

WE7141

100 MHz Universal Counter Module

Overview

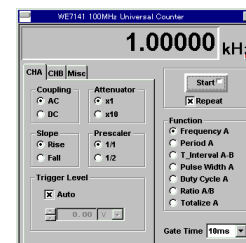
The WE7141 is a universal counter module with a limited range of basic functions. Its flash memory contains setup information required for module operations, such as ranges and gate times. The setup information is transferred to the PC when the module is connected.

Features

- Measurement of frequencies from 1 Hz to 120 MHz
- Wide variety of measurement functions (time interval, pulse width, duty factor, totalization, etc.)
- D/A output function
- Auto-trigger function

Input Section Specifications

- Number of input channels: 2 (A, B)
- Input format: Non-isolated unbalanced
- Connector type: BNC
- Input impedance: 1 MΩ, 40 pF (Typical value (see Note 1))
- Input coupling: DC, AC
- Low frequency: -3 dB point during AC coupling: 35 Hz (Typical value (see Note 1))
- Attenuator: ×1, ×10
- Trigger level
 - When the attenuator is set to ×1: -5 V to +5 V (resolution: 20 mV)
 - When the attenuator is set to ×10: -40 V to +40 V (resolution: 200 mV)
- Setting accuracy (see Note 2): ±10% ±30 mV of the set value (When the attenuator is set to ×1)
- Trigger slope: Rise, Fall
- Auto trigger: Automatically set to the center value of the input amplitude
 - Operation frequency range: Sine wave 50 Hz to 120 MHz (sensitivity: 250 mVrms)
 - Operation voltage range: ±5 V (When the attenuator is set to ×1)
- Input sensitivity (see Note 2)
 - 50 mVrms: DC < input frequency ≤ 60 MHz
 - 100 mVrms: 60MHz < input frequency ≤ 120 MHz
- Maximum input voltage
 - 40 V (DC + ACpeak): DC ≤ input frequency < 4 MHz
 - $(\frac{140}{f} + 5) [V (DC + ACpeak)]$
 - $f [MHz]$
 - 4 MHz ≤ input frequency < 120 MHz (Overvoltage Category: CAT I and II)
- Channel B gate
 - Gate signal used during frequency A and totalize count measurements
 - Input range: Gate setting pulse width is 100 ns to 100 s (The number of input cycles of channel A within the gate time does not exceed 2³² counts.)



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Gate time of channel B > One period of the input signal of channel A

- Minimum input pulse width (see Note 2): 10 ns (except when using 1/2 prescaler)

Note 1: Typical value represents a typical or average value. It is not strictly guaranteed.

Note 2: Value or allowed value obtained during standard operating conditions.

Specifications for Individual Measurement Functions

Frequency A

- Measurement range: 1 Hz to 120 MHz (when using 1/2 prescaler), 1 mHz to 60 MHz
- Gate time (see Note 1)
 - When using prescaler: 10 ms, 100 ms, 1 s, 10 s
 - When not using prescaler: 10 ms, 100 ms, 1 s, 10 s, CH B gate (channel B pulse width)
- Resolution:

$$\frac{\pm 10 \text{ ns} \pm \sqrt{2} \times \text{Trigger error (see Note 3)}}{\text{Gate time}} \times \text{Measurement frequency (Hz)}$$
- Accuracy (see Note 2): Resolution ±(Time base aging × measurement frequency)[Hz]

Period A

- Measurement range: 20 ns to 999.999999 s
- Multiplier: 1, 10, 100, 1000
- Resolution

$$\frac{\pm 10 \text{ ns} \pm \sqrt{2} \times \text{Trigger error (see Note 3)}}{\sqrt{10^N}} \text{ (s)}$$

(10^N denotes the multiplier (N = 0, 1, 2, 3).)
- Accuracy (see Note 2): Resolution ±(time-base aging × measurement period) (seconds)

Time Interval A → B

- Measurement range: 60 ns to 999.999999 s
- Input frequency range: 1 mHz to 50 MHz (for input channels A and B)

- Multiplier: 1, 10, 100, 1000
- Measurement suspension time: 200 ns (when multiplier = 10, 100, 1000)
- Resolution:

$$\frac{\pm 10 \text{ ns } \pm \text{Channel A input trigger error} \pm \text{Channel B input trigger error}}{\sqrt{10^N}} \quad (\text{s})$$

(10^N denotes the multiplier ($N = 0, 1, 2, 3$)).

- Accuracy (see Note 2): Resolution \pm (Time base aging \times measurement time) \pm trigger level timing error (see Note 4) ± 10 ns error between channels (see Note 5)

Pulse Width A

- Measurement range: 20 ns to 999.999999 s
- Multiplier: 1, 10, 100, 1000
- Resolution:

$$\frac{\pm 10 \text{ ns } \pm \text{Rising edge trigger error} \pm \text{Falling edge trigger error}}{\sqrt{10^N}} \quad (\text{s})$$

(10^N denotes the multiplier ($N = 0, 1, 2, 3$)).

- Accuracy (see Note 2): Resolution \pm (Time base aging \times measurement time) \pm trigger level timing error (see Note 4)

Duty Cycle A

- Measurement range: 0.00000001 to 0.99999999
- Input range: 20 ns to 999.999999 s
- Multiplier: 1, 10, 100, 1000
- Displayed units: Value is displayed as a ratio (50% is displayed as 0.5)
- Resolution:

$$\pm \left(\frac{\text{Pulse width} + |\text{Pulse width resolution}|}{\text{Period} - |\text{Period resolution}|} - \text{measured duty value} \right)$$

- Accuracy (see Note 2):

$$\pm \left(\frac{\text{Pulse width} + |\text{Pulse width accuracy}|}{\text{Period} - |\text{Period accuracy}|} - \text{measured duty value} \right)$$

Frequency Ratio A/B

- Measurement range: 0.001 to 999999999 (When multiplier =1, 0 is displayed when frequency A < B)
- Input range: 1 mHz to 60 MHz
- Multiplier: 1, 10, 100, 1000
- Resolution:

$$\frac{\pm \text{Channel A input 1 count} \pm \sqrt{2} \times \text{Channel B input trigger error}}{10^N} \quad (\text{see Note 3})$$

(10^N denotes the multiplier ($N = 0, 1, 2, 3$)).

- Accuracy (see Note 2): Same as the resolution

Totalized Count A

- Input frequency range: 1 mHz to 50 MHz
- Counting capacity: 0 to 2^{52} (except 0 to 10^9 on the WE7000 Control Software)
- Counting error: ± 1 count during channel B gate measurement
- Counting control: Manual start or channel B gate (pulse width)

Continuous Measurement

- Sampling interval: 10 ms to 100000 s (see Note 6)
10 ms step
- Trigger output mode: Rise / Fall / In / Out

Note 1: When one period of the input frequency is greater than or equal to the set gate time, the gate time is the time over one period of the input signal.

Note 2: Value obtained under standard operating conditions. Values outside the measurement range are not guaranteed.

$$\text{Note 3: Trigger error} = \frac{\sqrt{X^2 + En^2}}{S.R} \quad [\text{S}]$$

X: Counter input section noise = 600[μ Vrms], En: Signal noise [Vrms] within the input amp bandwidth (120 MHz), SR: Slew rate of the input signal at the trigger level [V/s]

Note 4: Trigger level timing error

$$= \left(\frac{20\text{mV}}{S.R (START)} - \frac{20\text{mV}}{S.R (STOP)} \right)$$

$$\pm \left(\frac{\text{Trigger level setting accuracy}}{S.R (START)} \pm \frac{\text{Trigger level setting accuracy}}{S.R (STOP)} \right) [\text{S}]$$

SR(START): Slew rate of the input signal of channel A at the trigger level [V/s](Time interval measurement)

Slew rate of the rising/falling slopes [V/s](pulse width measurement)

SR(STOP): Slew rate of the input signal of channel B at the trigger level [V/s](Time interval measurement)

Slew rate of the rising/falling slopes [V/s](pulse width measurement)

Note 5: 10 ns error between channels: Error due to the difference in the internal delay of channels A and B.

Note 6: When four or more WE7141 or WE7262 modules are put into operation for continuous measurement, the sampling interval of each module must be set to no shorter than 20 ms.

External Input/Output Specifications

D/A Output

- Output voltage range: 0 to +10 V (under high impedance load)
Linear conversion, full scale 15 bit D/A
- Range setting range: Set the maximum and minimum values of the range to perform D/A conversion
Setting range: 0 to 2^{52} (except 0 to 10^9 on the WE7000 Control Software)
- Maximum output current: ± 2 mA
- Output format: Non-isolated unbalanced
- Connector type: BNC

Reference Time Specifications

- Internal reference frequency: 10 MHz
- Frequency stability (see Note 1)
Aging rate: $\pm 1.5 \times 10^{-6}$ /yr
Temperature characteristics: $\pm 3 \times 10^{-6}$ (5°C to 40°C)
- Reference output
Connector type: BNC
Output coupling: AC
Output impedance: 50 Ω (Typical value (see Note 2))
Output frequency: 10 MHz (Typical value (see Note 2))
Output level: 1 Vp-p or more (under 50 Ω load)
- External reference input (see Note 1)
Connector type: BNC
Input coupling: AC
Input impedance: 1 k Ω or more
Input frequency range: 10 MH \pm 10 Hz
Input level: 1 Vp-p or more
Maximum input voltage: ± 10 V (Overvoltage Category: CAT I and II)

Note 1: Value or allowed value obtained during standard operating conditions.

Note 2: Typical value represents a typical or average value. It is not strictly guaranteed.

■ General Specifications

- Standard operating conditions
 Temperature: $23 \pm 2^{\circ}\text{C}$, humidity: $50 \pm 10\%$ RH,
 Power voltage/frequency error: within 1% of rating, after
 the warmup time has passed
- Warmup time: At least 30 minutes
- Operating conditions: Same as those of the measuring
 station
- Storage conditions
 Temperature: -20 to 60°C
 Humidity: 20 to 80% RH
- Power consumption: 6 VA (Typical value at 100 V/50 Hz
 (see Note))
- External dimensions: Approx. $33\{1.30\}$ (W) \times $243\{9.57\}$
 (H) \times $232\{9.13\}$ (D) mm{inch} (projections excluded)
- Weight: Approx. $0.7\{1.54\}$ kg{lb}
- Number of used slots: 1
- Standard accessory: User's Manual (1)
- Optional accessories
 700976 50 Ω terminator
 366921 Adapter (BNC plug - banana terminal jack)
 366923 Connection adapter (T-shaped BNC)
 366924 BNC cable (1 m (3.28 ft))
 366925 BNC cable (2 m (6.56 ft))
 366926 BNC alligator clip cable (1 m (3.28 ft))

Note: Typical value represents a typical or average value. It is not strictly guaranteed.

AVAILABLE MODEL

Model	Description
707141/HE	100 MHz Universal Counter Module

■ Dimensions

Unit: mm (inch)

