

Table 1-3. Specifications

INPUT CHARACTERISTICS

Channel A and B (standard and option 040)

Sensitivity:

25 mV rms, 0—40 MHz (dc coupled)
20 Hz—40 MHz (ac coupled)
200 kHz—40 MHz (ac coupled and 50Ω with Opt. 040)

50 mV rms, 40 MHz—100 MHz
Min. pulse width: 5 ns, 140 mV p-p

Coupling: Ac or Dc, switch selectable

Impedance: 1 MΩ || <40 pF (switch selectable 1 MΩ or 50Ω nominal with Opt. 040)

Trigger Level: Variable over ±2.5 volts times attenuator setting with 0 volt preset position.

Trigger Slope: independent selection of + or - slope

Attenuators: X1, X10, X100 (X1, X2, X20 with Opt. 040)

Dynamic Range: 25 mV to 1 V rms x attenuator setting for 0—40 MHz; 50 mV to 500 mV rms x attenuator setting for 40—100 MHz

Maximum Input (dc coupled):

X1: 250 V rms, dc—50 kHz
1.25 x 10⁷ V rms/freq., 50 kHz—2.5 MHz
5 V rms, 2.5—100 MHz
X10, X100: 250 V rms, dc—5 MHz
1.25 x 10⁸ V rms/freq., 5—100 MHz
X2, X20: 250 V rms, dc—500 kHz
(Opt. 040) 1.25 x 10⁸ V rms/freq., 0.5—25 MHz
5 V rms, 25—100 MHz

Ac coupled: Vmax = 200 V (peak + dc) for dc—20 Hz; same as dc coupled for frequency greater than 20 Hz.

Opt. 040 50Ω

position: 5 V rms, dc—100 MHz

Channel Input: Common A or separate, switch selectable. In COM A position, sensitivity remains the same. Impedance becomes 1 MΩ || <65 pF for the standard and 500 kΩ || <65 pF for the Option 040 high impedance position. 50Ω position remains nominal 50Ω.

Channel C (option 030)

Sensitivity: 15 mV rms, 5 MHz—512 MHz

Coupling: dc

Trigger Level: 0 V, fixed

Impedance: 50Ω nominal

Maximum Input: 5 V rms

Input Protection: Fused

FREQUENCY MEASUREMENTS

Frequency A (standard and option 040)

Range: 0 — 100 MHz direct count

Resolution: 1 MHz to 0.1 Hz in decade steps

Accuracy: ±1 count ±timebase error

Display: kHz, MHz

Frequency C (option 030)

Range: 5 — 512 MHz direct count

Resolution: 1 MHz to 0.1 Hz in decade steps

Accuracy: ±1 count ±timebase error

Display: kHz, MHz

*Trigger error is <0.3% of one period for sinewaves of 40 dB S/N or better and amplitude equal to sensitivity of counter. For any waveshape, trigger error is less than

$$\frac{\pm 2 \times \text{peak noise voltage}}{\text{signal slope}}$$

$$\left(\text{or } \frac{\pm .0025 \mu\text{sec}}{\text{signal slope in } V/\mu\text{sec}} \text{ for 40 dB S/N.} \right)$$

PERIOD MEASUREMENTS

Period A (standard and option 040)

Range: 0 — 10 MHz

Resolution: 100 ns to 1 s in decade steps
(10 ns to 0.1 s with opt. 040)

Accuracy: ±1 count ±timebase error ±trigger error*

Display: ns, μs, ms, s

Period Average A (standard and option 040) — the period of the signal at the A input is averaged over the number of periods, N, indicated by the resolution switch (N=1 to 10⁷).

Range: 0 — 10 MHz

Resolution: 100 ns to .01 ps in decade steps
(10 ns to .001 ps with opt. 040)

Accuracy: ±1 count displayed ±timebase error

$$\pm \frac{\text{trigger error}^*}{\text{no. periods averaged}}$$

TIME INTERVAL MEASUREMENTS

Time Interval A to B (standard and option 040)

Range: 100 ns — 10⁸ s (10 ns — 10⁷ s with opt. 040)

Resolution: 100 ns to 1 s in decade steps
(10 ns to 0.1 s with opt. 040)

Accuracy: ±1 count ±timebase error ±trigger error*

Time Interval Average A to B (standard and option 040) —

The time interval between a start signal at A and a stop signal at B is averaged over the number of time intervals, N, indicated by the resolution switch (N=1 to 10⁷).

Range: 0.1 ns — 10 s (0.1 ns — 1 s with opt. 040)

Resolution: $\sqrt{\frac{\pm 100 \text{ ns}}{\text{no. intervals averaged}}} \pm 10 \text{ ps}$

$\left(\sqrt{\frac{\pm 10 \text{ ns}}{\text{no. intervals averaged}}} \pm 10 \text{ ps with opt. 040} \right)$

Accuracy: $\sqrt{\frac{\pm 100 \text{ ns} \pm \text{trigger error}^*}{\text{no. intervals averaged}}} \pm 4 \text{ ns} \pm \text{timebase error}$

$\left(\sqrt{\frac{\pm 10 \text{ ns} \pm \text{trigger error}^*}{\text{no. intervals averaged}}} \pm 2 \text{ ns} \pm \text{timebase error} \right)$

with opt. 040. The opt. 040 has a "jittered" clock in time interval averaging for those cases when the input is coherent with the 5328A's clock frequency.)

Minimum pulse width: 25 ns (10 ns with opt. 040)

Minimum dead time: 150 ns (40 ns with opt. 040 and maximum repetition rate of 10 MHz) ("dead time" is the time between the preceding time interval's stop event and the current time interval's start event).

RATIO MEASUREMENTS

B/A and C/A (standard and option 040) — The ratio of the frequency at B (or C for C/A function when option 030 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 10⁷).

Range: A: 0 — 10 MHz

B: 0 — 100 MHz

C: 5 — 512 MHz

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

Accuracy: ±1 count of B (or C) ±trigger error* of A x freq. of B (or C) (N > 1)

For N = 1, add ±120 ns x freq. of B (or C)
(±12 ns x freq. of B (or C) with Opt. 040)

Table 1-3. Specifications (Continued)

DIGITAL VOLTMETER MEASUREMENTS

DVM (option 020 and 021) — Trigger levels of input channels A and B and external voltages may be measured.†

Maximum Sensitivity:	OPT. 020	OPT. 021
Meas. Time (N=):		
10 s (N=10 ⁷)	1 mV	10 μ V
1 s (N=10 ⁶)	1 mV	100 μ V
0.1 s (N=10 ⁵)	2 mV	1 mV
10 ms (N=10 ⁴)	20 mV	10 mV
1 ms (N=10 ³)	200 mV	100 mV
Range:	0 to \pm 125 Vdc	\pm 10, \pm 100, \pm 1000 Vdc, and AUTORANGE
Full range display resolution (1 sec measurement time):	\pm 0.9999, \pm 9.999, \pm 99.99, \pm 125.0	\pm 12.5000, \pm 125.000, \pm 1000.00
Accuracy: (20 min. warm-up)	\pm .5% reading \pm 4 mV	\pm .03% reading \pm .004% range; for 1000 V range: \pm .087% reading \pm .004% range
Temp. Coefficient: (0 to 40°C)	\pm .05% reading/°C \pm 0.5 mV/°C	\pm .002% reading/°C \pm .001% range/°C
Input Terminals:	Single ended	Floating pair
Input Impedance:	10 M Ω	10 M Ω
Normal Mode Rejection Ratio:	> 60 dB at 60 Hz (50 Hz) \pm 0.1%	> 80 dB at 50 Hz or greater with filter on
Effective Common Mode Rejection Ratio (1 kΩ unbalance):	—	DC: > 120 dB AC: > 120 dB for multiples of 60 Hz (50 Hz) with filter on
Response Time (step input):	70 ms	10 ms (filter off)
Maximum Input:	\pm 500 V	HI to LO: \pm 1100 V all ranges; LO to chassis ground: \pm 500 V
Trigger Level Measurements:	2 mV display resolution	1 mV display resolution; trigger level reading automatically multiplied by setting of attenuator switch if using option 040 universal module

TOTALIZING AND SCALING MEASUREMENTS

Start A (standard and option 040) — The number of counts at the A input are totaled for N=1 on the resolution switch. For N>1, A/N is totaled and the scaled output (A/N) is available at the Timebase Out rear panel connector.

Range: 0 — 100 MHz for N=1
0 — 10 MHz for N>1

EVENTS C, A TO B (standard and option 040) — The number of events at the C input are totaled during the synchronized time interval (i.e., a multiple of 100 ns, or 10 ns for opt. 040) defined by inputs to channel A and B.

Accuracy: \pm 1 count of C \pm trigger error* of A and B \pm freq. of C x 120 ns
(\pm 1 count of C \pm trigger error* of A and B \pm freq. of C x 12 ns with opt. 040)

MEASUREMENTS WITH DELAY (Option 040)

Delay mode is activated by inner concentric knob on LEVEL A control of option 040 Universal Module (red LED indicates delay is activated). In delay mode, Channel A triggers and is then disabled from triggering again until the delay times out (disabled state occurs within 1 μ s after triggering). Channel B is continuously disabled until the delay times out. After the delay, both A and B are enabled. The delay time may be measured by placing the counter in T.I. A \rightarrow B and the Universal Module in check (CHK).

Delay range: 20 μ s to 20 ms continuously adjustable

Minimum Dead Time: 1 μ s between stop and next start (T.I. average measurements only)

Meaningful Functions: FREQ. A, PER A, PER AVG A, T.I. A \rightarrow B, T.I. AVG A \rightarrow B, RATIO C/A, START A, EVENTS C, A \rightarrow B

HP-IB INTERFACE (Option 011)

Provides digital output of measurement data ("talker") as well as input for remote program control ("listener").

Programmable Functions: Function, Resolution, Sample rate (max, or manual control), Arming, Display modes, Measurement modes, Output modes, and Reset commands

HP-IB commands: responds to the following bus commands (see HP-IB Users Guides for definitions) — Unlisten, Untalk, Local Lockout, Device Clear, Serial Poll Enable, Serial Poll Disable, Go to Local, Selected Device Clear, and Group Executive Trigger.

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

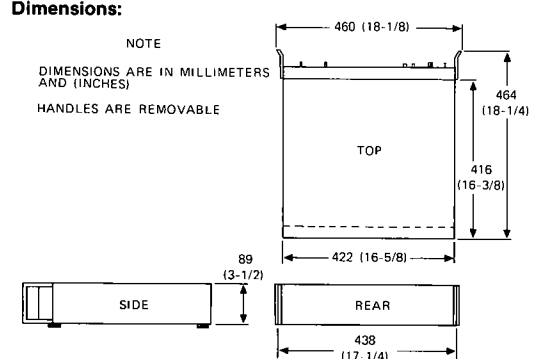
Maximum data output rate: 500 readings/sec

Table 1-3. Specifications (Continued)

GENERAL

- Display:** 8 digit (9 with Opt. 030) LED display
- Blanking:** Suppresses display of unwanted zeros to left of most significant digit
- Storage:** Holds reading between samples; can be overridden by rear panel switch.
- Sample rate:** Variable from less than 2 ms between measurements to HOLD which holds display indefinitely.
- Gate output:** Rear panel output; TTL levels; high when counter gate open
- Timebase output:** Rear panel output; TTL levels
- Check signal:** With function switch in CHECK, counter should display 10 MHz ± 1 count. (With opt. 040, place function switch in Freq A and universal module in CHECK (CHK) — counter should display 100 MHz ± 1 count.)
- Timebase:**
 - standard crystal**
 - Aging rate: $< 3 \times 10^{-7}$ /month
 - Temperature: $< 2.5 \times 10^{-6}$ 0° to 50°C
 - Line voltage: $< 1 \times 10^{-7}$ for 10% change
 - Opt. 010 over oscillator**
 - Aging rate: $< 5 \times 10^{-10}$ /day after 24-hour warm-up
 - Short term: $< 1 \times 10^{-10}$ rms/sec
 - Temperature: $< 7 \times 10^{-9}$ 0° to 50°C
 - Line voltage: $< \pm 5 \times 10^{-9}$ for 10% variation
 - Warm-up: $< \pm 5 \times 10^{-9}$ in 20 min.
- Ext. Freq. Std. Input:** 30 kHz to 10 MHz signal of amplitude > 1.0 V rms into 1 k Ω . Maximum input: 5 V p-p. For opt. 040 only, the following constraints apply: ext. freq. std. must be 10 MHz for Period Avg., T.I. Avg., Period (N=1), and T.I. (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. Operative over frequency range 0—100 MHz.

- Marker Outputs:** Inverted channel A and channel B Schmidt trigger outputs available on front panel; 0 to -100 mV levels into 50 Ω ; < 20 ns delay. (With Opt. 040, inverted channel A Schmidt trigger and T.I. A \rightarrow B marker outputs (0 to -50 mV) available on front panel—T.I. A \rightarrow B is high during the time interval measured by the counter). Outputs protected from inadvertently applied voltage to ± 5 Vdc.
- 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, C/A; the following are armed by an event at C: T.I. A \rightarrow B, T.I. AVG A \rightarrow B, EVENTS C, A \rightarrow B, B/A.
- 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, 200 cm (7½ ft.)
- Weight:** Net 8.5 kg (18 lb, 12 oz). Shipping 11.2 kg (24 lb, 12 oz)



- Available Accessories**
- HP Rack Mount Ears (2 each required)
 - (for use with handles) 5020-8873
 - (for use without handles) 5020-8861