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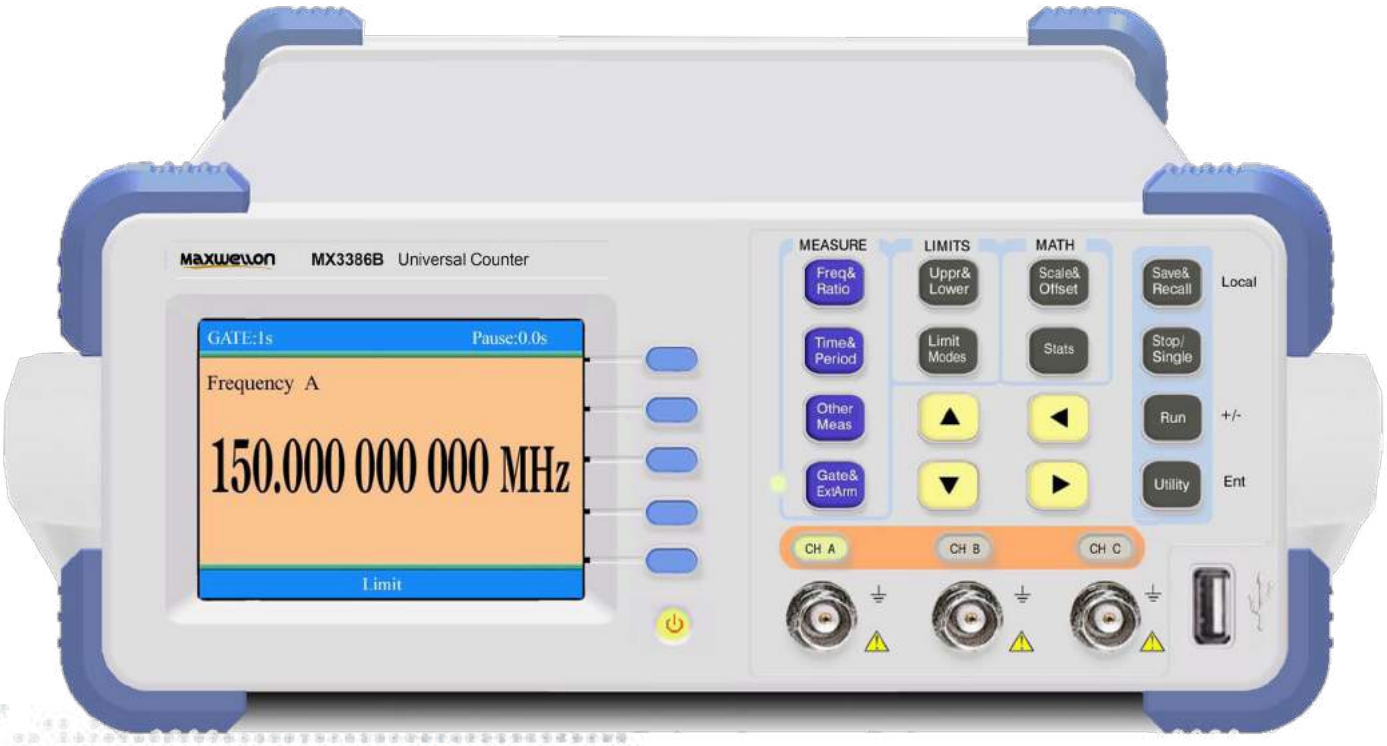

MAXWELLON MX3386B

0.14mHz~150MHz/1.5GHz/2.5GHz/3GHz/6GHz/9GHz

High Accurate Universal Counter

2023

Maxwellon

MX3386B series high-precision universal counter is a newly developed instrument by Maxwellon for accurate frequency and time measurements. Powered by a high-performance AVR microcontroller, it manages function control, measurement timing, data processing, and result display. Employing reciprocal counting technology, it achieves consistent precision across the entire measurement range.

In addition to fundamental measurements such as frequency, period, time interval, pulse width, duty cycle, phase, and count, it also features advanced measurement operations like multiple averages, maximum value, minimum value, standard deviation, Allan variance, maximum deviation (difference between maximum and minimum values), single-event deviation (difference from a preset value), and PPM calculations.

The instrument includes external trigger and external gate functions, allowing measurement triggering on rising edges (for time measurements) and frequency measurements within a positive gate (for frequency measurements). The internal clock frequency of the MX3386B series universal counter is set at 150MHz.

With stable performance, comprehensive functionality, wide measurement range, high sensitivity, large dynamic range, and high precision, this instrument is compact, user-friendly, and reliable. It finds extensive applications in industrial production, scientific research, and metrology, making it an ideal replacement for traditional electronic counters.

Key Feature

- The MX3386B series operates with a 150MHz clock frequency, providing frequency resolution of 9 digits/s and time resolution of 7 ns.
- Channel A of the MX3386B series can measure frequencies up to 150MHz.
- Utilizing high-performance AVR microcontrollers, large-scale integrated circuits, and CPLD devices, the instrument ensures high reliability.
- Channel C frequency measurement can reach a maximum of 9GHz.
- Capable of measuring single-time intervals and single pulse widths.
- Features limit operation functionality.
- Includes mathematical operation capabilities.
- Offers statistical operations such as multiple averages, maximum value, minimum value, maximum deviation, single absolute deviation, single relative deviation (PPM), standard deviation, and Allan variance.
- Counting measurements include fixed gate counting and manual counting functionality.
- The counter automatically stores current parameters, preventing data loss upon shutdown.
- The counter can store up to 9 measurement states.
- Standard configurations include RS232C universal serial interface and Centronics standard printer interface.
- Optional USB DEVICE interface is available.
- Optional IEEE488 universal programmable interface.
- The instrument features a QVGA color LCD display for an aesthetically pleasing design, compact size, and comfortable operation.

Instrument Input Characteristics	
Channels A and B	
Frequency Range	0.14mHz to 150MHz
Dynamic Range	30mVrms to 1.5Vrms for sine waves (0.14mHz to 100MHz)
	50mVrms to 1Vrms for sine waves (100MHz to 150MHz)
	100mVp-p to 4.5Vp-p for pulse waves (0.14mHz to 100MHz)
	150mVp-p to 2Vp-p for pulse waves (100MHz to 150MHz)
Input Impedance	1MΩ // 45pF or 50Ω
Coupling Modes	AC or DC (DC coupling below 1kHz)
Trigger Modes	Rising or falling edge
Input Attenuation	×1 or ×10
Low Pass Filter	Cutoff frequency approximately 100kHz
Trigger Level	-2.50V to +2.50V, user-defined
Channel A, B Crosstalk	Not less than 500mVrms
Damage Level	3Vrms
Both channels A and B can adapt to input signals with a modulation level of ≤ 30%, and their envelope valleys should meet the input sensitivity. To prevent the low-frequency signal being measured from containing high-frequency components, it is necessary to turn on the low-pass filter when conducting low-frequency measurements below 100kHz. When conducting low-frequency measurements below 100Hz, the trigger level needs to be manually set. When the frequency of the input signal to Channel A or B is greater than 100MHz, and the RMS amplitude is greater than 500mV, set the input impedance to 50Ω (low impedance).	
Channel C (Options I-IV)	
Frequency Range	Option I: 100MHz to 500MHz
	Option II: 100MHz to 1.5GHz
	Option III: 100MHz to 2.5GHz
	Option IV: 100MHz to 3GHz
Dynamic Range	Sin: 30mVrms to 1.5Vrms
Input Impedance	50Ω
Coupling Mode	AC
Channel BU (Option VI)	
Frequency Range	100MHz to 1.5GHz
Dynamic Range	Sin: 30mVrms to 1.5Vrms
Input Impedance	50Ω
Coupling Mode	AC
Channel C (Options V-VI)	
Option V	
Frequency Range	100MHz to 6GHz
Power Range and Sensitivity	-15dBm to +13dBm (100MHz to 500MHz)
	-25dBm to +13dBm (500MHz to 6GHz)
Damage Level	+20dBm
Input Impedance	50Ω
Coupling Mode	AC
Option VI	
Frequency Range	1.5GHz to 9GHz
Power Range and Sensitivity	-25dBm to +7dBm (1.5GHz to 2GHz)
	-25dBm to +13dBm (2GHz to 6GHz)
	-20dBm to +13dBm (6GHz to 9GHz)
Damage Level	+25dBm
Input Impedance	50Ω
Coupling Mode	AC
VSWR	<2.5:1

Instrument Input Characteristics	
External Trigger Input	
Signal Input Range	TTL Level
Pulse Width	>50ns
External Gate Signal	Positive pulse (used for frequency and period measurements)
External Trigger Signal	Rising edge (used for time measurements)
Attention: The input signal must not exceed the damaged level of the channel, otherwise it will cause damage to the input channel and cause instrument malfunction!	
Timebase	
Internal Crystal Oscillator	
Nominal Frequency	5MHz
Aging Rate	Standard: 1×10^{-8} / day
	Option VII: 5×10^{-9} / day (Option VII)
	Option VIII: 3×10^{-9} / day (Option VIII)
Accuracy	$\pm1\times10^{-7}$
Timebase Input	
Frequency	10MHz
Amplitude	≥0.3Vrms
Timebase Output	
Frequency	10MHz
Amplitude	≥1Vp-p (50Ω)
Measurement Specifications	
Frequency Measurement	
Channel A Range	0.14mHz to 150MHz
Channel BU Range (Option VI)	100MHz to 1.5GHz
Channel C Ranges	Option I: 100MHz to 500MHz
	Option II: 100MHz to 1.5GHz
	Option III: 100MHz to 2.5GHz
	Option IV: 100MHz to 3GHz
	Option V: 100MHz to 6GHz
	Option VI: 1.5GHz to 9GHz
Display Least Significant Digit (LSD)	(t_{es}×Frequency of the measured signal)/Gate Time; $t_{es}= 7\times10^{-9}$ s
Gate Time	10μs,100μs,1ms,10ms,100ms,300ms,1s,10s,100s, 1000s,External gate optional
Measurement Error	±(LSD/Frequency of the measured signal +Timebase Error+Trigger Error) Note: When the signal-to-noise ratio of the measured signal is 40dB, the triggering error is (0.3% × Tested signal period) / gate time
Period Measurement	
Channel A Range	7ns to 7000s
Channel BU Range (Option VI)	0.7ns to 10ns
Channel C Ranges	Option I: 2ns to 10ns
	Option II: 0.7ns to 10ns
	Option III: 0.4ns to 10ns
	Option IV: 0.3ns to 10ns
	Option V: 0.167ns to 10ns
	Option VI: 0.11ns to 0.66ns
Display Least Significant Digit (LSD)	(t_{es}×Frequency of the measured signal)/Gate Time; $t_{es}= 7\times10^{-9}$ s
Gate Time	10μs,100μs,1ms,10ms,100ms,300ms,1s,10s,100s, 1000s,External gate optional
Measurement Error	±(LSD/Frequency of the measured signal +Timebase Error+Trigger Error) Note: When the signal-to-noise ratio of the measured signal is 40dB, the triggering error is (0.3% × Tested signal period) / gate time

Measurement Specifications

Time Interval Measurement

The measured signal is input from channels A and B (COMMON: OFF) or channel A (COMMON: ON).

Measurement Range	20ns to 7000s
Display LSD	7ns
Trigger Signal	Internal automatic trigger or external trigger
Measurement Error	±(LSD)±Trigger Error±(Time Base Error×Time Interval)
System Error	±7ns

Frequency Ratio Measurement

(When performing frequency ratio measurements on channels A and B of the MX3386B, both input frequencies for the two channels should not exceed 100MHz.)

Display LSD	Channel A/Channel B: 1/(Channel B frequency × gate time)
	Channel A/Channel BU: 1/(Channel BU frequency × gate time)
	Channel A/Channel C: 1/(Channel C frequency × gate time)
	Channel B/Channel A: Channel B/((Channel A frequency)^2 × gate time)
	Channel BU/Channel A: Channel BU/((Channel A frequency)^2 × gate time)
	Channel C/Channel A: Channel C/((Channel A frequency)^2 × gate time)

Pulse Width Measurement

Measurement Range	20ns to 100s
Display LSD	7ns
Trigger Signal	Internal automatic trigger or external trigger
Measurement Error	±(LSD)±Trigger Error±(Time Base Error×Time Interval)
System Error	±7ns

Phase Measurement

(The measured signal is input from channels A and B (COMMON A: OFF). The input impedance of channels A and B should be set to 1M Ω. To prevent the low-frequency signal being measured from containing high-frequency components, the 100kHz low-pass filter should be turned on, and the trigger level should be set at the center of the signal level.)

Input Signal Frequency Range	1Hz to 10kHz
Input Signal Amplitude	≥2Vp-p
Measurement Range	0º to 359º
Display LSD	0.1º
Measurement Error	±3º ± Error caused by signal noise

Duty Cycle Measurement(Channel A input.)

Measurement Range	0% to 99.9%(Pulse width ≥ 5ns, cycle<1000s)
Measurement Error	±0.01%±RMS±(Trigger Level Error±Timebase Error×Time Interval±1.5ns)×Frequency×100%

Count Measurement

Measurement Range	0 to 1×10^{12}
Resolution	±1 count

Measurement Operations

Limit Operations

Limit Check	Conducted after the measurement is completed
Display Method	If the measurement result falls outside the upper and lower limits, it will be displayed in the special status display area as "Limit."

Mathematical Operations

Mathematical Operations	Performed after the measurement is completed.
Display	The number of significant figures remains unchanged.

Statistical Operations

Statistical Functions	multiple averages, maximum value, minimum value, maximum deviation, single absolute deviation, single relative deviation (PPM), standard deviation, Allan variance.
Display	Multiple means, standard deviation, allen variance, least significant bit=single/N Single Relative Deviation (PPM) Least Significant Bit=Single × 10^6/F_{sv} in PPM The least significant bit of other functions remains unchanged
Number of Samples	2 to 2000

Others	
Storage and Recall Functionality	
The instrument can store up to 9 measurement states for convenient recall.	
Centronics Standard Printer Interface	
The Centronics standard printer interface allows direct connection to a printer. Simply activate the print switch to print the measurement data.	
Remote Control Interfaces	
RS232 Universal Serial Interface	
IEEE488 (GPIB) Universal Interface (optional)	
USB DEVICE Universal Serial Interface (optional)	
Power Supply	
Voltage	AC 220V ± 22V
Frequency	50Hz ± 3Hz
Power Consumption	35W
Dimensions	
240mm × 380mm × 105mm (Width × Depth × Height)	
Power Supply	
Approximately 2kg	

Ordering Information

Standard

No.	Name	Qty.
1	Testing Cables (BNC Q9-J5)	2 pc
2	RS232 Cable	1 pc
3	Power Cord	1 pc
4	Fuse Tube (BGXP-1-18-1A)	2 pc
5	Product User Manual	1 pc
6	Product Certificate of Conformity	1 pc
7	Product Warranty Certificate and User Profile Card	1 pc

Option

No.	Name	Qty.
Input Channels	Option I: 500MHz input channel	1 set
	Option II: 1.5GHz input channel	1 set
	Option III: 2.5GHz input channel	1 set
	Option IV: 3GHz input channel	1 set
	Option V: 6GHz input channel	1 set
	Option VI: 9GHz input channel	1 set
Crystal Oscillators	Option VII: 5×10^{-9}/day Crystal Oscillator	1 unit
	Option VIII: 3×10^{-9}/day Crystal Oscillator	1 unit
Interfaces	Option IX: IEEE488 Universal Interface	1 set
	Option X: USB DEVICE Universal Interface	1 set
Testing Cable	N-type Testing Cable (Option V or VI)	1 pc

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