sqrt{(ei)^2 + (en)^2}}{\text{Input slew rate at trigger point}}$ s rms,

where ei and en are input noise voltages (rms) for the counter and signal, respectively, for a 100 MHz bandwidth.

$ei \leq 100\ \mu V$ rms,

Channel B: negligible due to high signal slew rate at the trigger point.

Best Case Resolution for 1 second gate (±Hz)

Amplitude	Frequency (Hz)									
mV rms	10	100	1K	10K	100K	1M	10M	100M	200M	1.0G
50	.0003	.0003	.0003	.0003	.0008	.004	.04	0.4	0.8	4.0
100	.0002	.0002	.0002	.0003	.0007	.004	.04	0.4	0.8	4.0
500	.0002	.0002	.0002	.0003	.0006	.004	.04	0.4	0.8	4.0
1000	.0001	.0001	.0001	.0001	.0005	.004	.04	0.4	0.8	4.0

This chart shows best case frequency resolution vs sine wave input voltage (rms). Noise from the signal source is assumed to be zero and trigger error produced only by the counter's noise (i.e., 100 μV rms).

LSD DISPLAYED: Unit value of least significant digit rounded to the nearest decade, i.e., 4 Hz→1 Hz, 6 Hz→10 Hz.