product data

CNT-85 & CNT-85R

Frequency Counter/Calibrators

Ultimate frequency counting

- High resolution: 10 digits in 1s
- Low uncertainty: 0.0001 ppm (Rb)
- Short warm-up time 10 min. to 4 x10^{-10}
- 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 new CNT-85 and CNT-85R frequency counters and calibrators, Pendulum now offers the ultimate tools for stationary as well as portable calibration of frequency. 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. The frequency counter range comprises 2 models, the economy model CNT-85 and the ultimate CNT-85R including a built-in Rubidium time-base reference.

Selection chart	CNT-85	CNT-85R
Frequency, Frequency burst, PRF	●	●
Period, Pulse width, Duty cycle, Totalize	●	●
Frequency range (standard)	300 MHz	300 MHz
Frequency resolution (1s gate time)	10 digits	10 digits
Pulse width resolution	250 ps	250 ps
Arming delay by time and events	●	●
Best timebase stability/month	3x10^{-9}	5x10^{-11}

Selection chart	CNT-85	CNT-85R
Frequency deviation after 10 min. warm-up	5x10^{-9}	4x10^{-10}
GPIB	option 80	option 80
Signal strength indicator (bar graph)	●	●
Nulling of display value	●	●
Display digit blanking	●	●
2.7 GHz HF-input	option 10	option 10

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), offering a low initial cost solution (2 month calibration interval for a margin of 5x better than GSM specification)
- CNT-85R, providing low cost of ownership, (10 year adjustment interval, for a margin of 50x better than GSM specification).

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CNT-85 & CNT-85R Specifications

Measuring modes

Frequency A, C

Range:
Input A: 10 Hz to 300 MHz
Input C (option): 140 MHz to 2.7 GHz
Resolution: 10 digits/s

Burst Frequency A

Frequency and PRF of burst signals down to 1 µs can be measured without external control signal

Period A

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

Ratio A/E, C/A

Range: 10^{-7} to 10^{10}
Frequency Range:
Input A: 10 Hz to 160 MHz
Input E: 10 Hz to 50 MHz
Input C (option): 100 MHz to 2.7 GHz

Pulse Width A

Range: 3 ns to 10 ms
Resolution: 250ps

Duty Factor A

Range: 0.000001 to 0.999999

Totalize A

Event counting with manual start and stop
Range: 0 to 10^{17}

Input and Output Specifications

Input A

Coupling: AC
Impedance: 1 MΩ or 50Ω
Max sensitivity: 10 mV rms, < 50 MHz
Manual Trigger:
Sensitivity Range: 10 mV rms to 10V rms, variable in 3 dB steps
Trigger Level: Selectable for high, medium or low duty factors
Trigger Slope: Positive or negative
Auto Trigger: Automatic optimum triggering on various amplitudes and waveforms
Frequency: Minimum 50 Hz
Signal Monitor: A bar graph displays input signal level in 3 dB steps, 10mV rms to 10V rms
Low Pass Filter: 100 kHz.
Max Voltage Without Damage: 350V (dc + ac peak) to 440Hz

Input C (Option 10)

Frequency Range: 100 MHz to 2.7 GHz
Operating Input Voltage Range:
0.1 to 0.3 GHz: 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
Impedance: 50Ω nominal, VSWR<2.5:1
Max Voltage Without Damage: 12V rms during 60s, pin-diode protected
Connector: N-type, female

Rear panel inputs and outputs

Ref. Input: 10 MHz; >500 mV rms
Arm Input (Input E): Used in Ratio A/E and for external arming/gating. DC to 50 MHz; TTL level triggering
Ref. Output: 10 MHz sine, >0.5V rms into 50Ω load
Analog output (incl. with GPIB option): 0-5V voltage, proportional to 3 consecutive display digits

Auxiliary Functions

External Arming/External Gate

Arming modes: Start/stop on pos/neg slope
Start Arming Delay: 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

Measuring Time: Single cycle, 0.8µs to 20 s, (up to 400 s for some functions)
Restart: Starts a new measurement
Display Hold: Freezes measuring result.
Blanking: Unstable digits can be blanked
Save/Recall: 19 complete instrument set-ups. 10 set-ups can be user protected

GPIB (option 80)

Maximum Measurement Rate *
Via GPIB: 100 readings/s
To internal memory: 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:

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

Environmental Conditions

Operating temp.: 0°C to +50°C
Storage temperature: -40°C to +70°C
Safety: EN61010-1, Cat II, Pollution degree 2, CSA 22.2, CE
EMC: FCC Part 15J Class A, EN55011-1, EN50082-2, CE

Power Line Requirements (at 25ºC)

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

Mechanical Data

WxHxD:
CNT-85: 210x86x 395 mm (8.25x3.4x15.6 in)
CNT-85R: 315x86x395 mm (12.4x3.4x15.6 in)
Weight CNT-85: Net 3.2 kg (7 lb)
Shipping 5.5 kg (12 lb)
Weight CNT-85R: Net 5.5 kg (12 lb)
Shipping 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
Users manual
Programming manual (only with GPIB)
Certificate of Calibration
RF Input Frequency Option *
Option 10: 2.7 GHz Input C
Time Base Options *
Option 30: Very-high stability Oven Time Base ($1x10^{-8}$/month)
Option 40: Ultra-high stability Oven Time Base ($3x10^{-9}$/month)
GPIB Option *
Option 80: GPIB interface (SCPI)
Optional accessories
Option 22: Rack-Mount Kit (CNT-85R only)
Option 27: Carrying Case
Option 27H: Heavy Duty Hard Transport Case

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

Time Base Options

	Model:	CNT-85	CNT-85	CNT-85	CNT-85R
	Option:	Standard	Option 30	Option 40	
Stability :	Time base type:	UCXO	OCXO	OCXO	Rubidium
Ageing:	per month	$< 5 \times 10^{-7}$	$< 1 \times 10^{-8}$	$< 3 \times 10^{-9}$	$< 5 \times 10^{-11}$
	per year	$< 5 \times 10^{-6}$	$< 7.5 \times 10^{-8}$	$< 2 \times 10^{-8}$	$< 2 \times 10^{-10}$
vs. temp:	0°C -50°C,	$< 1 \times 10^{-5}$	$< 5 \times 10^{-9}$	$< 2.5 \times 10^{-9}$	$< 3 \times 10^{-10}$
	20°C -26°C (typ.)	$< 3 \times 10^{-6}$	$< 6 \times 10^{-10}$	$< 4 \times 10^{-10}$	$< 2 \times 10^{-11}$
Short term:	$\tau = 1$ s (Allan dev.)	n. s.	1×10^{-11}	5×10^{-12}	5×10^{-11}
Warm-up stability:		n. s.	$< 1 \times 10^{-8}$	$< 5 \times 10^{-9}$	$< 4 \times 10^{-10}$
after a warm-up time of:		30 min	10 min	10 min	10 min
Total uncertainty (2σ):					
1 year after calibration		$< 7 \times 10^{-6}$	$< 1 \times 10^{-7}$	$< 2.5 \times 10^{-8}$	$< 2.5 \times 10^{-10}$
2 years after calibration		$< 1.2 \times 10^{-5}$	$< 2 \times 10^{-7}$	$< 5 \times 10^{-8}$	$< 5 \times 10^{-10}$
(20°C- 26°C operating temperature)					

Specifications subject to change without notice

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– experts in Time & Frequency Calibration, Measurement and Analysis

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