



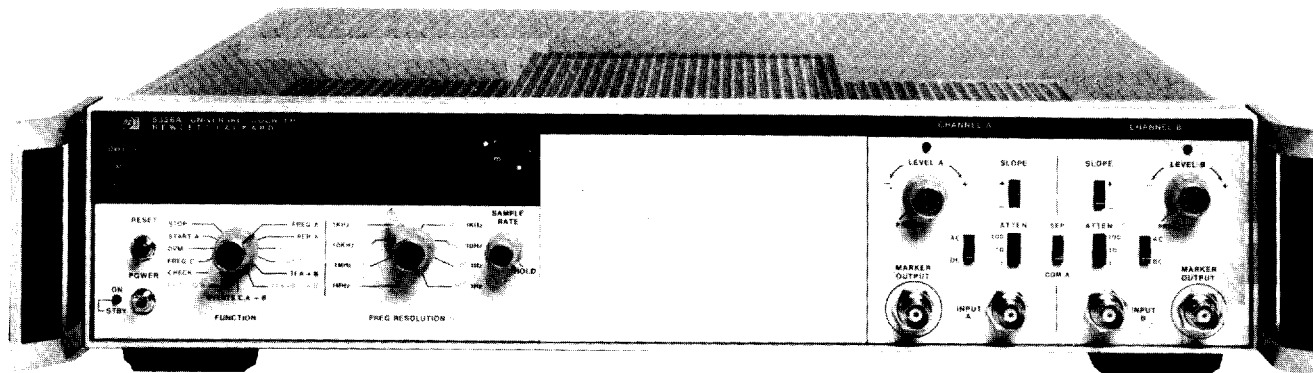
# ELECTRONIC COUNTERS

## 100 MHz Universal Counters

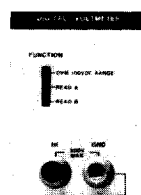
### Model 5328A

- 100 MHz, 512 MHz and 1300 MHz
- 100 ns or 10 ns time interval
- T.I. averaging to 10 ps resolution

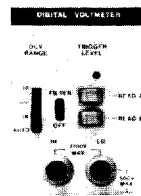
- "Armed" measurements
- DVM options
- HP-IB interface option



5328A



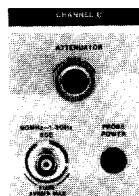
Opt 020



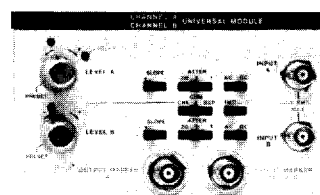
Opt 021



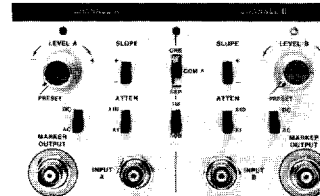
Opt 030



Opt 031



Opt 040



Opt 041

### Description

The 5328A, thru the use of technology such as a ROM controlled measurement cycle and a modular design, provides you with excellent universal counter price/performance. Optional modules allow you to tailor the performance of the 5328A to meet your particular measurement needs. In many instances, however, the standard 5328A offers all the capability you're likely to need.

**Burst and CW measurements to 100 MHz:** special gating circuits start a measurement only when the input signal is present, allowing burst frequencies to be measured as easily as CW signals. The option 030 C Channel extends this capability to 512 MHz; option 031, to 1300 MHz.

**Single shot time interval measurements:** the standard universal module's 100 ns single shot resolution meets or exceeds the requirements for a wide range of applications such as mechanical and electromechanical device timing (relays), time of flight measurements (ballistics), sonar ranging, radio ranging and navigation.

**Time interval averaging:** resolution better than 10 ps ( $10^{-11}$  seconds) for repetitive time intervals as short as 100 ps.

### General

**Display:** 9 digit LED display, ninth digit used only with channel C functions (FREQ. C, Ratio C/A, Events C, A-B).

**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 if gate is open.

**Period, period average, ratio, totalize, scale:** extra problem solving power for your special requirements.

**Armed measurements:** versatile arming modes (controlled by a rear panel switch) allow real time control over when a measurement begins. Useful for measurements such as frequency burst profile and frequency sweep linearity.

**Trigger lights:** trigger light blinks when channel is triggering; light is ON when input is above trigger level; OFF when input is below trigger level. Simplifies trigger level adjustments.

**High performance marker outputs:** marker outputs (operational to 100 MHz) indicate where channel is triggering in real time for oscilloscope monitoring applications. Provides measurement feedback to the operator for greatly simplified measurement set-ups.

These features and capabilities make the 5328A an excellent choice for general purpose lab use, electronic service, and production test. For more demanding applications, a variety of options offer extended performance at a modest increase in price.

**Time base output:** rear panel output: TTL levels.

**Check signal:** with function switch in CHECK, counter should display  $10 \text{ MHz} \pm 1$  count. With options 040 and 041, place function switch in FREQ A and universal module in CHECK (CHK). Counter should display  $100 \text{ MHz} \pm 1$  count.

**Operating temperature:**  $0^\circ$  to  $50^\circ \text{C}$ .

**Power requirements:** 100/120/220/240 V rms, +5%, -10% (switch selectable), 48-66 Hz; 150 VA max.



#### Standard Universal Module

##### Input characteristics

**Sensitivity:** 25 mV rms, to 40 MHz  
50 mV rms, 40 MHz - 100 MHz

**Impedance (Nominal):** Separate: 1MΩ//<40 pF;  
Common: 1MΩ//<65 pF

**Attenuators (Nominal):** X1, X10, X100 switch selectable

##### Frequency A

**Range:** 0 to 100 MHz with resolution to 0.1 Hz

##### Period A

**Range:** 100 ms to 10<sup>8</sup> with resolution to 100 ns

##### Period Average A

**Range:** 100 ns to 10<sup>8</sup> s with resolution to 100 ps

##### Time Interval A-B

**Range:** 100 ns to 10<sup>8</sup> s with resolution to 100 μs

##### Time Interval Average A-B

**Range:** 0.1 ns to 10 s with resolution to 100 ps

**Minimum Dead Time:** 150 ns

##### Ratio B/A

**Range:** channel A, 0 to 10 MHz; channel B, 0 to 100 MHz

#### Time Base Oscillators

##### Standard Crystal Oscillator

**Frequency:** 10 MHz

**Aging rate:** <3 x 10<sup>-7</sup>/month

**Temperature:** ±2.5 x 10<sup>-6</sup>, 0° to 50°C

**Line voltage:** <1 x 10<sup>-7</sup> for 10% change

##### Opt 010 Oven Oscillator

**Frequency:** 10 MHz

**Aging rate:** <5 x 10<sup>-10</sup>/day after 24-hour warm-up

**Short term:** <1 x 10<sup>-10</sup> rms/s

**Temperature:** <7 x 10<sup>-9</sup>, 0° to 50°C

**Line voltage:** ±5 x 10<sup>-8</sup> for 10% variation

**Warm-up:** within 5 x 10<sup>-9</sup> of final value in 20 minutes

**Ext. freq. std. input:** 30 kHz to 10 MHz signal of amplitude >1.0 V rms into 1 kΩ. Maximum input: 5 V p-p. With options 040 and 041 the external frequency standard must be 10 MHz for Period Avg., T.I. Avg., Period (N = 1), and T.I. (N = 1).

#### Option 011: HP-IB Interface

Option 011 provides digital output of measurement data ("talker") as well as input for remote program control ("listener"). HP-IB cable not supplied.

**Programmable features:** function, resolution, sample rate (max or manual control), arming, display modes, measurement cycle modes, output modes, and reset commands. Option 041 adds control of channel A and B trigger level, slope, attenuator, coupling, input impedance, and SEP-COM-CHECK selection.

**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 Execute Trigger

**Service request (SRQ):** if enabled, indicates end of measurement

**Maximum data output rate:** 500 readings/s

#### Option 020: Digital Voltmeter

**Range:** ±125 Vdc

**Sensitivity:** 1 mV, 1 mV, 2 mV, 20 mV, 200 mV for measurement times of 10 s, 1 s, 0.1 s, 10 ms, 1 ms respectively

**Input type:** single ended

**Impedance:** 10 MΩ Nominal

**Maximum input:** ±500 V

**Trigger level measurements:** 2 mV display resolution

#### Option 021: High Performance Digital Voltmeter

**Range:** ±10, ±100, ±1000 V dc and Autorange

**Sensitivity:** 10 μV, 100 μV, 1 mV, 10 mV, 100 mV for measurement times of 10 s, 1 s, 0.1 s, 10 ms, 1 ms respectively

**Input type:** floating pair

**Impedance:** 10 MΩ Nominal

**Maximum input:** Hi to Lo: ±1100 V all ranges

Lo to Chassis ground: ±500 V

**Trigger level measurements:** 1 mV display resolution

**Note:** Trigger level readings are multiplied automatically by attenuator setting of using options 040 or 041.

#### Option 030: 512 MHz C Channel

##### Input characteristics

**Sensitivity:** 15 mV rms sine wave (-23.5 dBm)

**Input protection:** fused input

**Maximum input:** 5 V rms

##### Frequency C

**Range:** 5 MHz to 512 MHz, direct count with resolution to 0.1 Hz

##### Ratio C/A

**Range:** channel A, 0 to 10 MHz; channel C, 5 to 512 MHz

**Events C, A-B:** totalizes the number of events at C input during the synchronized time interval as defined by inputs to A and B

#### Option 031: 1300 MHz C Channel

##### Input characteristics

**Sensitivity:** 20 mV rms sine wave (-21 dBm)

**Input protection:** fused input

**Maximum input:** 5 V rms, ±5 V dc

##### Frequency C

**Range:** 90 MHz to 1300 MHz, prescaled by 4 with resolution to 0.1 Hz

##### Ratio C/A

**Range:** channel A, 0 to 10 MHz; channel C, 90 to 1300 MHz

**Attenuation:** continuously variable for optimum noise suppression

#### Extended Capability Universal Modules

##### (Option 040 and 041)

##### Input characteristics

**Sensitivity:** same as standard unit

**Impedance (Nominal):** 10 MΩ or 50 Ω, switch selectable

**Attenuators (Nominal):**

Option 040—X1, X2, X20 switch selectable

Option 041—X1, X10 switch selectable

**Frequency A:** same as standard unit

##### Period A

**Range:** 100 ns to 10<sup>8</sup> s with resolution to 10 μs

##### Period Average A

**Range:** 100 μs to 10<sup>8</sup> s with resolution to 0.01 ps

##### Time Interval A-B

**Range:** 10 ns to 10<sup>7</sup> s with resolution to 10 s

##### Time Interval Average A-B

**Range:** 0.1 ns to 1 s with resolution to 10 ps

**Minimum dead time:** 40 ns

**Ratio A/B:** same as standard unit

**Delay (Option 040 only):** 20 μs to 20 ns

**Programmable control (Option 041 only):** Level,

Coupling, Attenuation, Impedance, SEP-COM-CHK

#### Options and Accessories

| Options and Accessories   | Price  |
|---|--------|
| 010: High Stability Time Base   | \$800  |
| 011: HP-IB Interface  | \$450  |
| 020: DVM  | \$400  |
| 021: High Performance DVM   | \$800  |
| 030: 512 MHz Channel C  | \$700  |
| 031: 1300 MHz Channel C   | \$900  |
| 040: High Performance Universal Module  | \$550  |
| 041: Programmable Input Controls Module<br>(Requires Option 011 for HPIB use) | \$1050 |
| 908: Rack Flange Kit for use w/o front handles                                | \$25   |
| 913: Rack Flange Kit for use with supplied front handles                      | \$25   |
| 10855A Preamp   | \$475  |
| 10856A Filter Kit   | \$175  |
| 5363B Time Interval Probes  | \$3675 |

#### 5328A Universal Counter

**Front Handles:** supplied with instrument

**\$2100**