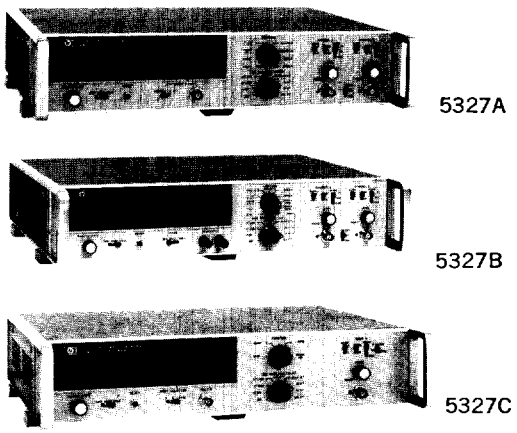
ELECTRONIC COUNTERS

UNIVERSAL COUNTERS

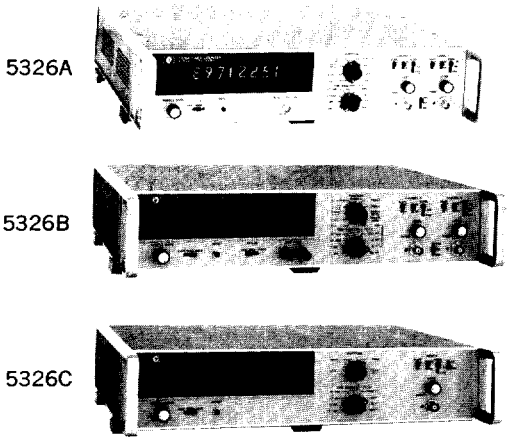
Unique Capabilities in 50 & 550 MHz Counters

5326/5327 Family

550 MHz Universal Timers/Counters DVMs



50 MHz Universal Timers/Counters/DVMs



Unique measurement benefits

The Hewlett-Packard 5326/5327 Universal Counters are both general-purpose lab instruments and fast, efficient systems instruments. Frequency measurements to 550 MHz, high resolution time interval measurements, and voltage measurements make the 5326/5327 family the most useful Timer/Counter/DVM's available. A single set of controls and one readout provide either frequency or voltage data which leads to easy manual operation. Systems interface is greatly simplified since a single programming connector and a single BCD connector serve both the counter and DVM sections.

New features

Many new features are offered with the 5326/5327 family which provide unique measurement benefits. The exclusive Hewlett-Packard feature of readout blanking suppresses unwanted zeros to the left of the most significant digit to improve clarity of the digital presentation. The new function of Time Interval Averaging (explained in Counters, Tuturial, see Index) provides the capability of high resolution (100 ps or better) averaged time interval measurements on repetitive input signals. 550 MHz frequency capability with low cost and good reliability is provided by new Hewlett-Packard high frequency monolithic integrated circuits. And, for those who need higher sensitivity in the 550 MHz area a 25 mV option is available (see General Specifications). An internal integrating DVM in the 5326B and 5327B allows, in addition to standard dc measurements, the ability to measure with digital precision the internal trigger levels of the A and B input channels. This feature adds a whole new dimension to Time Interval measurements. Full details on these new techniques are in April 1970 Hewlett-Packard Journal.

Hysteresis compensated slope selection has been added to the 5326/5327 family to further enhance its usefulness and ease of operation when making time interval measurements. Now, when switching from + to — slopes, the trigger level need not be readjusted, since the trigger points remain at the same value. The 5326/5327 also provides front panel trigger lamps which indicate when the attenuator and level controls are properly set to trigger on the applied input signal.

High stability time bases

The time base in the 5326/5327 family consists of a stable 10 MHz crystal oscillator. The standard room temperature crystal provides fast warm-up and high stability. Aging for the crystal is specified as less than 3 parts in 10^7 per month.

Two higher stability time bases (see High Stability Time Base Chart) are available as options. Both are housed in special proportional ovens to give an excellent temperature specification of less than 1 part in 10^8 over the range of —20° to +65°C. And, their fast warm-up allows the oscillators to reach 5 parts in 10^9 in 15 min.

The two options, H49 and H50, have the aging rates of 3 parts in 10^9 per day and 5 parts in 10^{10} per day respectively. Their short term fluctuations are 1 part in 10^{10} rms for a one second average and 1 part in 10^{11} rms for a one second average respectively. (For a discussion of time base specifications, see Counters, Tutorial in Index.

Measurements

The 5326 series measures frequencies from 0-50 MHz and the 5327 series extends this range to 550 MHz with either periodic or random signals. Each counter's gate time is selectable in decade steps from 0.1 μs through 10 s with the decimal point and units automatically displayed. The rear panel frequency input is front panel selectable for use with external scaling devices or for system applications.

The 5326A/B and 5327A/B will measure the period of a single input cycle with a selectable resolution of 0.1 μs to 10 s for frequencies from dc to 10 MHz. Periods are fully displayed with a 7 digit readout (8 digits optional); e.g., 999999.9 μs. If the count exceeds the number of digits in the readout, an overflow lamp lights on the front panel.

Period average measurements are provided with each member of the 5326/5327 family to reduce effect of trigger error and ± one count ambiguity. Periods averaged are selectable from 1 to 10^8 (10-10^9 when prescaling) in decade steps for input rates from 0 to 10 MHz. Period average measurements result in higher accuracy at low frequencies and faster measurements at high frequencies for equivalent resolution.

Time intervals of 0.1 μs to 10^8 s can be measured with the 5326A/B and 5327A/B using their standard time interval capability. However, the unique time interval

averaging capability offered in the 5326A/B and 5327A/B provides time interval measurements ranging from 0.15 ns to 10 s. Optimum resolution of these measurements made on repetitive signals is 100 ns/$\sqrt{\text{intervals averaged}}$. Since a measurement can be averaged over 10^8 intervals, maximum resolution can be in the 10 ps region.

The 5326B and 5327B offer dc voltage measurements in addition to the above described capability. DC ranges of 10, 100 and 1000 volts provide autopolarity with measurement times front panel selectable from 1 ms (2 digits) to 1 sec (5 digits). The highly linear and stable V-F Converter affords excellent accuracy.

Quantitative time interval

The 5326B and 5327B have two functions which make them absolutely unique among the universal counter/timers. The READ A and READ B functions allow the DVM to accurately measure the 2 internal input amplifier trigger points to within .05%, and display that value. Consequently, 50% point, 10%-90% rise time points, and others can be accurately set for time interval measurements by using the internal DVM functions. Coupling the Time Interval Averaging capability to the foregoing yields an extremely powerful measurement tool—quantitative time interval. This measurement accurately determines both relevant signal parameters—time between measure points and their respective levels.

Systems compatability

Each member of the 5326/5327 family can be effectively used as a fast, efficient systems instrument.

Option 003 provides 4-line 1-2-4-8 BCD output with "1" state positive. This output is suitable for systems use or for output devices such as the HP Model 5050B or 5055A Digital Recorders.

Option 002 and Option 004 (5326A/B and 5327A/B only) provide remote programming capability via contact closure to ground or DTL drive. A rear panel connector provides access to all programmable circuits. With Option 002 all front panel controls are single line programmable except the FAST/NORM MODE, SEPARATE-COMMON switch (the CHECK position is programmable on the 5326A/B and 5327A/B only), input attenuators, and ac-dc input coupling switches. With Option 004 all front panel controls including all signal input conditioning are single line programmable except the FAST/NORM MODE. Both Options 002 and 004 provide programmable trigger level controls through single line analog signals.

In addition, the HP 10542A Remote Programming Interface provides two digital-to-analog converters to enable the 5326/5327 series with Option 004 to be completely programmed from a 40-bit digital output register.

5326/5327 Family Selection

Model	Description	Frequency Range	Period Average Totalize/Ratio Scaling	Time Interval Time Interval Averaging	DVM (DC Voltage)	Price
5326C	Multi-Function Counter	50 MHz	■			$ 950
5326A	Universal Timer/Counter	50 MHz	■	■		1,250
5326B	Universal Timer/Counter/DVM	50 MHz	■	■	■	1,595
5327C	Multi-Function Counter	550 MHz	▨			1,495
5327A	Universal Timer/Counter	550 MHz	▨	▨		1,795
5327B	Universal Timer/Counter/DVM	550 MHz	▨	▨	▨	2,150

General 5326/5327 Specifications

Display: 7 digits (8 optional).
Blanking: suppresses display of unwanted zeros left of the most significant digit.
Display storage: holds reading between samples. Rear panel switch overrides storage.
Sample rate: FAST and NORM ranges, and HOLD position.
Overflow: neon indicates when display range is exceeded.
Operating temperature: 0° to 50°C (see DVM Temp. Range).
Gate output: TTL level pulses, low while gate open, rear panel.
Power requirements: 115/230 V ±10%, 50/60 Hz, 70 watts (max).
Weight: max: net, 16 lbs (7,4 kg); shipping, 18 lbs 16 oz (8,7 kg).
Dimensions: 3-15/32" high x 16¾" wide x 11¼" deep (88, 2 x 425 x 286 mm).
Accessories furnished: power cord, 7½ ft and rack mount kit.
Accessories available

HP 10503A: 50Ω BNC cable, 4 ft (122 cm). Price, $7.
HP 10532A: extender board kit containing 2 each. 15-pin extender 5060-0049, 1 each. 18-pin extender 5060-2041, and 1 each amplifier extender. 10532-60001. Price, $50.
HP 10542A: remote programming interface enables interfacing between the 5326/5327 series counters with Option 004 and a 40-bit output register. Includes two (2) 7 bit digital-to-analog converters for level controls and decoding for time base and function selector. Price, $400.
HP Cable 562A-16C: (6 ft, 183 cm) to connect 5326/5327 series with Option 003 to HP 5050B Digital Recorder. Price, $50.
Option 001: 8-digit display. Price, $75.
Option 002: remote programming.
Controls: all front panel controls are single line programmable except:
SEP-COM switch; CHECK is programmable (5326A/B, 5327A/B only).
FAST/NORM mode.
Input attenuators.
AC/DC input signal coupling.
Price: $75.
Option 003: digital output (for numerals and polarity only).
Price: $50.
Option 004: remote programming *including all signal input conditions* (includes attenuators and ac/dc switches).
Controls: all front panel controls are programmable except: FAST/NORM mode.
Price: $200.
Option H60: higher sensitivity for the 550 MHz input channel on the 5327 series. 25 mV rms, 0 to 50°C; 10-15 mV rms typical at 25°C.
Price: $125.

High Stability Time Base Options

Option	Aging Rate	Short Term Stability	Temperature Stability	Price
Standard	$<3 \times 10^{-7}$/mo.	$<5 \times 10^{-9}$/1 sec rms (typ)	$<\pm 2.5 \times 10^{-6}$, 0 to 50°C	included
H49	$<3 \times 10^{-9}$/day	$<1 \times 10^{-10}$/1 sec rms	$<1 \times 10^{-8}$, −20 to +65°C	$300.00
H50	$<5 \times 10^{-10}$/day	$<1 \times 10^{-11}$/1 sec rms	$<1 \times 10^{-8}$, −20 to +65°C	450.00