

# CNT-90XL

## 60 GHz Microwave Counter/Analyzer

### A Revolution in Microwave Frequency Counting

- Speed: 250k measurements/s to internal memory
- CW and burst measurement of frequency & power
- Resolution: 14 digits display
- Statistical analysis including Histogram, trend & modulation domain display
- Frequency range: 27, 40, 46 or 60 GHz models
- Unique ease-of-use: Multi-parameter display & graphical presentation of results
- USB & GPIB as standard
- Outstanding performance/price ratio
- 2 instruments in one - Microwave Counter/Analyzer & 300 MHz general-purpose timer/counter



With the CNT-90XL Microwave Counter/Analyzer, Pendulum Instruments now offers **The Ultimate Tool** for measurement, analysis and calibration of **Microwave Frequency and Power**. Whether in test systems, on the R&D bench, in the calibration lab or out in the field, the CNT-90XL is the state-of-the-art Microwave Counter/Analyzer and outperforms any existing Microwave counter on the market. The CNT-90XL is the worlds fastest Microwave counter with integrated power meter and offers a unique ease-of-use with graphical display and improved control over measurement at an outstanding price.

### Fastest Microwave Counter on the Market

The CNT-90XL Microwave Counter/Analyzers set new milestones for microwave frequency counting and outperforms any microwave counter on the market regarding resolution, speed and acquisition time. The measurement speed is up to 250 000 frequency samples/s, for advanced statistical analysis.

It is intended for *several applications*, such as:

- Microwave link carrier calibration
- Satellite communication equipment testing
- YIG and VCO testing
- RF and microwave instrumentation calibration
- RF components and modules testing

#### Product features and benefits:

- Fast high-resolution frequency or power measurements, very short acquisition time of 25 ms (Auto) or zero (Manual)
- Burst measurements via Ext. arming
- High sensitivity (-33 dBm)
- Statistical processing and graphical histogram, trend and modulation display
- Affordable microwave frequency counting

### Graphical Display

The graphical display shows frequency changes over time directly on-screen, e.g. fast power switching or FM. Built-in statistical processing presents numerical stability data and also frequency distribution histograms on-screen for analysis of frequency stability or modulation.

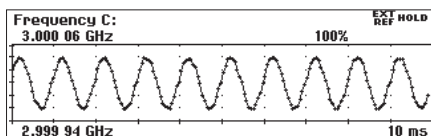


Fig. 1: 1 kHz FM with 12 ppm modulation depth

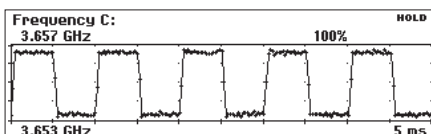


Fig. 2: Pulse modulated frequency

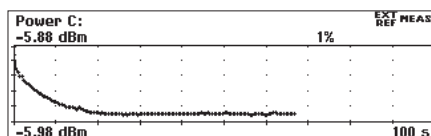


Fig. 3: Generator start-up power settling

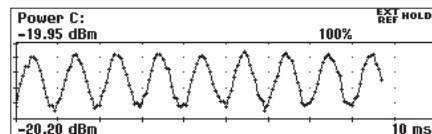


Fig. 4: Very small AM on carrier is visualized

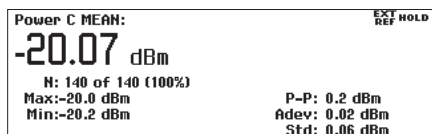


Fig. 5: Numeric statistics screen of the AM signal above

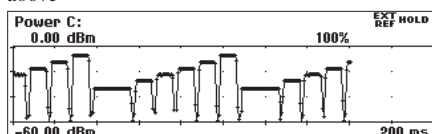


Fig. 6: Power step from generator (-30 to -5 dBm in 5 dBm steps) NOTE: output is turned off shortly betw. power steps

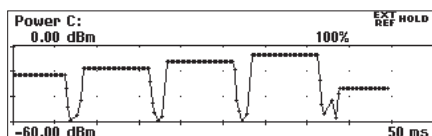


Figure 7: Power step (close up)

# CNT-90XL Specifications

INLAY to Product Data CNT-90/91

The CNT-90XL performs measurements on inputs A (300 MHz), input B (300 MHz) and input C (27, 40, 46 or 60 GHz). The specification below only refers to the input C measurements of frequency and power.

For the timer/counter measurements except Frequency on inputs A and B, as well as general CNT-90 data, please consult the CNT-90 data sheet

## Measuring Functions

### Frequency A, B, C

#### Range:

Input A, B: 0.002 Hz to 300 MHz

Input C: 300 MHz to 27, 40, 46 or 60 GHz

**Resolution:** 12 digits in 1s measuring time

**Acquisition C:** Auto or Manual

**Acquisition time:** 25 ms in Auto (typ.)

#### Aux. Parameters:

Input A, B: Vmax, Vmin, Vp-p

Input C: Power C in dBm or W

### Frequency burst A, B, C

#### Range:

Input A, B: 0.001 Hz to 300 MHz

Input C: 300 MHz to 27, 40, 46 or 60 GHz

**Acquisition C:** Manual

**Aux. Parameters:** PRF

### Period A, B (single or average), C (average)

#### Range:

Input A, B: 3.3 ns to 1000s

Input C: 3.3 ns down to 37, 25, 22 or 17 ps

**Resolution:** 100 ps (single); 12 digits/s (average)

**Acquisition C:** Auto or Manual (within  $\pm 40$  MHz)

**Acquisition time:** 25 ms in Auto (typ.)

**Aux. Parameters:** See Freq. A, B, or C measurements

### Ratio A/B, B/A, C/A, C/B

**Range:**  $(10^{-9})$  to  $10^{11}$

#### Input Frequency:

Input A, B: 0.1 Hz to 300 MHz

Input C: 300 MHz to 27, 40, 46 or 60 GHz

**Aux. Parameters:** Freq 1, Freq 2

### Power C

#### Range:

Power: -35 dBm to +10 dBm

Frequency: 300 MHz to 27, 40, 46 or 60 GHz

**Display units:** dBm (default) or W

**Resolution:** 0.01 dBm @ 100ms measuring time

**Accuracy (typ.):** <1 dBm to 27 GHz;  
<2 dBm to 40 GHz;  
<3 dBm to 60 GHz

**Acquisition:** Auto or Manual (within  $\pm 40$  MHz)

**Acquisition time:** 20 to 30 ms in Auto (typ.)

**Aux. Parameters:** Frequency C

## Input Specifications

### Inputs A and B

#### Frequency Range:

DC-Coupled: DC to 300 MHz

AC-Coupled: 10 Hz to 300 MHz

**Sensitivity:** 15mVrms (DC to 200MHz)  
25mVrms (200 to 300MHz)

**Attenuation:** x1, x10

**Dynamic Range (x1):** 30 mV p-p to 10V p-p within  $\pm 5$ V window

**Analog Noise Reduction Filter:** Nominal 100 kHz, RC-type.

**Digital Low Pass Filter:** 1 Hz to 50 MHz cut-off frequency

**Impedance:** 1 M $\Omega$  // 20 pF or 50 $\Omega$  (VSWR $\leq 2:1$ )

#### Max Voltage Without Damage:

1 M $\Omega$ : 350V (DC + AC pk) to 440 Hz, falling to 12V rms (x1) at 1 MHz

50  $\Omega$ : 12V rms

**Connector:** BNC

### Input C

**Freq. Range:** 0.3 to 27, 40, 46, 60 GHz depending on model

#### Operating input voltage range :

0.3 to 18 GHz: -33 to +13 dBm

18 to 20 GHz: -29 to +13 dBm

20 to 27 GHz: -27 to +13 dBm

27 to 40 GHz: -23 to +13 dBm

40 to 46 GHz: -17 to +13 dBm

46 to 60 GHz: -15 to +10 dBm

**Impedance:** 50 $\Omega$  nominal, AC coupled

#### VSWR:

0.3 to 27 GHz: <2.0:1 (typ.)

27 to 46 GHz: <2.5:1 (typ.)

46 to 60 GHz: <3.0:1 (typ.)

#### FM tolerance:

Manual acq.: 50 MHz p-p; freq C >3.5 GHz

30 MHz p-p; freq C <3.5 GHz

Auto acq.: 20 MHz p-p; for any freq C and modulation frequency > 0.1 MHz

**AM tolerance:** Any modulation index (minimum signal must be within sensitivity range)

**Automatic Amplitude Discrimination:** 10 dB separation between 2 signals within 30 MHz, 20 dB otherwise

#### Max Voltage Without Damage:

+27dBm (27, 40, 46 GHz models)

+25dBm (60 GHz model)

#### Overload indication:

ON when input C power >+10dBm

#### Connector:

27 GHz: SMA

40 and 46 GHz: 2.92 mm sparkplug female

60 GHz: 1.85 mm sparkplug female (all connectors are field replaceable)

## Auxiliary Functions

### External Start and Stop Arming

Arming can be used to synchronize the frequency and power measurements with the start of a burst signal. Minimum burst length must exceed 100 $\mu$ s.

**Modes:** Start and Stop Arming

**Input Channels:** A, B or E (Ext. Arming input)

#### Start Time Delay Range:

20 ns to 2s, 10 ns resolution

### Statistics

**Functions:** Maximum, Minimum, Mean,  $\Delta$ max-Min, Standard Deviation and Allan Deviation

**Display:** Numeric, histograms or trend plots

**Sample Size:** 2 to 2 x 10<sup>9</sup> samples

**Limit Qualifier:** OFF or Capture values above/below/inside or outside limits

### Mathematics

**Functions:** (K\*X+L)/M, (K/X+L)/M or X/M-1. X is current reading and K, L and M are constants; set via keyboard or as frozen reference value (X<sub>0</sub>)

### Other Functions

**Measuring Time:** 20 ns to 1000s

**Timebase Reference:** Internal, External or Automatic

**Display Hold:** Freezes result, until a new measurement is initiated via Restart

**Stored Instrument Set-ups:** 20

**Display:** Backlit graphics LCD; 320\*97 pixels

**Interfaces:** GPIB (IEEE 488.2, SCPI) and USB

#### Max. measuring speed

##### To PC:

Individual meas.: 500/s (40/s for Freq. C)

Block meas.: 5000/s (block size 10k measurements)

To internal mem.: up to 250k/s (max 750k stored results)

## General Specifications

### Environmental Data

**Class:** MIL-PRF-28800F, Class 3

**Operating Temp:** 0°C to +50°C

**Storage Temp:** -40°C to +71°C

**Humidity:** 5%-95% (10°C-30°C)  
5%-75% (30°C-40°C)  
5%-45% (40°C-50°C)

**Altitude:** 4 600m

**Vibration:** Random and sinusoidal according to MIL-PRF-28800F, Class 3

**Shock:** Half-sine 30G per MIL-PRF-28800F Bench handling

**Transit drop test:** According to MIL-PRF-28800F

**Safety:** EN 61010-1, pollution degree 2, meas cat I, CSA C22.2 No 1010-1, CE

**EMC:** EN 61326 (1997); A1 (1998), increased test levels according to EN 50082-2, Group 1, Class B, CE

**Mains power:** 90 to 265V rms, 45 to 440 Hz, <40W

### Dimensions and Weight

#### Width x Height x Depth:

210x90x395 mm (8.25x3.6x15.6 in)

**Weight:** Net 2.7 kg (5.8 lb),  
Shipping app. 3.5 kg (app. 7.5 lb)

## Ordering Information

### Basic Models

**CNT-90XL-27G** 27 GHz Microwave Counter/Analyzer incl. Standard Time Base

**CNT-90XL-40G** 40 GHz Microwave Counter/Analyzer including Standard Time Base

**CNT-90XL-46G** 46 GHz Microwave Counter/Analyzer including Standard Time Base

**CNT-90XL-60G** 60 GHz Microwave Counter/Analyzer including Standard Time Base

*Included with Instrument:* 18 months product warranty, line cord, user documentation on CD, and Certificate of Calibration

### Time Base Options

**Option 19/90** Medium Stability Time Base; 0.2 ppm/month

**Option 30/90** Very High Stability Oven Time Base; 0.01 ppm/month

**Option 40/90** Ultra High Stability Oven Time Base; 0.003 ppm/month

### Optional Accessories

**Option 22/90** Rack-Mount Kit

**Option 27** Carrying Case - soft

**Option 27H** Heavy-duty Hard Transport Case

**Option 29/90** TimeView Modulation domain Analysis SW for CNT-90XL

**Option 90/01** Calibration Certificate with Protocol; Standard oscillator

**Option 90/06** Cal. Cert.; Oven oscillator

**Option 90/00** Cal. Cert. Frequency ageing/week

**Option 95/05** 3 years extended warranty

**Option 95/05** 5 years extended warranty

*Specifications subject to change without prior notice*

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- Experts in time & frequency calibration, measurement and analysis

Pendulum Instruments is a company of the Orolia Group