CNT-85 & CNT-85R

pendulum

Frequency Counters/Calibrators

- **High resolution: 10 digits in 1s**
- **Low uncertainty: 0.0001 ppm (Rb)**
- **Short warm-up time: 10 min to $4x10^{-10}$**
- **Wide frequency range to 8GHz**
- **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 Pendulum CNT-85 and CNT-85R frequency counters and calibrators, Spectracom offers the ultimate tools for stationary as well as portable calibration of frequency, from DC to over 8GHz. 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.

On-Site Frequency Calibration

The CNT-85 frequency counter 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 Frequency Counter/Calibrator

The Pendulum CNT-85R is one of 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:

- 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).

Selection Chart	CNT-85	CNT-85R
Frequency, Frequency burst, PRF	yes	yes
Period, Pulse width, Duty cycle, Totalize	yes	yes
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	yes	yes
Best timebase stability/month	$3x10^{-9}$	$5x10^{-11}$
Frequency deviation after 10 min warm-up	$5x10^{-9}$	$4x10^{-10}$
GPIB	Option 80	Option 80
Signal strength indicator (bar graph)	yes	yes
Nulling of display value	yes	yes
Display digit blanking	yes	yes
3GHz HF-input	Option 10	Option 10
8GHz HF-input	Option 13	Option 13
Battery Pack	Option 23/85	no

USA | 95 Methodist Hill Drive | Rochester, NY 14623 | +1.585.321.5800 | sales@spectracomcorp.com
FRANCE | 3 Avenue du Canada | 91974 Les Ulis, Cedex | +33 (0)1 64 53 39 80 | sales@spectracom.fr
UK | 6A Beechwood | Chineham Park | Basingstoke, Hants, RG24 8WA | +44 (0)1256 303630 | info@spectracom.co.uk
SWEDEN | Box 20020 | 161 02 Bromma, Sweden | +46 8 598 510 00 | info@pendulum.se

Measuring modes

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

Burst Frequency A
Frequency/PRF of burst signals down to 1µs

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

Ratio A/E, C/A
Range: 10^{-7} to 10^{10}
Freq. Range: See specs for input A, C and E

Pulse Width A
Range: 6ns to 10 ms
Resolution: 250 ps

Duty Factor A
Range: 0.000001 to 0.999999

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

Input & Output Specifications

Input A
Coupling: AC
Impedance: 1MΩ or 50 Ω
Sensitivity: *10 Hz to 50 MHz:* 10 mVrms
50 to 100 MHz: 15 mVrms
100 to 150 MHz: 20 mVrms
150 to 200 MHz: 30 mVrms
200 to 300 MHz: 50 mVrms
Manual Trigger:
*Sensitivity Range:*10 mV to 10 Vrms, in 3dB steps
Trigger Level: High, medium or low duty factors
Trigger Slope: Positive or negative
Auto Trigger: Automatic optimum trigger
Frequency: Minimum 50 Hz
Signal Monitor: A bar graph displays input signal level in 3dB steps, 10 mVrms to 10 Vrms
Low-pass filter: 100 kHz or OFF.
Max Voltage Without Damage:
350 V (dc + ac peak) to 440 Hz

Input C (Option 10)
Operating input voltage range:
0.1 to 0.3 MHz: 20 mVrms to 12 Vrms
0.3 to 2.5 GHz: 10 mVrms to 12 Vrms
2.5 to 2.7 GHz: 20 mVrms to 12 Vrms
2.7 to 3.0 GHz: 100 mVrms to 12 Vrms
Impedance: 50 Ω nom, VSWR <2.5:1
Connector: N-type, female

Input C (Option 13)
Operating input voltage range:
0.3 to 0.5 GHz: -21 to +30dBm (20mVrms to 7Vrms)
0.5 to 3.0 GHz: -27 to +30dBm (10 mVrms to 7Vrms)
3.0 to 4.5 GHz: -21 to +30dBm (20 mVrms to 7Vrms)
4.5 to 6.0 GHz: -15 to +30dBm (40 mVrms to 7Vrms)
6.0 to 8.0 GHz: - 9 to +30 dBm (80 mVrms to 7Vrms)
Impedance: 50 Ω nom, VSWR <2:1
Connector: N-type, female

Rear panel inputs and outputs
Ref. Input: 10 MHz; >200 mVrms
Arm Input (E):
10 Hz to 80 MHz; TTL level triggering
Ref. Output: 10 MHz sine, >1Vrms into 50 Ω
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 1.6 s

Nulling/Frequency Offset
Nulling enable meas 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, 800 ns to 26 s
Restart: Starts a new measurement
Display Hold: Freezes measuring result.
Blanking: Unstable digits can be blanked
Save/Recall: 20 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
Overflow: Display of the 11th and 12th digits
Bar graph: Displays input signal level or sensitivity setting in 3dB steps from 10 mV to 10 Vrms

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

Power Line Requirements (at 25°C)
AC voltage: *CNT-85:* 90 to 264Vrms, 47 to 440Hz
CNT-85R: 90 to 264 Vrms, 47 to 63 Hz
Power rating: *CNT-85:* max 30 W
CNT-85R: max 100 W (6min warm-up)
max 47 W (cont. operation)

Battery (option 23/85)
Capacity @25°C:
Stand-by: 20 h typ. w. oven time base
Operating: 2-3h typ. depending on installed options
Re-charge time: 8h typ. in stand-by mode
Battery type: sealed lead-acid cells
Environmental temperature:
Operating: 0°C to +40°C
Storage: -40°C to +50°C
Weight: 1.5 kg (3.3 lb)

Dimensions and Weight
WxHxD:
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: 18 months product warranty, power line cord, operators manual on CD-rom, certificate of calibration

RF Input Frequency Option*
Option 10: 3.0 GHz Input C
Option 13: 8.0 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)

Other Options*
Option 23/85: Battery Pack
Option 80: GPIB interface (SCPI)

Optional Accessories
Option 22: Rack-Mount Kit (CNT-85R only)
Option 27: Soft Carrying Case
Option 27H: Heavy Duty Hard Transport
Option 95/03: 3 years extended warranty
Option 95/05: 5 years extended warranty
OM-85: Operators Manual (printed)
PM-85: Programmers Manual (printed)
SM-85: Service Manual

*) 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: Time base type:	Standard UCXO	Option 30 OCXO	Option 40 OCXO	 Rubidium
Aging per month: Aging per year:	$<5x10^{-7}$ $<5x10^{-6}$	$1x10^{-8}$ $<5x10^{-8}$	$<3x10^{-9}$ $<1.5x10^{-8}$	$<5x10^{-11}$ $<1x10^{-9}$/10 years
Stability vs. temp: 0°C to 50°C: 20°C to 26°C (typ.):	 $<1x10^{-5}$ $<3x10^{-6}$	 $<5x10^{-9}$ $<6x10^{-10}$	 $<2.5x10^{-9}$ $<4x10^{-10}$	 $<3x10^{-10}$ $<2x10^{-11}$
Short term stability: τ=1s (Allan dev.)	n.s.	$1x10^{-11}$	$5x10^{-12}$	$5x10^{-11}$

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