

CNT-85 & CNT-85R

Frequency Counter/Calibrators

**NOW with
8 GHz option!**



Ultimate frequency counting

- High resolution: 10 digits in 1s
- Low uncertainty: 0.0001 ppm (Rb)
- Short warm-up time: 10 min. to 4×10^{-10}
- Wide frequency range to 8 GHz
- Smartest input trigger system
- Measures any type of input signal, incl. bursts, AM, FM and noisy signals
- Displays also input signal strength
- Excellent EMC-immunity
- Easy to use
- Ideal for on-site frequency calibration of the master clock in GSM base stations

With the CNT-85 and CNT-85R frequency counters and calibrators, Pendulum offers the ultimate tools for stationary as well as portable calibration of frequency, from DC to over 8 GHz. These counters are designed for on-site calibration of the master clock in GSM base stations, offering a TUR of >50 over a 10 year period. They also fit on the R&D bench, in the calibration lab or in manufacturing test systems where fast and accurate frequency measurements are needed. Choose between the economy model CNT-85 and the ultimate CNT-85R including a built-in Rubidium time-base reference.

Selection chart	CNT-85	CNT-85R	Selection chart	CNT-85	CNT-85R
Frequency, Frequency burst, PRF	✓	✓	Frequency deviation after 10 min. warm-up	5×10^{-9}	4×10^{-10}
Period, Pulse width, Duty cycle, Totalize	✓	✓	Option 80	Option 80	Option 80
Frequency range (standard)	300 MHz	300 MHz	Signal strength indicator (bar graph)	✓	✓
Frequency resolution (1s gate time)	10 digits	10 digits	Nulling of display value	✓	✓
Pulse width resolution	250 ps	250 ps	Display digit blanking	✓	✓
Arming delay by time and events	✓	✓	3 GHz HF-input	Option 10	Option 10
Best timebase stability/month	3×10^{-9}	5×10^{-11}	8 GHz HF-input	Option 13	Option 13
			Battery Pack	Option 23/85	No

On-site frequency calibration

The CNT-85 frequency counter from Pendulum brings cal lab accuracy to field measurements. With the (optional) ultra-stable oven timebase and a high 10 digits resolution in just one second, it delivers high-accuracy measurements instantly. An overflow mode displays also the 11th and 12th digits, when needed. The CNT-85 is easy to use, compact and has a unique, smart automatic input triggering for any type of signal. A very short warm-up time of the oven oscillator, gives you ppb-performance after only 10 minutes.

CNT-85R - The ultimate frequency counter/calibrator

The CNT-85R from Pendulum is the most accurate portable frequency calibrator on the market. It offers all the functionality of the CNT-85, plus the stability and accuracy of a built-in Rubidium atomic reference.

This instrument is ideal for high-accuracy frequency calibration, inside as well as outside the cal lab environment, such as in digital communication systems.

The short warm-up time means that the CNT-85R is instantly ready for use after a change of location.

GSM Network operators

Depending on the internal procedures and budgets of the network operator, the requirement for master clock calibration in base stations, can be fulfilled with the following solutions from Pendulum.

- CNT-85 with oven oscillator (option 40), offers a low initial cost solution. With 3 month calibration intervals the counters margin to GSM specification is 5:1, and 1 year calibration intervals give a margin of 3:1.
- CNT-85R, provides low cost of ownership, (10 year adjustment interval, for a margin of better than 50:1 to the GSM specification).

CNT-85 and CNT-85R Specifications

Measuring modes

Frequency A, C

<i>Range (A):</i>	10 Hz to 300 MHz
<i>Range (C):</i>	100 MHz to 3 GHz or 300 MHz to 8 GHz (option)
<i>Resolution:</i>	10 digits/s

Burst Frequency A

Frequency / PRF of burst signals down to 1µs

Period A

<i>Range:</i>	6 ns to 100 ms
<i>Resolution:</i>	10 digits/s

Ratio A/E, C/A

<i>Range:</i>	10 ⁻⁷ to 10 ¹⁰
<i>Freq. Range:</i>	See specs for input A, C and E

Pulse Width A

<i>Range:</i>	6 ns to 10 ms
<i>Resolution:</i>	250 ps

Duty Factor A

<i>Range:</i>	0.000001 to 0.999999
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Totalize A

Event counting with manual start and stop	
<i>Range:</i>	0 to 10 ¹⁷

Input & Output Specifications

Input A

<i>Coupling:</i>	AC
<i>Impedance:</i>	1 MΩ or 50Ω
<i>Sensitivity:</i>	
10 Hz to 50 MHz	10 mV rms
50 to 100 MHz	15 mV rms
100 to 150 MHz	20 mV rms
150 to 200 MHz	30 mV rms
200 to 300 MHz	50 mV rms

Manual Trigger:

<i>Sensitivity Range:</i>	10 mV to 10 Vrms, in 3 dB steps
<i>Trigger Level:</i>	High, medium or low duty factors
<i>Trigger Slope:</i>	Positive or negative
<i>Auto Trigger:</i>	Automatic optimum trigger
<i>Frequency:</i>	Minimum 50 Hz

Signal Monitor:

A bar graph displays input signal level in 3 dB steps, 10 mV rms to 10V rms

Low-pass filter: 100 kHz or OFF.

Max Voltage Without Damage:

350V (dc + ac peak) to 440 Hz

Input C (Option 10)

<i>Operating input voltage range:</i>	
0.1 to 0.3 MHz	20 mV rms to 12V rms
0.3 to 2.5 GHz	10 mV rms to 12V rms
2.5 to 2.7 GHz	20 mV rms to 12V rms
2.7 to 3.0 GHz	100 mV rms to 12V rms
<i>Impedance:</i>	50Ω nom, VSWR<2.5:1
<i>Connector:</i>	N-type, female

Input C (Option 13)

<i>Operating input voltage range:</i>	
0.3 to 0.5 GHz	-21 to +30 dBm (20 mV rms to 7V rms)
0.5 to 3.0 GHz	-27 to +30 dBm (10 mV rms to 7V rms)
3.0 to 4.5 GHz	-21 to +30 dBm (20 mV rms to 7V rms)
4.5 to 6.0 GHz	-15 to +30 dBm (40 mV rms to 7V rms)
6.0 to 8.0 GHz	- 9 to +30 dBm (80 mV rms to 7V rms)
<i>Impedance:</i>	50Ω nom, VSWR<2:1
<i>Connector:</i>	N-type, female

Rear panel inputs and outputs

<i>Ref. Input:</i>	10 MHz; >200 mV rms
<i>Arm Input (E):</i>	10 Hz to 80 MHz TTL level triggering
<i>Ref. Output:</i>	10 MHz sine, >0.5V rms into 50Ω
<i>Analog output (incl. with GPIB option):</i>	0-5V voltage, proportional to 3 consecutive display digits

Time Base Options

	Model:	CNT-85	CNT-85	CNT-85	CNT-85R
<i>Option:</i>		Standard	Option 30	Option 40	
<i>Time base type:</i>		UCXO	OCXO	OCXO	Rubidium
Ageing:					
<i>Per month:</i>		<5x10 ⁻⁷	1x10 ⁻⁸	<3x10 ⁻⁹	<5x10 ⁻¹¹
<i>Per year:</i>		<5x10 ⁻⁶	<5x10 ⁻⁸	<1.5x10 ⁻⁸	<1x10 ⁻⁹ /10 years
Stability vs. temp:					
0°C-50°C:		<1x10 ⁻⁵	<5x10 ⁻⁹	<2.5x10 ⁻⁹	<3x10 ⁻¹⁰
20°C-26°C (typ.):		<3x10 ⁻⁶	<6x10 ⁻¹⁰	<4x10 ⁻¹⁰	<2x10 ⁻¹¹
Short term stability: t=1s (Allan dev.)		n.s.	1x10 ⁻¹¹	5x10 ⁻¹²	5x10 ⁻¹¹

Auxiliary Functions

External Arming/External Gate

<i>Arming modes:</i>	Start/stop on pos/neg slope
<i>Start Arming Delay:</i>	OFF or 200 ns to 1.6s

Nulling/Frequency Offset

Nulling enable measurements to be displayed relative to a previously measured value or any frequency offset value entered via front panel keys

Other Functions

<i>Measuring Time:</i>	Single cycle, 100 ns to 15s
<i>Restart:</i>	Starts a new measurement
<i>Display Hold:</i>	Freezes measuring result.
<i>Blanking:</i>	Unstable digits can be blanked
<i>Save/Recall:</i>	20 instrument set-ups. 10 set-ups can be user protected

GPIB (option 80)

Maximum Measurement Rate *

<i>Via GPIB:</i>	100 readings/s
<i>To internal memory:</i>	1.6k readings/s

Internal memory size* up to 2600 readings

Data Output Format

ASCII, IEEE double precision floating point

* depending on measurement function and internal data format

General Specifications

Display

<i>Type:</i>	LCD with back-light
<i>No. of digits:</i>	10 plus exponent
<i>Overflow:</i>	Display of the 11th and 12th digits
<i>Bar graph:</i>	Displays input signal level or sensitivity setting in 3dB steps from 10 mV to 10V rms

Environmental Conditions

<i>Operating temp:</i>	0°C to +50°C
<i>Storage temp:</i>	40°C to +70°C
<i>Safety:</i>	EN61010-1, Cat II, Pollution degree 2, CSA 22.2, CE
<i>EMC:</i>	EN61326 (1997) + A1 (1998), EN55011-1, EN50082-2, CE

Power Line Requirements (at 25°C)

<i>AC voltage:</i>	
CNT-85:	90 to 264V rms, 47 to 440 Hz
CNT-85R:	90 to 264V rms, 47 to 63 Hz
<i>Power rating:</i>	
CNT-85:	max 30W
CNT-85R:	max 100W (6 min. warm-up) max 47W (cont. operation)

Battery (option 23/85)

<i>Capacity @ 25°C:</i>	
<i>Stand-by:</i>	20h typ. w. oven time base
<i>Operating:</i>	2-3h typ. depending on installed options
<i>Re-charge time:</i>	8h typ. in stand-by mode
<i>Battery type:</i>	sealed lead-acid cells

Environmental temperature:

<i>Operating:</i>	0° to +40°C
<i>Storage:</i>	-40° to +50°C
<i>Weight:</i>	1.5 kg (3.3 lb)

Mechanical Data W x H x D

CNT-85:	210x86x395 mm (8.25x3.4x15.6 in)
CNT-85R:	315x86x395 mm (12.4x3.4x15.6 in)

Weight Net / Shipping

CNT-85:	3.2 kg (7 lb) / 5.5 kg (12 lb)
CNT-85R:	5.5 kg (12 lb) / 8.8 kg (19 lb)

Ordering Information

Basic models

CNT-85	300 MHz Frequency Counter incl. Standard timebase (5x10 ⁻⁷ /month)
CNT-85R	300 MHz Frequency Counter/Calibrator incl. Rubidium timebase (5x10 ⁻¹¹ /month)

Included with Instrument

Power line cord
Operators manual on CD-ROM
Certificate of Calibration

RF Input Frequency Option *

<i>Option 10</i>	3.0 GHz Input C
<i>Option 13</i>	8.0 GHz Input C

Time Base Options *

<i>Option 30</i>	Very-high stability Oven Time Base (1x10 ⁻⁸ /month)
<i>Option 40</i>	Ultra-high stability Oven Time Base (3x10 ⁻⁹ /month)

Other Options *

<i>Option 23/85</i>	Battery Pack
<i>Option 80</i>	GPIB interface (SCPI)

Optional Accessories

<i>Option 22</i>	Rack-Mount Kit (CNT-85R only)
<i>Option 27</i>	Soft Carrying Case
<i>Option 27H</i>	Heavy Duty Hard Transport
<i>OM-85</i>	Operators Manual (printed)
<i>PM-85</i>	Programmers Manual (printed)
<i>SM-85</i>	Service Manual

*) Options are factory installed upon order and can not be customer retrofitted.

Warranty

<i>Standard</i>	18 months
<i>Option 95/03</i>	Extended to 3 years
<i>Option 95/05</i>	Extended to 5 years

Specifications subject to change without notice

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Pendulum Instruments AB

www.pendulum.se

-Experts in time & frequency calibration, measurement and analysis