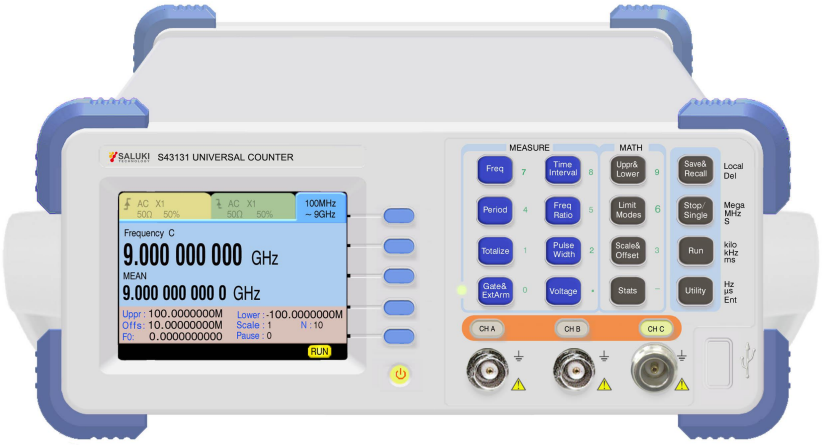
S43131 Series Universal Counter

Datasheet



Saluki Technology Inc.

The document applies to the universal counter of the following models:

- S43131A universal counter (channel A,B: DC-225MHz)
- S43131B universal counter (channel A,B: DC-225MHz, channel C: 100MHz-500MHz)
- S43131C universal counter (channel A,B: DC-225MHz, channel C: 100MHz-1.5GHz)
- S43131D universal counter (channel A,B: DC-225MHz, channel C: 100MHz-2.5GHz)
- S43131E universal counter (channel A,B: DC-225MHz, channel C: 100MHz-3GHz)
- S43131F universal counter (channel A,B: DC-225MHz, channel C: 100MHz-6GHz)
- S43131G universal counter (channel A,B: DC-225MHz, channel C: 100MHz-9GHz)

Standard Package of the S43131 series universal counter:

No.	Item	Qty.
1	Universal Counter	1
2	Test Cable (BNC male)	2
3	RS232 Cable	1
4	Power Cord	1
5	Fuse Tube BGXP-1-18-1A	2

Options of the S43131 series universal counter:

Model No.	Item
S43131-01	High-stability and Constant- temperature Crystal Oscillator 5×10^{-10}/day
S43131-02	High-stability and Constant- temperature Crystal Oscillator 3×10^{-10}/day
S43131-03	IEEE488 General Interface
S43131-04	USB general serial interface
S43131-05	LAN interface
S43131-06	Centronics standard printer interface
S43131-07	Test Cable (Type N)

Preface

Thank you for choosing S43131 series universal counter produced by Saluki Technology Inc.

We devote ourselves to meeting your demands, providing you high-quality measuring instrument and the best after-sales service. We persist with “superior quality and considerate service”, and are committed to offering satisfactory products and service for our clients.

Document No.

S43131-02-01

Version

Rev01 2022.05

Saluki Technology

Document Authorization

Product Quality Assurance

The warranty period of the product is three years from the date of delivery. The instrument manufacturer will repair or replace damaged parts according to the actual situation within the warranty period.

Product Quality Certificate

The product meets the indicator requirements of the document at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

Quality/Settings Management

Research, development, manufacturing and testing of the product comply with the requirements of the quality and environmental management system.

Contacts

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Content

1. Overview

S43131 series universal counter is the high-precision frequency and time measuring instrument developed by Saluki Technology. It adopts the high-performance single chip microcomputer as the core to conduct function control, survey time sequence control, data processing and result display. Adopt the countdown counting technique and digital interpolation technique to realize high-precision measurement within the whole range. In addition to frequency, cycle, time interval, pulse width, duty ratio, phase position, counting and other survey functions, it also has multi-time average, maximum value, minimum value, standard deviation, Allan variance, maximum deviation (maximum value deducted by the minimum value), single deviation (reduced by the preset value) and PPM survey and calculation functions. The instrument has the external trigger / external gate function, and can rising edge trigger measurement (during time measurement) and positive gate measurement frequency (during frequency measurement).

S43131 series universal counter has stable performance, complete function, wide measurement range, high sensitivity, large dynamic range, high precision, small volume and convenient and reliable use. It has wide application in industrial production, scientific research and measurement and other fields, and is the ideal upgraded and renewed product of the traditional electronic counter.

2. Main Characteristics

- Adopt the frequency test resolution is 10 digits/s, and the time test resolution is 100ps
- Channel A and B frequency can be up to 225MHz
- Channel C frequency survey can be up to 9GHz at most
- Can measure the single time interval and single pulse width
- Measure: Frequency, Frequency ratio, Time interval, Period, Positive/negative pulse width, Rise/Fall time, Duty cycle, Phase angle (channel A to channel B), Totalize, Peak volts.
- Analysis: Limit testing, Mathematics operations, Statistics (max, min, average, PPM, standard deviations, allan variance etc.)
- There are fixed gate counting function and manual operation counting function for counting measurement.
- The counter can store 9 measurement states.
- Advanced design, compact and reliability, MTBF greater than 8000h
- Standard RS232 universal serial bus, and optional USB DEVICE interface, IEEE488 (GPIB) universal program control interface, Centronics standard printer interface.
- QVGA color LCD is adopted for the instrument with artistic modeling; small volume and comfortable operation.

3. Technical Specifications

3. 1. Input Characteristics

Channel A and B:

Frequency range	DC coupling: DC-225MHz AC coupling: 1MHz-225MHz (50Ω), 30Hz-225MHz (1MΩ)
Dynamic range	30mVrms - 1.5Vrms sine wave 100mVp-p - 4.5Vp-p pulse wave
Input impedance	1MΩ‖45pF or 50Ω
Coupling mode	AC or DC
Trigger mode	Rising edge or falling edge
Input attenuation	×1 or ×10
Low-pass filter	Cutoff frequency about 100kHz
Trigger level	-5V to +5V any setting
Crosstalk interference	Not less than 500mVrms

Channel A and B can adapt to the input signal with modulation degree ≤30%, and the enveloping valley value shall satisfy the input sensitivity.

In order to prevent high-frequency components in the low frequency signal measured, the low-pass filter shall be opened for during low frequency measurement below 100kHz. When low frequency measurement below 100Hz is conducted, the trigger level shall be set manually.

Channel BU:

Model	S43131G
Frequency range	100MHz-1.5GHz
Dynamic range	30mVrms - 1.5Vrms sine wave
Input impedance	50Ω
Coupling mode	AC

Channel C:

Model	S43131B/C/D/E
Frequency range	S43131B: 100MHz-500MHz, S43131C: 100MHz-1.5GHz, S43131D: 100MHz-2.5GHz, S43131E: 100MHz-3GHz
Dynamic range	30mVrms - 1.5Vrms sine wave
Input impedance	50Ω
Coupling mode	AC

Model	S43131F
Frequency range	100MHz-6GHz
Power range and sensitivity	100MHz-500MHz: -15dBm to +13dBm, 500MHz-6GHz: -25dBm to +13dBm

Damage level	+20dBm
Input impedance	50Ω
Coupling mode	AC

Model	S43131G
Frequency range	100MHz-9GHz
Power range and sensitivity	1.5GHz-2GHz: -25dBm to +7dBm, 2GHz-6GHz: -25dBm to +13dBm 6GHz-9GHz: -20dBm to +13dBm
Damage level	+25dBm
Input impedance	50Ω
Coupling mode	AC
Standing wave ratio	< 2.5:1

External trigger input:

Signal input range	TTL level
Pulse width	> 50ns

Note: *The input signal shall not exceed the damage level of the channel. Otherwise, the input signal will be damaged, leading to instrument damage!*

3. 2. Time Base

Internal crystal oscillator	Nominal frequency	10MHz
	Daily aging rate	1×10^{-9}/ day, 1×10^{-7}/ year (Standard) 5×10^{-10}/day, 5×10^{-8}/year (Option) 3×10^{-10}/ day, 3×10^{-8}/year (Option)
Time-based input	Frequency	5MHz or 10MHz
	Amplitude	≥ 0.3Vrms
Time-based output	Frequency	10MHz
	Amplitude	≥ 1Vp-p (50Ω)

3. 3. Measurement Indicator

Frequency measurement:

Channel A scope	0.001Hz - 225MHz
Channel B scope	0.001Hz - 225MHz
Channel BU scope	100MHz - 1.5GMHz (S43131G)
Channel C scope	S43131B: 100MHz - 500MHz, S43131C: 100MHz - 1.5GHz, S43131D: 100MHz - 2.5GHz, S43131E: 100MHz - 3GHz, S43131F: 100MHz - 6GHz, S43131G: 100MHz - 9GHz
Display least significant digit LSD	(100ps × measured signal frequency) / gate time
Gate time	1ms-500s optional
Measurement error	± (100ps / gate time + time-based error + trigger error) × measured signal frequency

Note: *when the signal-noise ratio of the measured signal is 40dB, trigger error* $= \frac{0.3\% \times Period}{GateTime}$

Periodic measurement:

Channel A scope	4.44ns - 1000s
Channel B scope	4.44ns - 1000s
Channel BU scope	0.7ns - 10ns (S43131G)
Channel C scope	S43131B: 2ns - 10ns, S43131C: 0.7ns - 10ns, S43131D: 0.4ns - 10ns, S43131E: 0.3ns - 10ns, S43131F: 0.167ns - 10ns, S43131G: 0.11ns - 0.66ns
Display least significant digit LSD	(100ps × measured signal frequency) / gate time
Gate time	1ms-500s optional
Measurement error	± (100ps / gate time + time-based error + trigger error) × measured signal frequency

Note: *when the signal-noise ratio of the measured signal is 40dB, trigger error* $= \frac{0.3\% \times Period}{GateTime}$

Time interval measurement:

The measured signal is input from Channel A, B (COMMON: OFF) or Channel A (COMMON: ON).

Measurement range	-1ns to 1000s
Display least significant	100ps

digit LSD	
Trigger signal	Internal automatic trigger or external trigger
Measurement error	±(100ps + time-based error × time interval + trigger error + system error)
System error	±1ns

Frequency ratio measurement:

Display least significant digit LSD	Channel A / Channel B:	$\frac{1}{CHBfreq \times GateTime}$
	Channel A / Channel BU:	$\frac{1}{CHBUfreq \times GateTime}$
	Channel A / Channel C:	$\frac{1}{CHCfreq \times GateTime}$
	Channel B / Channel A:	$\frac{CHBfreq}{(CHAfreq)^2 \times GateTime}$
	Channel BU / Channel A:	$\frac{CHBUfreq}{(CHAfreq)^2 \times GateTime}$
	Channel C / Channel A:	$\frac{CHCfreq}{(CHAfreq)^2 \times GateTime}$

Pulse width measurement:

Channel A input, divided into positive pulse width measurement and negative pulse width measurement.

Measurement range	5ns to 1000s
Display least significant digit LSD	100ps
Trigger signal	Internal automatic trigger or external trigger
Measurement error	±(100ps + time-based error × time interval + trigger error + system error)
System error	±1ns

Rising edge / falling edge measurement:

Measurement range	5ns to 1000s
Measurement error	±(100ps + time-based error × time interval + trigger error + system error)

Phase measurement:

Input signal frequency range	<100MHz
Input signal amplitude	≥2Vp-p
Measurement range	0º - 360º

Display least significant digit LSD	0.1°
Measurement error	< ±(trigger error + 1.5ns × frequency × 360 + 0.001) degree

Duty ratio measurement:

Measurement range	0-99.9% (pulse width ≥5ns, cycle <1000s)
Display least significant digit LSD	$t_{res} \times freq \times \sqrt{1+(DutyCycle/100)^2} \times 100$ (where t_{res}=100ps, freq=measured signal frequency)
Measurement error	±0.01% ±RMS ±(trigger level error ± time-based error × time interval ±1.5ns) × measured signal frequency ×100%

Counting measurement:

Measurement range	0 - 1×10^{15}
Resolution	±1 counting

Peak voltage measurement:

DC voltage of Channel A and Channel B input channel can be measured. In case of AC signal, the peak voltage with frequency between 100Hz and 30MHz and signal >100mV can be measured. The signal peak voltage measurement with frequency >30MHz is only for reference (automatic trigger actually refers to that the instrument automatically set trigger level according to the measured signal amplitude. When the automatic level setting is used, one shall pay attention to that the use range shall not exceed the peak voltage measurement range).

Measurement range	-5V to +5V
Resolution	10mV
Measurement error	25mV + 10% of the peak voltage (×1 attenuation) 250mV + 10% of the peak voltage (×10 attenuation)

3. 4. Measurement Calculation

Limit calculation:

Limit detection	Conduct after measurement
Display mode	if the measurement results are beyond the upper and lower limits, display "Over the limit" in the measurement state display area.

Mathematical operation:

Mathematical operation	Conduct after measurement
Display mode	Display significant digits unchanged

Statistics operation:

Statistics function	Multi-time average, maximum value, minimum value, maximum deviation, single absolute deviation, single relative deviation (PPM), standard deviation, Allan variance
Display mode	Multi-time average, standard deviation, least significant digit of Allan variance = unit / N Single relative deviation (PPM) least significant digit = unit ×, unit is PPM The least significant digits of other functions are unchanged
Sampling frequency	2-2000

3. 5. Other Characteristics

Save and recall functions	The instrument can store 9 measurement states at most for call.
Centronics standard printer interface	Centronics standard printer interface can be directly connected with the printer. Turn on the printing switch to print the measured data.
Remote control interface	RS232 universal serial interface, IEEE488(GPIB) universal serial interface (optional) and USB DEVICE universal serial interface (optional).
Power Supply	Voltage: AC 220V±22V, Frequency: 50Hz±3Hz, Power dissipation: 35VA
Dimension	240mm×380mm×105mm (W×D×H)
Weight	About 2.5kg

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