*Table 1-1. 5315A/B Specifications**

INPUT CHARACTERISTICS: (Channel A and Channel B)

Range:
DC coupled, 0 to 100 MHz.
AC coupled, 30 Hz to 100 MHz.

Sensitivity:
10 mV rms sine wave to 10 MHz.
25 mV rms sine wave to 100 MHz.
75 mV peak-to-peak pulse at minimum pulse width of 5 ns.
Sensitivity can be varied continuously up to 500 mV rms **NOMINAL** by adjusting SENSITIVITY control. In SENSITIVITY mode, trigger level is automatically set to 0V **NOMINAL**.

Dynamic Range:
30 mV to 5V peak-to-peak, 0 to 10 MHz.
75 mV to 5V peak-to-peak, 10 to 100 MHz.

Signal Operating Range: +2.5V DC to −2.5V DC.

Coupling: AC or DC, switchable.

Filter: Low pass, switchable in or out of Channel A. 3 dB point of **NOMINALLY** 100 kHz.

Impedance: 1 MΩ **NOMINAL** shunted by less than 40 pF.

Attenuator: X1 or X20 **NOMINAL.**

Trigger Level: Variable between +2.5V DC and −2.5V DC.

Slope: Independent selection of + or − slope.

Common Input: All specifications are the same for Common A except the following:

Sensitivity: 20 mV rms to 10 MHz, 50 mV rms to 100 MHz, 150 mV peak-to-peak.

Dynamic Range: 60 mV-5V peak-to-peak 0–10 MHz, 150 mV–5V peak-to-peak 10–100 MHz.

Impedance: 500 kΩ (Nom) shunted by less than 70 pF.

Damage Level:

AC&DC × 1:	
DC to 2.4 kHz	250V (DC + AC rms)
2.4 kHz to 100 kHz	6×10^5V rms Hz/FREQ
>100 kHz	6V rms
AC&DC × 20:	
DC to 28 kHz	500V (DC + AC peak)
28 kHz to 100 kHz	1×10^7V rms Hz/FREQ
>100 kHz	100V rms

FREQUENCY (Channel A)

Range: 0.1 Hz to 100 (burst or cw).

NOTE
Between 0.1 Hz and 0.14 Hz, the resolution is one millihertz.

LSD Displayed: 10 Hz to 1 nHz depending upon gate time and input signal. At least 7 digits displayed per second of gate time.

****Resolution:**

$$\pm \text{LSD}\dagger \pm 1.4 \times \frac{\text{Trigger Error}}{\text{Gate Time}} \times \text{FREQ, FREQ} < 10 \text{ MHz.}$$

± LSD†, ≥10 MHz.

Accuracy: ±Resolution ± (time base error) × FREQ.

*****Best Case Resolution for 1 Second Gate*

	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz	100 MHz
50 mV rms	±.0004 Hz	±.00048 Hz	±0.0014 Hz	±0.01 Hz	±0.1 Hz	±1 Hz	±10 Hz
100 mV rms	±.0002 Hz	±.00029 Hz	±0.0012 Hz	±0.01 Hz	±0.1 Hz	±1 Hz	±10 Hz
500 mV rms	±.00005 Hz	±.00014 Hz	±0.0011 Hz	±0.01 Hz	±0.1 Hz	±1 Hz	±10 Hz
1V rms	±.00003 Hz	±.00012 Hz	±0.0010 Hz	0.01 Hz	±0.1 Hz	±1 Hz	±10 Hz

This chart shows best case frequency reduction versus input sinewave rms amplitude. This is best case because noise from the signal source is assumed to be zero; the trigger error is produced only by the counter's noise (i.e., 120 μV rms).

PERIOD

Range: 10 ns to 10^5 s.

LSD Displayed: 100 ns to 1 fs depending upon gate time and input signal. At least 7 digits displayed per second of gate time.

Resolution:

$$\pm \text{LSD}\dagger \pm 1.4 \times \frac{\text{Trigger Error}}{\text{Gate Time}} \times \text{PER, PER} > 100 \text{ ms.}$$

± LSD†, PER ≤ 100 ns.

Accuracy: ± Resolution ± (time base error) × PER.

TIME INTERVAL

Range: 100 ns to 10^5 s.

LSD Displayed: 100 ns.

Resolution: ± LSD ± Start Trigger Error ± Stop Trigger Error.

Accuracy: ± Resolution ± (time base error) × TI.

TIME INTERVAL AVERAGE

Range: 0 ns to 10^5 s.

LSD Displayed: 100 ns to 10 ps depending upon gate time and input signal. See table in Definitions section.

Resolution:

$$\pm \text{LSD} \pm \frac{\text{Start Trigger Error}}{\sqrt{N}} \pm \frac{\text{Stop Trigger Error}}{\sqrt{N}}$$

Accuracy: ± Resolution ± (time base error) × TI ± 4 ns.

Number of intervals averaged (N): N= Gate Time × FREQ.

Minimum Dead Time (stop to start): 200 ns.

TIME INTERVAL DELAY (Holdoff)

Front panel gate time knob inserts a variable delay of **NOMINALLY** 500 μs to 20 ms between START (Channel A) and enabling of STOP (Channel B). Electrical inputs during delay time are ignored. Delay time may be digitally measured by simultaneously pressing T.I. Averaging, T.I. Delay, and blue key. Other specifications of T.I. Delay are identical to Time Interval.

RATIO

Range: 0.1 Hz to 100 MHz, both channels.

LSD:

$$\frac{2.5 \times \text{Period A}}{\text{Gate Time}} \times \text{Ratio. (rounded to nearest decade)}$$

Resolution:

$$\pm \text{LSD} \pm \frac{\text{B Trigger Error}}{\text{Gate Time}} \times \text{Ratio.}$$

Accuracy: Same as resolution. Highest frequency input is connected to Channel A to achieve specified accuracy.

TOTALIZE

Manual:
Range: 0 to 100 MHz.

A Gated by B:
Totalizes input A between two events of B. Instrument must be reset to make new measurement. Gate opens on A slope, closes on B slope.

Range: 0 to 100 MHz.

Resolution: ± 1 count.

Accuracy: ± 1 count ± B Trigger Error × Frequency A.

*Specifications describe the instrument's warranted performance. Supplemental characteristics are intended to provide information useful in applications of the instrument by giving **TYPICAL** or **NOMINAL**, but nonwarranted performance parameters. Definition of terms is provided at the end of the specification section. For a more detailed explanation, see HP Application Note 200-4 *"Understanding Frequency Counter Specifications"*.

Table 1-1. 5315A/B Specifications (Continued)

TIME BASE

Frequency: 10 MHz.
Aging Rate: <3 parts in 10^7/mo.
Temperature: ≤±5 parts in 10^6, 0 to 50°C.
Line Voltage: ≤±1 part in 10^7 for ±10% variation.

GENERAL

Check: Counts internal 10 MHz reference frequency over gate time range **NOMINALLY** 500 μs to 20 ms.
Error Light: LED warning light activated if logic error is found during instrument turn-on self-check.
Display: 8-digit amber LED display, with engineering units annunciator.
Overflow: Only frequency and totalize measurements will overflow. In case of overflow, eight least significant digits will be displayed and amber front panel overflow LED will be actuated. All other measurements which would theoretically cause a display of more than 8 digits will result in the display of the 8 most significant digits.
Gate Time: Continuously variable, **NOMINALLY** from 60 ms to 10 s or 1 period of the input, whichever is longer.
Sample Rate: Up to 5 readings per second **NOMINAL** except in time interval mode, where it is continuously variable **NOMINALLY** from 4 readings per second to 1 reading every 10 seconds via Gate Time control.
Operating Temperature: 0° to 50°C.
Power Requirements: Internally switch selectable 100, 120, 220, or 240V (+5%, -10%) 48-66 Hz; 15 VA maximum.
Weight: Net, 2.2 kg (4 lbs. 12 oz.); Shipping, 4.1 kg (9 lbs.).
Dimensions: 238 mm W × 98 H × 276 mm D (9⅜ × 3⅞ × 10⅞ in.).

OPTIONS

Option 001: Temperature Compensated Time Base (TCXO)
Frequency: 10 MHz.
Aging Rate: <1 part in 10^7/mo.
Temperature: ≤1 part in 10^6, 0° to 40°C.
Line Voltage: <1 part in 10^8 for ±10% variation.

Option 002: Battery (5315A only)
Type: Rechargeable lead-acid (sealed).
Capacity: TYPICALLY 4 hours of continuous operation at 25°C.

Recharging Time: TYPICALLY 16 hours to 98% of full charge, instrument nonoperating. Charging circuitry included with Option. Batteries not charged during instrument operation.

Low Voltage Indicator: Instrument turns itself off automatically when low battery conditions exists. **Discharge** LED flashes slowly when this happens. **Discharge** LED is on whenever battery is supplying power to instrument. **Charge** LED indicates state of charge of battery during charging only and is on whenever battery is charged to 95% **NOMINAL** of capacity. **Charge** LED flashes when 90% **NOMINAL** of charge taken out is replaced. **Charge** LED is off if charge is less than 70% **NOMINAL** of capacity.

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

Weight: Option 002 adds 1.4 kg (3 lbs.) to weight of instrument.

WARRANTY

ALL COMPONENTS IN OPTION 002, EXCEPT THE BATTERY, ARE WARRANTED FOR ONE FULL YEAR. BATTERY BT-1, (HP PART NO. 1400-0253) IS NOT WARRANTED.

Option 003: C Channel

Input Characteristics:

Range: 50 to 1000 MHz, prescaled by 10.

Sensitivity:
15 mV rms sine wave (-23.5 dBm) to 650 MHz.
75 mV rms sine wave (-9.5 dBm) to 1000 MHz.
Sensitivity can be decreased continuously by up to 20 dB **NOMINAL,** 50 to 500 MHz and 10 dB **NOMINAL**, 500 to 1000 MHz by adjusting sensitivity control.
Trigger level is fixed at 0V **NOMINAL**.

Dynamic Range:
15 mV to 1V rms (36 dB), 50 to 650 MHz.
75 mV to 1V rms (20 dB), 650 to 1000 MHz.
Signal Operating Range: +5 Vdc to -5 Vdc.
Coupling: AC.
Impedance: 50Ω **NOMINAL** (VSWR, <2.5:1 TYPICAL)
Damage Level: ±8V (DC + AC peak), fuse protected. Fuse located in BNC connector.

Frequency:

Range: 50 to 1000 MHz (burst or cw).
LSD Displayed: 100 Hz to 1 Hz depending upon gate time. At least 7 digits per second of gate time.

LSD, Resolution and Accuracy: Same formulas as for Frequency A except "Gate Time" term becomes "(Gate Time)/10".

Option 004 (for 5315A): High Stability Time Base (Oven Oscillator)

Frequency: 10 MHz.

Aging Rate: <1 part in 10^7/mo. (after 10 day warm up).

Temperature: ±1 part in 10^7, 0° to 50°C.

Line Voltage: ≤1 part in 10^7 for ±10% variation.

Option 004 (for 5315B): High Stability Time Base (Oven Oscillator)

Frequency: 10 MHz.

Aging Rate: <5 parts in 10^8/mo.

Temperature: <2 parts in 10^8, 0° to 67°C.

Line Voltage: ≤1 part in 10^7 for ±10% variation.

5315B: Rack and stack metal case with rear panel, switchable AC power line module.
Specifications same as 5315A except as follows:

Rack Mount Kit: 5061-0072 recommended.

Oscillator Output: 10 MHz, 50 mV p-p into 50Ω load on rear panel.

External Frequency Standard Input: 10 MHz, 1V rms into 500Ω on rear panel. Requires internal selection.

Dimensions: 212 mm W × 81 mm H × 345 mm D (8⅜ × 3½ × 13¾ in.).

Weight: Net, 3.2 kg (7 lbs. 2 oz.); Shipping, 4.5 kg (10 lbs.).

Table 1-1. 5315A/B Specifications (Continued)

DEFINITIONS

Resolution: Smallest discernible change of measurement result due to a minimum change in the input.

Accuracy: Deviation from the actual value as fixed by universally accepted standards of frequency and time.

Least Significant Digit (LSD) Displayed:

Frequency:

$\frac{2.5 \times 10^{-7}}{\text{Gate Time}} \times \text{FREQ}$, FREQ <10 MHz.

$\frac{2.5}{\text{Gate Time}}$ FREQ ≥10 MHz.

Period:

$\frac{2.5 \times 10^{-7}}{\text{Gate Time}} \times \text{PER}$, PER >100 ns.

$\frac{2.5}{\text{Gate Time}} \times \text{PER}^2$, PER ≤100 ns.

All above calculations should be rounded to nearest decade (i.e., 0.5 Hz will become 10 Hz and 0.4 ns will be 0.1 ns).

Time Interval Average

	LSD
1 to 25 intervals	100 ns
25 to 2500 intervals	10 ns
2500 to 250,000	1 ns
250,000 to 25,000,000 intervals	100 ps
>25,000,000 intervals	10 ps

Time Interval Average is a statistical process. LSD displayed is calculated for 1 standard deviation (σ) confidence level.

Trigger Error:

$$\frac{\sqrt{(120 \times 10^{-6})^2 + e_n^2}}{\text{(Input slew rate at trigger point)}} \text{ seconds rms}$$

where e_n is the rms noise voltage of the input for a 100 MHz bandwidth.

NOTES:

†Due to arithmetic truncation, quantization error will be ±1 or ±2 counts of the LSD as follows:

± 2 counts of LSD if $\frac{\text{LSD}}{\text{FREQ or PER}} < 1 \times 10^{-7}$ FREQ <10 MHz.

± 2 counts of LSD if $\frac{\text{LSD}}{\text{FREQ or PER}} < \frac{1/(\text{Gate Time})}{\text{FREQ}}$ FREQ ≥10 MHz.

± 1 count of LSD for all other cases.