

Table 1-1. Model 5328B Specifications

INPUT CHARACTERISTICS

(Channel A and B)

Range:

- DC Coupled: 0 to 100 MHz
- AC Coupled: 20 Hz to 100 MHz
- AC Coupled (50Ω): 200 kHz to 100 MHz
- Common A: 0 to 10 MHz

Sensitivity (x 1):

- 0 to 40 MHz Sine wave: 25 mV rms
- 40 MHz to 100 MHz Sine wave: 50 mV rms
- 5 ns Pulse: 140 mV p-p

Dynamic Range (x 1):

- 0 to 40 MHz: 71 mV to 3 V p-p
- 40 MHz to 100 MHz: 141 mV to 1.5 V p-p

Signal Operating Range (x 1, DC): ± 2.5 V DC

Trigger Level Range (x 1):

- Preset: 0V NOMINAL
- Adjustable: ± 2.5 V
- Useable Range: 20% to 80% of Signal Amplitude

Coupling: AC or DC, Switchable

Impedance:

- Separate: 1 MΩ NOMINAL shunted with <100 pF, or 50Ω NOMINAL, switchable
- Common: 500 kΩ NOMINAL, shunted with <150 pF, or 50Ω NOMINAL, switchable

Attenuators (NOMINAL): × 1, × 10, Switchable

Slope: Independent + or - Slope, Switchable

Channel Input: Separate, Common A or Check

Damage Level:

- 1 MΩ, x 1, DC Coupled:**
 - DC to 50 kHz 250 V rms
 - 50 kHz to 2.5 MHz 1.25 × 10⁷ V rms/Freq
 - 2.5 MHz to 100 MHz 5 V rms

- 1 MΩ, x 10, DC Coupled:**
 - DC to 500 kHz 250 V rms
 - 0.5 to 25 MHz 1.25 × 10⁸ V rms/Freq
 - 25 to 100 MHz 5 V rms

- AC Coupled:**
 - DC to 20 Hz 200 V (Peak AC + DC)
 - 20 Hz to 100 MHz Same as DC coupled.

- 50Ω Position:**
 - DC to 100 MHz 5 V rms

CROSS TALK

Measurements made above 20 MHz with input signals applied to both channels may be affected by cross talk. During dual channel measurements, input signals with similar amplitudes greater than 75mV (nominal) are recommended for both channels.

FREQUENCY A MEASUREMENT

- Range:** 0 to 100 MHz, Direct Count
- LSD** Displayed:** 1 MHz to 0.1 Hz in decade steps
- Resolution:** Same as LSD**
- Accuracy:** ± Resolution, ± Time Base Error × Freq

PERIOD A MEASUREMENT

- Range:** 100 ns to 1 × 10⁷ s
- LSD** Displayed:** 10 ns to 0.1 s in decade steps

- Resolution:** ± LSD** ± Trigger Error**
- Accuracy:** ± Resolution, ± Time Base Error × Period

PERIOD AVERAGE A MEASUREMENT

- Range:** 100 ns to 1 × 10⁷ s
- LSD** Displayed:**

$$\frac{10 \text{ ns}}{\text{Number of Periods Averaged}}$$

- Resolution:**

$$\pm \text{LSD} \pm \frac{\text{Trigger Error}^{**}}{\text{Number of Periods Averaged}}$$

Accuracy: ± Resolution, ± Time Base Error × Period

TIME INTERVAL A TO B MEASUREMENTS

- Range:** 10 ns to 1 × 10⁷ s
- Minimum Pulse Width:** 10 ns
- LSD** Displayed:** 10 ns to 0.1 s in decade steps
- Resolution:** ± LSD** ± Trigger Error** ± Trigger Level Timing Error**
- Accuracy:** ± Resolution, ± Time Base Error × T.I.

TIME INTERVAL AVERAGE A TO B MEASUREMENTS

No more than one STOP pulse allowed for each START pulse, otherwise measurement scaling will occur.

- Range:** 0.1 ns to 1 s
- LSD** Displayed:**

$$\frac{10 \text{ ns}}{\sqrt{\text{Number of Intervals Averaged}}}$$

- Resolution:**

$$\pm \text{LSD}^{**} \pm \frac{\text{Trigger Error}^{**}}{\sqrt{\text{Number of Intervals Averaged}}} \pm \text{Trigger Level Error}^{**} \pm 10 \text{ ps}$$

Accuracy: ± Resolution, ± 2 ns ± Time Base Error × T.I.

Minimum Pulse Width: 10 ns

Minimum Dead Time: 40 ns (10 MHz maximum repetition rate)

RATIO MEASUREMENTS

Note — The ratio of the frequency at B (or C for C/A Function when Option 031 is installed) to the frequency at A is measured for N counts of A, where N is selected by the resolution switch (N = 1 to 1 × 10⁷ in decade steps).

- Range:** A: 0 to 10 MHz,
 B: 0 to 100 MHz
 C: 90 MHz to 1300 MHz (Option 031)

- LSD** Displayed:**

$$1 \text{ part in } \frac{B}{A} \times N \text{ (or } \frac{C}{A} \times N)$$

- Resolution:** ± LSD
- Accuracy:** ± Resolution, ± Trigger Error** of A × Frequency of B (or C) (N > 1)
 (For N = 1, add ± 12 ns × Frequency of B (or C))

Table 1-1. Model 5328B Specifications (Continued)

TOTALIZING AND SCALING MEASUREMENTS

Start A: Totalizes A/N, where A is the number of events on input A and N is the scaling factor as selected on the resolution switch (N = 1 to 1×10^7 in decade steps). The scaled output (A/N) is available at the rear panel time base output. For N > 1.

Range:

N = 1	0 to 100 MHz
N > 1	0 to 10 MHz

* Specifications describe the instrument's warranted performance. Supplemental characteristics are intended to provide information useful in applying the instrument by giving TYPICAL or NOMINAL but nonwarranted performance parameters.

** See notes/definitions section for further information.

GENERAL

Display: 8 digit LED display (Standard)
9 digit LED display (Option 031)

Blanking: Suppresses leading zeros.

Storage: Holds reading between measurements but can be overridden by rear panel switch.

Sample Rate: Variable from less than 2 ms between measurements to infinity (hold).

Gate Time: For frequency measurements, gate time is the reciprocal of the selected resolution (for Option 031, frequency C, the gate time is four times the reciprocal of resolution).

Gate Time Range: 1 μ s to 10 s (4 μ s to 40 s for Option 031, frequency C). Minimum signal burst measurable is 8 μ s.

Gate Output: Rear Panel output, TTL levels. High when counter gate is open.

Check Signal: Place function switch in Freq. A and input section in check (CHK) — counter displays 100 MHz \pm 1 count.

Time Base Output: Rear panel output, TTL levels.

Time Base (Standard):

Frequency: 10 MHz

Aging Rate: $< 3 \times 10^{-7}$ /month

Temperature: $< 2.5 \times 10^{-6}$, 0 to 50°C, ref. to 25°C.

Line Voltage: $< 1 \times 10^{-7}$ for 10% change

Ext Freq Std Input: Input: 30 kHz to 10 MHz signal of amplitude > 1.0 V rms into 1 k Ω . Maximum Input: 5 V p-p. Input other than 10 MHz will give scaled readings. External frequency standard must be 10 MHz for Period Average, Time Interval Average, Period (N = 1) and Time Interval (N = 1).

Trigger Lights: Light is on when input is above trigger level; off when input is below trigger level; blinking when channel is triggering. Operates over frequencies from 0 to 100 MHz.

Marker Outputs: Channel A and B Schmitt trigger outputs available on front panel. NOMINALLY 0 mV to +300 mV levels into 50 Ω ; < 20 ns delay; outputs protected to ± 5 V DC.

Arm: Rear Panel Switch turns arming ON or OFF. With arming ON, the measurement is armed by an input other than the input involved in the measurement. The following are armed by an event at B: Freq A, Period A, Period Avg A, Freq C, DVM and Ratio C/A. The following are armed by an event at C: T.I. A \rightarrow B; T.I. Avg A \rightarrow B; and Ratio B/A.

HP-IB INTERFACE

HP-IB interface provides both digital output of measurement data ("talker"), as well as remote control inputs ("listener"), on the HP-IB.

Programmable Functions: Function, resolution, sample rate (maximum or manual control), arming, display modes, measurement modes, output mode, and reset commands. Trigger level, trigger slope, input impedance, coupling, separate/common/check, invert A and B. Trigger level is programmable in 10 mV steps in $\times 1$; 100 mV in $\times 10$. Trigger level accuracy under remote control in $\times 1$: ± 35 mV.

HP-IB Commands: Unlisten, untalk, local lockout, device clear, serial poll enable, serial poll disable, go to local, selected device clear, and group execute trigger.

Service Request (SRQ): If enabled, indicates end of measurement.

Maximum Data Output Rate: 500 readings per second.

Operating Temperature: 0° to 50°C.

Power Requirements: 100/120/220/240 V rms, +5%, -10% (Switch selectable); 48-66 Hz; 150 VA Max.

Accessories Furnished: Power cord

Weight: Net 8.5 kg (18 lb., 12 oz.)

Shipping 11.2 kg (24 lb., 12 oz.)

TIME BASE OPTION

OPTION 010 — High Stability Time Base (Oven)

Frequency: 10 MHz

Aging Rate: $< 5 \times 10^{-10}$ /day after 24 hour warm up

Short Term: $< 1 \times 10^{-10}$ rms for 1 s averaging time

Temperature: $< 7 \times 10^{-9}$ 0° to 50°C

Line Voltage: $< 5 \times 10^{-9}$ for 10% variation

Warm Up: $< 5 \times 10^{-9}$ in 20 minutes

DIGITAL VOLTMETER OPTION

Trigger levels of input channels A and B and external voltages may be measured with DVM Option 021.

OPTION 021 — High Performance Digital Voltmeter***

Ranges: ± 10 , ± 100 , ± 1000 V DC and autoranging

Full Range Display Resolution (1 sec. Meas. Time):

+ 1000.00 V DC

± 125.000 V DC

± 12.5000 V DC

Sensitivity:

10 μ V for measurement time of 10 s (N = 10⁷)

100 μ V for measurement time of 1 s (N = 10⁶)

1 mV for measurement time of 100 ms (N = 10⁵)

10 mV for measurement time of 10 ms (N = 10⁴)

100 mV for measurement time of 1 ms (N = 10³)

Accuracy (20 Min. Warm Up): $\pm 0.03\%$ of reading, $\pm 0.004\%$ of range. For 1000 V range: $\pm 0.087\%$ of reading, $\pm 0.004\%$ of range.

Temperature Coefficient: $\pm 0.002\%$ of reading/°C, $\pm 0.001\%$ of range/°C.

Response Time (Filter Off, Step Input): 10 ms

Input: 10 M Ω NOMINAL, floating pair

Maximum Input:

High to Low: ± 1100 V all ranges

Low to Chassis Ground: ± 500 V

Normal Mode Rejection Ratio: > 80 dB at 50 Hz or greater, with filter on.

Effective Common Mode Rejection Ratio (1k Ω Unbalance):

DC: > 120 dB

AC: > 120 dB for multiples of 50/60 Hz with filter on

Trigger Level Display (x 1):

Resolution: 1 mV

Accuracy: 4% of reading ± 25 mV (NOMINAL)

Note — Readings are automatically multiplied by attenuator setting.

*** Performance: 60 days at 23°C \pm 5°C and R.H. $< 80\%$.

Table 1-1. Model 5328B Specifications (Continued)

C CHANNEL OPTION

OPTION 031 — 1300 MHz C Channel

INPUT CHARACTERISTICS

- Sensitivity: 20 mV rms
- Coupling: AC
- Trigger Level: 0 V NOMINAL, Fixed
- Impedance: 500 NOMINAL
- Maximum Input: 5 V rms, ± 5 V DC
- Input Protection: Fused input
- Attenuator: AGC and variable attenuator for optimum noise suppression on signals to 5 V rms.

FREQUENCY C MEASUREMENT

- Range: 90 to 1300 MHz, prescaled by 4
- LSD** Displayed: 1 MHz to 0.1 Hz in decade steps
- Resolution: Same as LSD**
- Accuracy: \pm Resolution \pm Time Base Error \times Frequency

GENERAL

Probe Power: Power to operate 10B55A or HP active probe is available on the front panel.

NOTES/DEFINITIONS

Trigger Error:

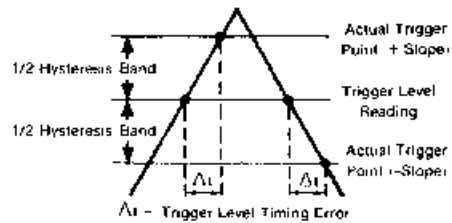
$$\text{Trigger Error} = 1.4 \frac{\sqrt{e_s^2 + e_n^2}}{\text{Input Voltage Slew Rate at Trigger Point}}$$

Where e_s = Effective rms noise of counter's input channel (300 μ V TYPICAL)

e_n = rms noise voltage of input signal for a 100 MHz bandwidth

Note — The above assumes that both start and stop signal slew rates are the same.

Trigger Level and Trigger Point (x 1):



Trigger Level Timing Error (x 1): Trigger Level

Timing Error as it applies to Time Interval measurements:

$$\pm \frac{1/2 \text{ Hysteresis Band}}{|\text{Input slew rate at START trigger point}|}$$

$$\pm \frac{1/2 \text{ Hysteresis Band}}{|\text{Input slew rate at STOP trigger point}|}$$

Time Interval Averaging:

Time Interval Averaging is a statistical process. Resolution is calculated for a 2 Sigma (σ) confidence level.

Dimensions:

