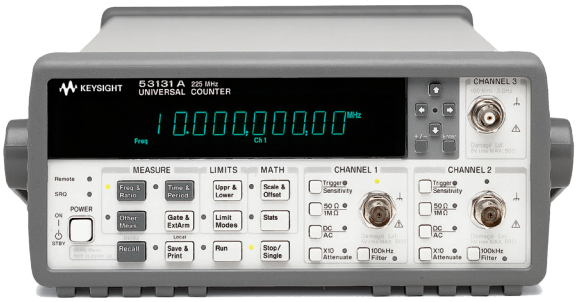
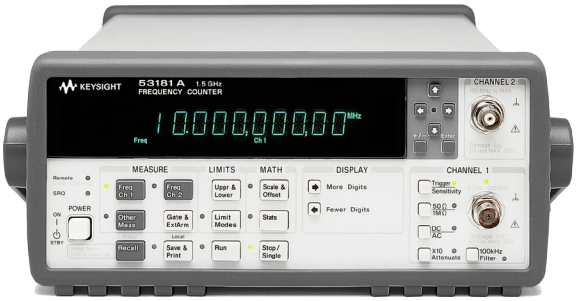
Keysight 53131A/132A/181A
Counters

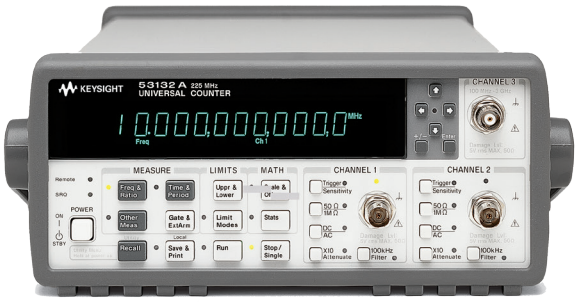
Data Sheet

Recommended replacement products:

53200 Series RF and universal frequency counter/timers (Data sheet publication number: 5990-6283EN)







KEYSIGHT TECHNOLOGIES
Unlocking Measurement Insights

Overview

- 225 MHz bandwidth (optional 1.5, 3, 5, or 12.4 GHz)
- 10- or 12-digit resolution with 1 s gate time
- GPIB interface and IntuiLink connectivity software standard
- Data transfer rate of up to 200 fully formatted measurements/second

A family of universal and RF counters to meet your needs

The Keysight Technologies, Inc. 53131A/132A/181A high-performance counters give you fast, precise frequency measurements at an affordable price. These counters feature an intuitive user interface and one-button access to frequently used functions so you can make accurate measurements quickly and easily.

Real-time digital signal processing technology is used to analyze data while simultaneously taking new readings, speeding measurement throughput. The technology, developed for Keysight's high-end line of modulation domain analyzers, allows the counters to gather more data for each measurement, so you get higher-resolution measurements in a fraction of the time it takes other counters.

The 53131A/132A/181A counters offer built-in statistics and math functions so you can scale measurements and simultaneously measure and track average, min/max and standard deviation. Automated limit testing lets you set upper and lower limits for any measurement. An analog display mode lets you see at a glance whether a measurement is within pass/fail limits. The counters flag out-of-limit conditions and can generate an output signal to trigger external devices when a limit is exceeded. For quick access to frequently used tests, a single keystroke recalls up to 20 different stored front-panel set-ups.

For computer-controlled systems applications, each counter includes a standard GPIB interface with full SCPI-compatible programmability and a data transfer rate of up to 200 fully formatted measurements per second. The standard RS-232 talk-only interface provides printer support or data transfer to a computer through a terminal-emulation program.

Keysight 53131A universal counter

The two-channel 53131A counter offers 10 digits per second of frequency/period resolution and a bandwidth of 225 MHz. Time interval resolution is specified at 500 ps. An optional third channel provides frequency measurements up to 3, 5, or 12.4 GHz. Standard measurements include frequency, period, ratio, time interval, pulse width, rise/fall time, phase angle, duty cycle, totalize, and peak voltage.

Keysight 53132A universal counter

For applications requiring higher resolution, the 53132A offers the same features and functions as the 53131A, with up to 12 digits/sec frequency/period resolution and 150 ps time interval resolution. In addition, the 53132A offers advanced arming modes for time interval measurements.

Keysight 53181A RF counter

Optimized for RF applications, the single-channel 10 digit/s 53181A measures frequency, period and peak voltage. A digit-blanking function lets you easily eliminate unnecessary digits when you want to read measurements quickly. For higher-frequency measurements, choose an optional second channel that provides measurements up to 1.5, 3, 5, or 12.4 GHz. A self-guided shallow menu makes this counter exceptionally easy to use.

Keysight IntuiLink provides easy access to the counter's data from your PC

The Keysight 53131A/132A/181A counters, capture precise frequency and time measurements. IntuiLink software allows that data to be put to work easily. You work in a familiar environment at all times, using PC applications such as Microsoft Excel or Word to analyze, interpret, display, print, and document the data you get from the counter.

It gives you the flexibility to configure and run tests from your PC making data gathering more convenient.

Keysight IntuiLink lets you:

- Configure tests, including measurement type, number of readings, measurement speed, and more.
- Choose display modes from real-time strip chart, histogram, readout, and table mode.
- Scale measurements data.
- Copy captured data to other programs.

Optional timebases offer increased stability

Optional timebases are available for 53131A/132A/181A counters to increase measurement accuracy. Option 010 provides a high stability oven timebase with aging of less than 5×10^{-10} per day.

Time base

Internal time base stability (see graph 3 for timebase contribution of measurement error).

		Standard (0 to 50 °C)	**Medium oven (Option 001)**	**High oven (Option 010)**	**Ultra high oven (Option 012 for 53132A only)**
Temperature stability (referenced to 25°C)		$< 5 \times 10^{-6}$	$< 2 \times 10^{-7}$	$< 2.5 \times 10^{-9}$	$< 2.5 \times 10^{-9}$
Aging rate (after 30 days)	Per day		$< 4 \times 10^{-8}$	$< 5 \times 10^{-10}$	$< 1 \times 10^{-10}$
	Per month	$< 3 \times 10^{-7}$	$< 2 \times 10^{-7}$	$< 1.5 \times 10^{-8}$	$< 3 \times 10^{-9}$
	Per year				$< 2 \times 10^{-8}$
Turn-on stability vs. time (in 30 minutes)			$< 2 \times 10^{-7}$ referenced to 2 h	$< 5 \times 10^{-9}$ referenced to 24 h	$< 5 \times 10^{-9}$ referenced to 24 h
Calibration		Manual adjust	Electronic	Electronic	Electronic

Note that power to the time base is maintained when the counter is placed in standby via the front panel switch. The internal fan will continue to operate when in standby to maintain long-term measurement reliability.

Instrument Inputs

Input specifications	**Channel 1 and 2 (53131A, 53132A) [1]** **Channel 1 (53181A)**	
Frequency range	DC coupled	DC to 225 MHz
	AC coupled	1 to 225 MHz (50 Ω) 30 Hz to 225 MHz (1 MΩ)
	FM tolerance	25%
Voltage range and sensitivity (Sinusoid) [2]	DC to 100 MHz 100 to 200 MHz 200 to 225 MHz	20 mVrms to ± 5 V AC + DC 30 mVrms to ± 5 V AC + DC 40 mVrms to ± 5 V AC + DC (all specified at 75 mVrms with option rear connectors) [3]
Voltage range and sensitivity (Single-shot pulse) [2]	4.5 to 10 ns pulse width > 10 ns pulse width	100 mVpp to 10 Vpp (150 mVpp with optional rear connectors) [3] 50 mVpp to 10 Vpp (100 mVpp with optional rear connectors) [3]
Trigger level [2]	Range Accuracy Resolution	± 5.125 V ± (15 mV + 1% of trigger level) 5 mV
Damage level	50 Ω 0 to 3.5 kHz, 1 MΩ 3.5 to 100 kHz, 1 MΩ > 100 kHz, 1 MΩ	5 Vrms 350 VDC + AC pk 350 VDC + AC pk linearly derated to 5 Vrms 5 Vrms
Input characteristics	**Channel 1 and 2 (53131A, 53132A) [1]** **Channel 1 (53181A)**	
Impedance	1 MΩ or 50 Ω	
1 MΩ capacitance	30 pF	
Coupling	AC or DC	
Low-pass filter	100 kHz, switchable –20 dB at > 1 MHz	
Input sensitivity	Selectable between Low, Medium, or High (default). Low is approximately 2x High Sensitivity.	
Trigger slope	Positive or negative	
Auto trigger level	Range Frequency Input amplitude	0 to 100% in 10% steps > 100 Hz > 100 mVpp (No amplitude modulation)
Attenuator	Voltage range Trigger range	x10 x10
Input specifications [4]	**Channel 3 (53131A, 53132A)** **Channel 2 (53181A)**	
Frequency range	Option 015 (for 53181A only) Option 030 Option 050 Option 124	100 MHz to 1.5 GHz (see Option 030 for additional specs) 100 MHz to 3 GHz 200 MHz to 5 GHz 200 MHz to 12.4 GHz
Power range and sensitivity (Sinusoid)	Option 030 Option 050 Option 124	100 MHz to 2.7 GHz: –27 dBm to +19 dBm 2.7 GHz to 3 GHz: –21 dBm to +13 dBm 200 MHz to 5 GHz: –23 dBm to +13 dBm 200 MHz to 12.4 GHz –23 dBm to +13 dBm
Damage level	Option 030 Option 050 Option 124	5 Vrms +25 dBm +25 dBm
Characteristics	Impedance Coupling VSWR	50 Ω AC < 2.5:1

Instrument Inputs (Continued)

Input specifications [4] (Continued)	Channel 3 (53131A, 53132A) Channel 2 (53181A)	
External arm input specifications [5]		
Signal input range	TTL compatible	
Timing restrictions	Pulse width	> 50 ns
	Transition time	< 250 ns
	Start-to-stop time	> 50 ns
	Damage level	10 Vrms
External arm input characteristics [5]		
	Impedance	1 kΩ
	Input capacitance	17 pF
	Start/stop slope	Positive or negative
External time base input specifications		
	Voltage range	200 mVrms to 10 Vrms
	Damage level	10 Vrms
	Frequency	1 MHz, 5 MHz, and 10 MHz (53132A 10 MHz only)
Time base output specifications		
	Output frequency	10 MHz
	Voltage	> 1 Vpp into 50 Ω (centered around 0 V)

1. Specifications and characteristics for Channels 1 and 2 are identical for both common and separate configurations.
2. Values shown are for X1 attenuator setting. Multiply all values by 10 (nominal) when using the X10 attenuator setting.
3. When the 53131A or 53132A are ordered with the optional rear terminals (Option 060), the channel 1 and 2 inputs are active on both front and rear of the counter. When the 53181A is ordered with the optional rear terminal, the channel 1 input is active on both front and rear of the counter. For this condition, specifications indicated for the rear connections also apply to the front connections.
4. When optional additional channels are ordered with Option 060, refer to configuration table for Option 060 under ordering info on page 8. There is no degradation in specifications for this input, as applicable.
5. Available for all measurements except peak volts. External arm is referred to as external gate forsome measurements.

For automatic or external arming: (and signals < 100 Hz using timed arming)

$$\text{LSD displayed: } \left(\frac{t_{res}}{\text{Gate time}} \right) \times \text{Frequency or period}$$

$$\text{RMS resolution: } \left(\frac{\sqrt{t^2_{res} + (2 \times \text{Trigger error})^2}}{\text{Gate time}} \right) \times \text{Frequency or period}$$

	53131A t_{res}	53132A t_{res}	53181A t_{res}
Typical	650 ps	200 ps	650 ps

See graphs for worst case resolution performance.

$$\text{For automatic arming: Gate time} = \frac{N}{\text{Frequency}}$$

where N = 1 for standard channel frequency < 1 MHz
4 for standard channel frequency > 1 MHz
128 for optional channel

$$\text{Systematic uncertainty: } \left(\pm \text{ Time base error } \pm \frac{t_{acc}}{\text{Gate time}} \right) \times \text{Frequency or period}$$

	53131A t_{acc}	53132A t_{acc}	53181A t_{acc}
Typical	350 ps	100 ps	350 ps
Worst case	1.25 ns	500 ps	1.25 ns

Trigger: Default setting is auto trigger at 50%.

For time or digits arming:

LSD displayed:
$$\left(\frac{2\sqrt{2} \times t_{res}}{\text{Gate time} \times \sqrt{\text{Number of samples}}} + \frac{t_{jitter}}{\text{Gate time}} \right) \times \text{Frequency or period}$$

RMS resolution (see Graph 2):
$$\left(\frac{4 \times \sqrt{t^2_{res} + (2 \times \text{Trigger error}^{\,2})}}{\text{Gate time} \times \sqrt{\text{Number of samples}}} + \frac{t_{jitter}}{\text{Gate time}} \right) \times \text{Frequency or period}$$

	53131A/181A		53132A	
	t_{res}	t_{jitter}	t_{res}	t_{jitter}
Typical	500 ps	50 ps	225 ps	3 ps

See graphs for worst case resolution performance.

Number of samples = Gate time × Frequency (Frequency < 200 kHz)
Gate time × 200,000 (Frequency > 200 kHz)

Systematic uncertainty:
$$\left(\pm \text{ Time base error } \pm \frac{t_{acc}}{\text{Gate time}} \right) \times \text{Frequency or period}$$

	53131A/81A t_{acc}	53132A t_{acc}
Typical	100 ps	10 ps
Worst case	300 ps	100 ps

Trigger: Default setting is auto trigger at 50%.

Measurement Specifications

Frequency (53131A, 53132A, 53181A)		
Channel 1 and 2 (53131A, 53132A) Channel 1 (53181A)	Range	0.1 Hz to 225 MHz
Channel 3 (53131A, 53132A) Channel 2 (53181A)	Option 015 (53181 A only) Option 030 Option 050 Option 124 (Period 2 or 3 selectable via GPIB only)	100 MHz to 1.5 GHz 100 MHz to 3 GHz 200 MHz to 5 GHz 200 MHz to 12.4 GHz
Period (53131A, 53132A, 53181A)		
Channel 1 and 2 (53131A, 53132A) Channel 1 (53181A)	Range	4.44 ns to 10 s
Channel 3 (53131A, 53132A) Channel 2 (53181A)	Option 015 (53181A only) Option 030 Option 050 Option 124	0.66 to 10 ns 0.33 to 10 ns 0.2 to 5 ns 80 ps to 5 ns
Frequency ratio (53131A, 53132A, 53181A)		
Measurement is specified over the full signal range of each input.	Results range "Auto" gate time	10^{-10} to 10^{11} 100 ms
Time interval (53131A, 53132A)		
Measurement is specified over the full signal ranges [6] of Channels 1 and 2	Results range LSD	–1 ns to 10^{5} s 500 ps (53131A)/150 ps (53132A)
Phase (53131A, 53132A)		
Measurement is specified over the full signal range of Channels 1 and 2	Results range	–180° to +360°
Duty cycle (53131A, 53132A)		
Measurement is specified over the full signal range of Channel 1. However, both the positive and negative pulse widths must be greater than 4 ns.	Results range	0 to 1 (e.g. 50% duty cycle would be displayed as .5)
Rise/fall time (53131A, 53132A)		
Measurement is specified over the full signal ranges of Channel 1. The interval between the end of one edge and start of a similar edge must be greater than 4 ns.	Edge selection Trigger Results range LSD	Positive or negative Default setting is auto trigger at 10 and 90% 5 ns to 10^{5} s 500 ps (53131A)/150 ps (53132A)
Pulse width (53131A, 53132A)		
Measurement is specified over the full signal range of Channel 1. The width of the opposing pulse must be greater than 4 ns.	Pulse selection Trigger Results range LSD	Positive or negative Default setting is auto trigger at 50% 5 ns to 10^{5} s 500 ps (53131A)/150 ps (53132A)
Totalize (53131A, 53132A)		
Measurement is specified over the full signal range of Channel 1.	Results range Resolution	0 to 10^{15} ± 1 count
Peak volts (53131A, 53132A, 53181A)		
Measurement is specified on Channels 1 and 2 for DC signals; or for ac signals of frequencies between 100 Hz and 30 MHz with peak-to-peak amplitude greater than 100 mV.	Results range Resolution	–5.1 V to +5.1 V 10 mV
Peak volts systematic uncertainty (53131A, 53132A, 53181A)		
Use of the input attenuator multiplies all voltage specifications (input range, results range, resolution and systematic uncertainty) by a nominal factor of 10.	For AC signals For DC signals	25 mV + 10% of V 25 mV + 2% of V

Measurement Specifications (Continued)

Gate time		
	Auto mode	1 ms to 1000 s
Measurement throughput		
	GPIB ASCII	200 measurements/s (maximum)
Measurement arming		
	Start measurement	Free run, manual, or external
	Stop measurement	Continuous, single, external, or timed
	Time interval	100 µs to 10 s (53131A)
	Delayed arming	100 ns to 10 s (53132A)
Arming modes		
Note that not all arming modes are available for every measurement function		

5. Available for all measurements except peak volts. External arm is referred to as external gate for some measurements.
6. See specifications for pulse width and rise/fall time measurements for additional restrictions on signal timing characteristics.

Time interval, pulse width, rise/fall time (53131A and 53132A only):

RMS resolution: $\sqrt{(t_{res})^2 + \text{Start trigger error}^2 + \text{Stop trigger error}^2}$

Systematic uncertainty:

± (Time base error × Measurement) Trigger level timing error ± 1.5 ns Differential channel error (53131A)

± (Time base error × Measurement) Trigger level timing error ± 900 ps Differential channel error (53132A)

where t_{res} = 750 ps for the 53131A, 300 ps for the 53132A

Frequency ratio: $\frac{Ch1}{Ch2}, \frac{Ch1}{Ch3}, \frac{Ch2}{Ch1}, \frac{Ch3}{Ch1}$ (53131A and 53132A) $\frac{Ch1}{Ch2}, \frac{Ch2}{Ch1}$ (53181A)

LSD: Ratio $\frac{1}{2}$: $\frac{1}{\text{Ch2 Freq} \times \text{Gate time}}$ Ratio $\frac{2}{1}$: $\frac{\text{Ch2 Freq}}{(\text{Ch1 Freq})^2 \times \text{Gate time}}$

RMS resolution: Ratio $\frac{1}{2}$: $\frac{2 \times \sqrt{1 + (\text{Ch1 Freq} \times \text{Ch2 Trigger error})^2}}{\text{Ch2 Freq} \times \text{Gate time}}$

Ratio $\frac{2}{1}$: $\frac{2 \times \text{Ch2 Freq} \times \sqrt{1 + (\text{Ch1 Freq} \times \text{Ch2 Trigger error})^2}}{(\text{Ch1 Freq})^2 \times \text{Gate time}}$

Systematic uncertainty: ± 2x resolution

For measurements using Ch3, substitute Ch3 for Ch2 in these equations. To minimize relative phase measurement error, connect the higher frequency signal to channel 1.

Phase (53131A and 53132A)

RMS resolution: $\sqrt{\left((T_{res})^2 + (2 \times \text{Trigger error}^2)\right) \times \left(1 + \left(\frac{\text{Phase}}{360°}\right)^2\right)} \times \text{Frequency} \times 360°$

53132ASystematic uncertainty:

- (± Trigger level timing error ± 1.5 ns Differential channel error) × Frequency × 360° (53131A)
- (± Trigger level timing error ± 900 ps Differential channel error) × Frequency × 360° (53132A)

Duty cycle (53131A and 53132A)

RMS resolution: $\sqrt{\left((T_{res})^2 + (2 \times \text{Trigger error}^2)\right) \times (1 + \text{Duty cycle}^2)} \times \text{Frequency}$

t_{res}	53131A	53132A
	750 ps	300 ps

Auto arming

Measurements are initiated immediately and acquired as fast as possible, using a minimum number of signal edges.

Timed arming

The duration of the measurement is internally timed to a user-specified value (also known as the “gate time”).

Digits arming

Measurements are performed to the requested resolution (number of digits) through automatic selection of the acquisition time.

External arming

An edge on the external arm Input enables the start of each measurement. Auto arming, timed arming modes or another edge on the external arm input may be used to complete the measurement.

Time interval delayed arming

For time interval measurements, the stop trigger condition is inhibited for a user-specified time following the start trigger. The 53132A offers advanced time interval arming capabilities including use of user specified time or Channel 2 events to delay both start and stop triggers.

Measurement limits

Limit checking

The measurement value is checked against user-specified limits at the end of each measurement.

Display modes

The measurement result may be displayed as either the traditional numeric value or graphically as an asterisk moving between two vertical bars.

Out-of-limits indications:

- The limits annunciator will light on the front panel display.
- The instrument will generate an SRQ if enabled via GPIB.
- The limits hardware signal provided via the RS-232 connector will go low for the duration of the out-of-limit condition.
- If the analog display mode is enabled, the asterisk appears outside the vertical bars, which define the upper and lower limits.

Fractional time base error (see Graph 3)

Time base error is the maximum fractional frequency variation of the time base due to aging or fluctuations in ambient temperature or line voltage:

$$\text{Time base error} = \left(\frac{\Delta f}{f} \text{ Aging rate} + \frac{\Delta f}{f} \text{ Temperature} + \frac{\Delta f}{f} \text{ Line voltage} \right)$$

Multiply this quantity by the measurement result to yield the absolute error for that measurement. Averaging measurements will not reduce (fractional) time base error. The counters exhibit negligible sensitivity to line voltage; consequently the line voltage term may be ignored.

Trigger error

External source and input amplifier noise may advance or delay the trigger points that define the beginning and end of a measurement. The resulting timing uncertainty is a function of the slew rate of the signal and the amplitude of spurious noise spikes (relative to the input hysteresis band). The (rms) trigger error associated with a single trigger point is:

$$\text{Trigger error} = \frac{\sqrt{(E_{input})^2 + (E_{signal})^2}}{\text{Input signal slew rate at trigger point}} \quad \text{(in seconds)}$$

where
E_{input} = RMS noise of the input amplifier: 1 mVrms (350 µVrms typical). Note that the internal measurement algorithms significantly reduce the contribution of this term.

E_{signal} = RMS noise of the input signal over a 225 MHz bandwidth (100 kHz bandwidth when the low-pass filter is enabled). Note that the filter may substantially degrade the signal's slew rate at the input of the trigger comparator.

For two-trigger-point measurements (e.g. rise time, pulse width), the trigger errors will be referred to independently as start trigger error and stop trigger error.

Trigger level timing error (see Graph 6)

Trigger level timing error results from a deviation of the actual trigger level from the specified level. The magnitude of this error depends on resolution and accuracy of the trigger level circuit, input amplifier fidelity, input signal slew rate, and width of the input hysteresis band.

The following equations should be summed together to obtain the overall trigger level timing error. At the "High" sensitivity input setting, the hysteresis band can be assumed to be the sensitivity of the counter input (see page 4). Reduction of input sensitivity or use of the attenuator will increase the size of this band.

Input hysteresis error:

$$\frac{\text{0.5 x hysteresis band}}{\text{Input signal slew rate at start trigger point}} - \frac{\text{0.5 x hysteresis band}}{\text{Input signal slew rate at stop trigger point}}$$

Trigger level setting error:

$$\pm \frac{\text{15 mV} \pm (\text{1\% x start trigger level setting})}{\text{Input signal slew rate at start trigger point}} \pm \frac{\text{15 mV} \pm (\text{1\% x stop trigger level setting})}{\text{Input signal slew rate at stop trigger point}}$$

Differential channel error

The differential channel error term stated in several systematic uncertainty equations accounts for channel-to-channel mismatch and internal noise. This error can be substantially reduced by performing a TI calibration (accessible via the utility menu) in the temperature environment in which future measurements will be made.

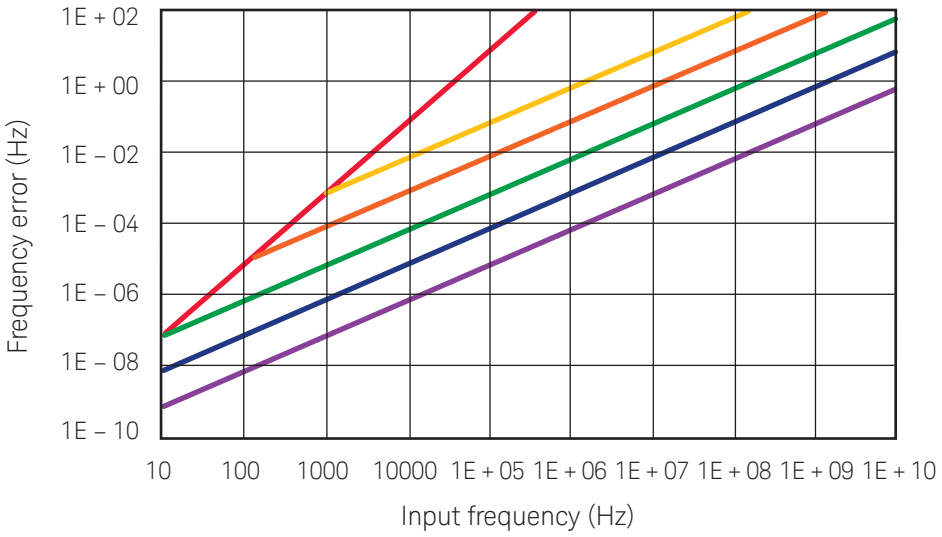
Graph 1:

Keysight 53131A/181A–Worst case RMS resolution [7] (Automatic or external arming)

The graphs may also be used to compute errors for period measurements. To find the period error (DP), calculate the frequency of the input signal (F = 1/P) and find the frequency error (DF) from the chart.

Then calculate the period error as:

$$\Delta P = \left(\frac{\Delta F}{F}\right) \times P$$

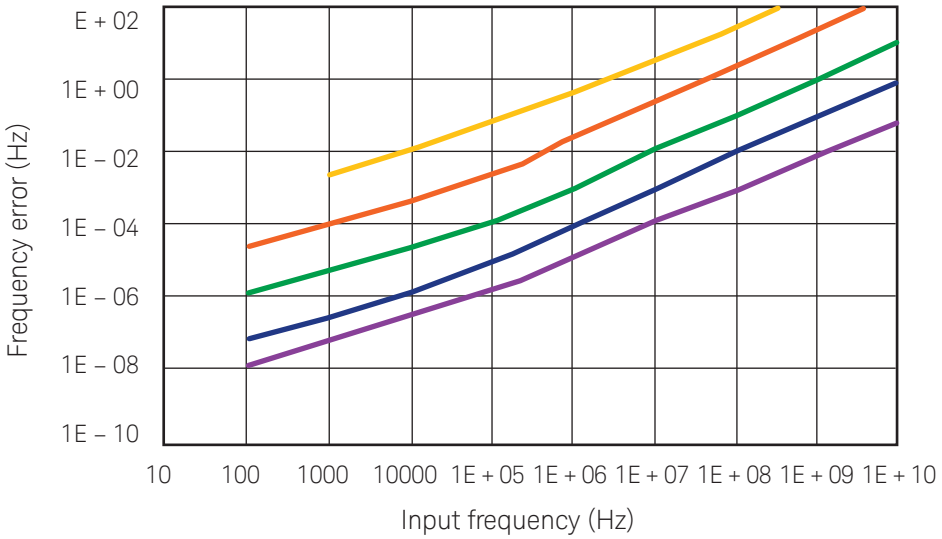


Remarks:

- Auto armed
- Gate time:
- 1 ms
- 10 ms
- 100 ms
- 1 s
- 10 s

Graph 2:

Keysight 53131A/181A–Worst case RMS resolution [7] (Time or digits arming)

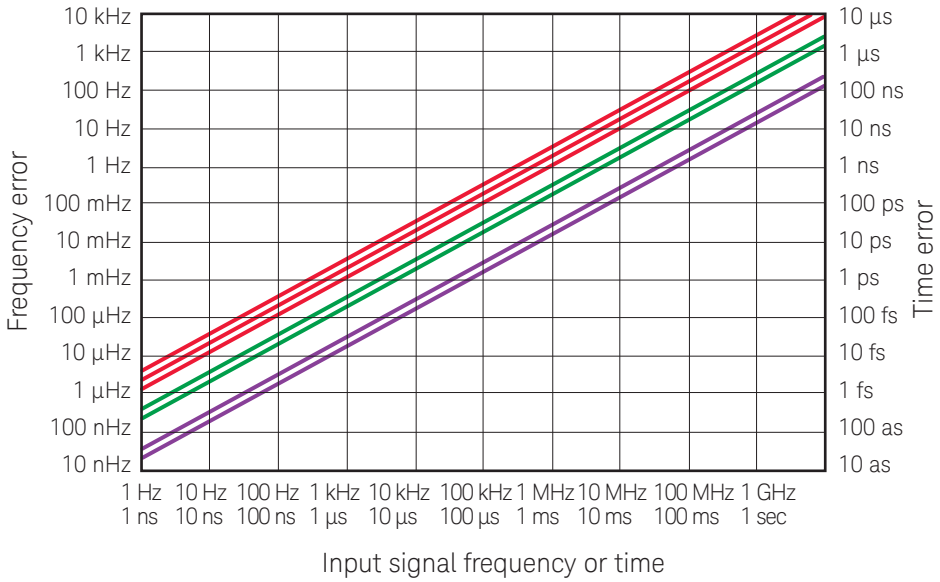


Remarks:

- Gate time:
- 1 ms
- 10 ms
- 100 ms
- 1 s
- 10 s

Graph 3:

Timebase error [7]



Remarks:

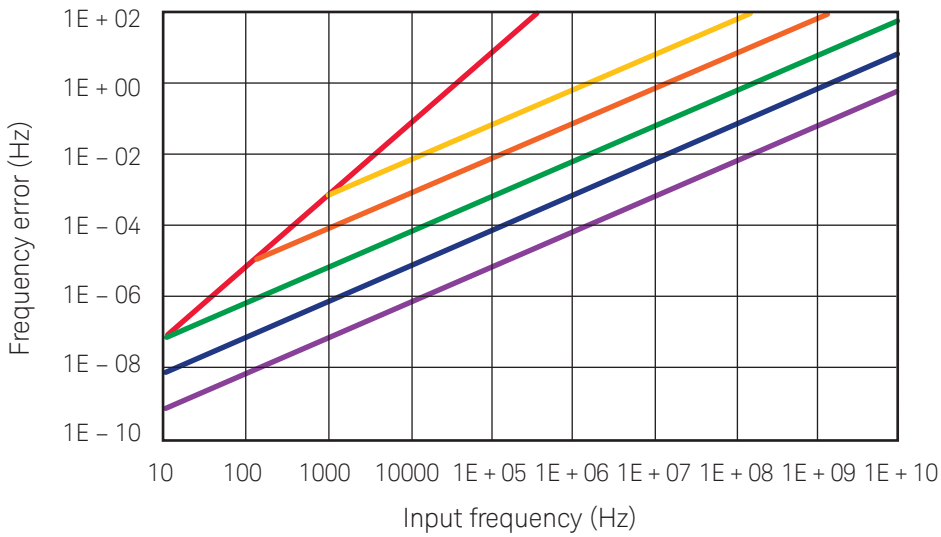
High stability T.B. 10 years after cal
Medium stability T.B. 1 year after cal
Standard stability T.B. 1 year after cal

High stability T.B. 1 year after cal
Standard T.B. 1 month after cal
Medium T.B. 1 month after cal

High stability T.B. 1 month after cal
Ultra stability T.B. 1 year after cal

Graph 4:

Keysight 53132A–Worst case RMS resolution [7]
(Automatic or external arming)

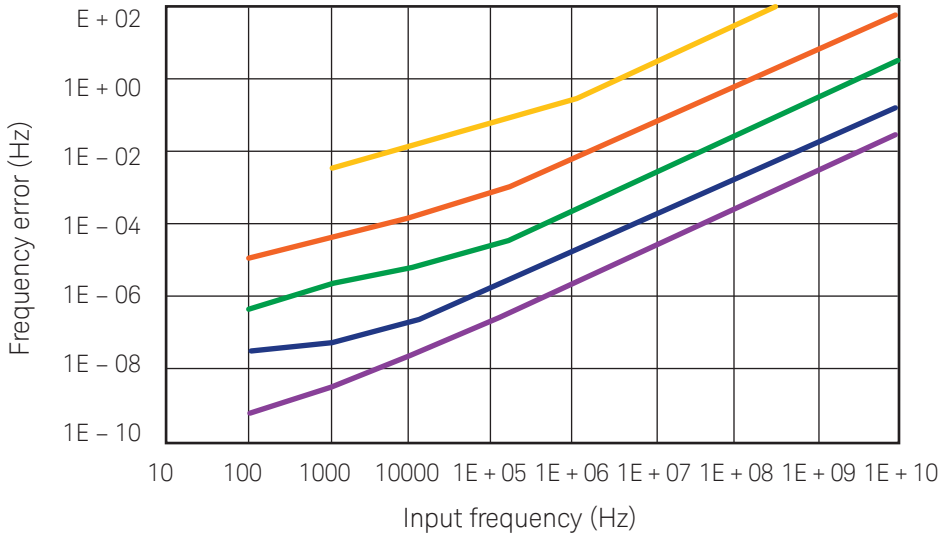


Remarks:

Auto armed
Gate time:
1 ms
10 ms
100 ms
1 s
10 s

Graph 5:

Keysight 53132A–Worst case RMS resolution [7] (Time or digits arming)



7. Graphs 1, 2, 4 and 5 do not reflect the effects of trigger error. To place an upper bound on the added effect of this error term, determine the frequency error from the appropriate graph and add a trigger error term as follows:

Time or digit arming

$$\text{Frequency error} + \left(\frac{4 \times \sqrt{2} \times \text{Trigger error}}{\text{Gate time} \times \sqrt{\text{Number of samples}}} \right) \times \text{Frequency or period}$$

Automatic or external arming

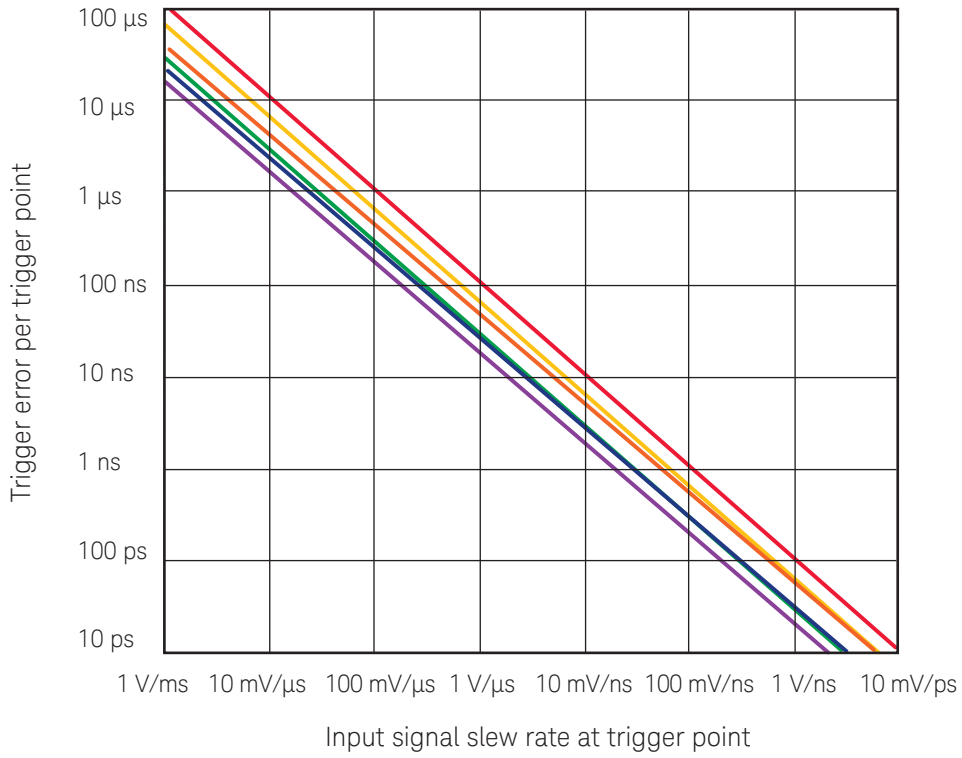
$$\text{Frequency error} + \left(\frac{\sqrt{2} \times \text{Trigger error}}{\text{Gate time}} \right) \times \text{Frequency or period}$$

Remarks:

Gate time:
- 1 ms
- 10 ms
- 100 ms
- 1 s
- 10 s

Graph 6:

Trigger level timing error (Level setting error and input hysteresis)



Remarks:

- 200 to 225 MHz rep. rate
- 100 to 200 MHz rep. rate
- Pulse and T.I. at 5 V trigger point
- DC to 100 MHz rep. rate
- Pulse and T.I. at 2.5 V trigger point
- Pulse and T.I. at 0 V trigger point

Measurement Statistics

	Description
Available statistics	Mean, Minimum, Maximum, Standard Deviation
Number of measurements 2 to 1,000,000	Statistics may be collected on all measurements or on only those which are between the limit bands. When the limits function is used in conjunction with statistics, N (number of measurements) refers to the number of in-limit measurements. In general, measurement resolution will improve in proportion to N, up to the numerical processing limits of the instrument.
Measurements	Statistics may be collected for all measurements except peak volts and totalize.

General Information

	Description	
Save and recall	Up to 20 complete instrument setups may be saved and recalled later. These setups are retained when power is removed from the counter.	
Rack dimensions (HxWxD)	88.5 mm x 212.6 mm x 348.3 mm	
Weight	3.5 kg maximum	
Power supply	100 to 120 VAC ± 10% I 50, 60 or 400 Hz ± 10% 200 to 240 VAC ± 10% I 50 or 60 Hz ± 10%	
AC line selection	Automatic	
Power requirements	170 VA maximum (30 W typical)	
Environment	Storage temperature Operating environment Operating temperature Operating humidity Operating altitude	–40 °C to 71 °C Pollution degree 2; indoor locations 0 °C to 55 °C Up to 80% at 40 °C Up to 3000 m or 10,000 ft.
Remote interface	GPIB (IEEE 488.1-1987 IEEE 488.2-1987)	
Remote programming language	SCPI-1992.0 (Standard Commands for Programmable Instruments)	
Safety	Designed in compliance with IEC-1010, UL-3111-1 (draft), CAN/CSA 1010.1 Installation Category II	
EMC	CISPR-11, EN50082-1, IEC 80-2, -3, -4	
Radiated immunity testing	When the product is operated at maximum sensitivity (20 mVrms) and tested at 3 V/m according to IEC 801-3, external 100 to 200 MHz electric fields may cause frequency miscounts.	

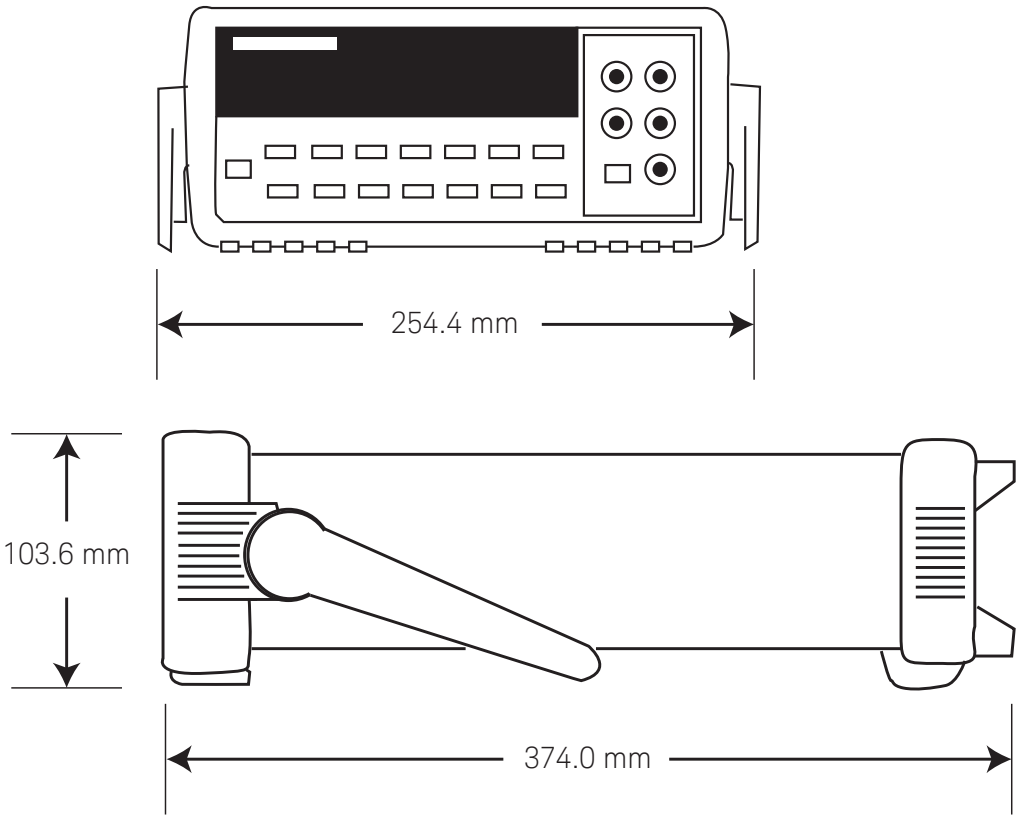
Ordering Information

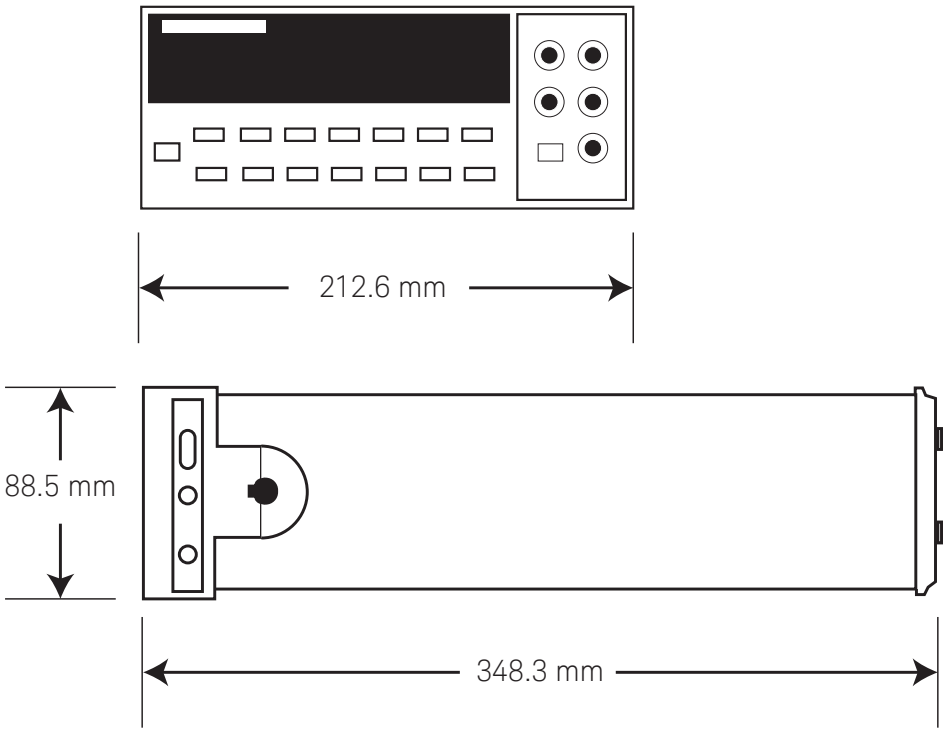
Model number	Description
53131A	10 digit/s, 500 ps universal counter
53132A	12 digit/s, 150 ps universal counter
53181A	10-digit/s RF counter
Accessories included	
Each counter comes with IntuiLink software, standard timebase, and power cord. CD with the following: IntuiLink software, Operating, Programming, Service and Getting Started Guides, a data sheet, and application notes.	
Manual options (Please specify one when ordering)	
ABA	US English
ABD	German
ABE	Spanish
ABF	French
ABJ	Japanese
ABZ	Italian
ABO	Taiwan Chinese
AB1	Korean
AB2	Chinese
Other options	
Option 001	Medium-stability timebase
Option 010	High-stability timebase
Option 012	Ultra-high stability timebase (53132A only)
Option 015	1.5 GHz RF input Ch 2 for 53181A only
Option 030	3 GHz RF input Ch 3 (Ch 2 on 53181A)
Option 050	5 GHz RF input with type N connector Ch 3 (Ch 2 on 53181A)
Option 124	12.4 GHz RF input with type N connector Ch 3 (Ch 2 on 53181A)
Option 060	Rear-panel connectors [1]
Option A6J	ANSI Z540 compliant calibration

53131A/132A [1]	
Ch1 and Ch2	Front and rear (in parallel)
Ch3	Option 030 rear only, front plugged
Ch3	Option 050/124 front only
Ch2	Option 050/124 front only
53181A [1]	
Ch1	Front and rear (in parallel)
Ch2	Option 015/030 rear only, front plugged
Ch2	Option 050/124 front only

Accessories	
34131A	Hard carrying case
34161A	Accessory pouch
34190A	Rackmount kit: Designed for use with only one instrument, mounted on either the left or the right side of the rack.
34191A	2U dual flange kit: Secures the instrument to the front of the rack. This kit can be used with the 34194A dual lock link kit to mount two half-width, 2U height instruments side-by side.
34194A	Dual lock link kit: Recommended for side-by-side combinations and includes links for instruments of different depths. This kit can be used with the 34191A 2U dual flange kit to mount two half-width, 2U height instruments side-by-side.

1. Option 060 configuration.


254.4 mm
103.6 mm
374.0 mm


212.6 mm
88.5 mm
348.3 mm

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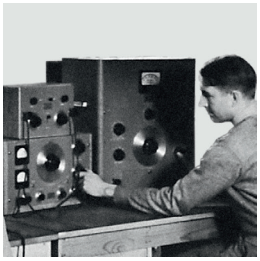
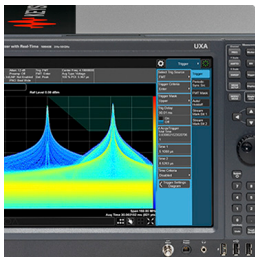


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