CNT-90XL
Pulsed RF Microwave Counter/Analyzer

- Pulsed RF measurements down to 30 ns
- Frequency, Power, CW or Burst to 27, 40, 46 or 60 GHz
- Speed: 250k measurements/s to internal memory
- Resolution: 14 digits display
- Statistical analysis including histogram, trend & modulation domain display
- Unique ease-of-use: Multiparameter display & graphical presentation of results
- USB & GPIB as standard
- 2 instruments in one - Microwave Counter/Analyzer & 400 MHz general-purpose timer/counter

The Pendulum CNT-90XL Microwave Counter/Analyzer is an excellent tool for measurement, analysis and calibration of Microwave Frequency, Power, and Pulsed RF time parameters like pulse width and PRI. Whether in test systems, on the R&D bench, in the calibration lab or out in the field, the high-resolution and ultra-fast CNT-90XL is the state-of-the-art Microwave Counter/Analyzer. The NEW option for pulsed RF makes CNT-90XL ideal for radar test and calibration. The CNT-90XL offers a unique ease-of-use with graphical display and improved control over measurement at an affordable price.

The Fastest Microwave Counter
The CNT-90XL Microwave Counter/Analyzer sets a new industry standard for microwave frequency analysis and outperforms any microwave Pulse or CW counter on the market regarding resolution, speed and acquisition time. The CNT-90XL is the world's fastest Microwave counter and offers a measurement speed up to 250,000 frequency samples/s, for advanced statistical analysis, and for analysis of frequency or power transients.

The NEW Pulsed RF option enables measurements of pulses down to 30 ns width, plus PRI/PRF, frequency in burst and power in burst.

The multi-functional CNT-90XL also serves as a 400 MHz general purpose timer/counter, with unique ease-of-use with analysis capabilities to view variations in signal parameters both numerically and graphically.

Applications and Features
The CNT-90XL is intended for several applications, such as:
- Pulsed, Chirped, and Doppler Radar testing and calibration
- Microwave link carrier calibration
- Satellite communication equipment testing
- RF and microwave instrumentation calibration
- RF components and modules, including YIG and VCO testing
- Medical RF equipment testing

Product Features And Benefits
- Pulsed RF measurements (optional) includes Pulse Width to 30 ns, PRI/PRF, Frequency in Burst, Power in Burst
- Fast high-resolution frequency or power measurements, for modulation, doppler shifts, or transient analysis
- Very short acquisition time of 25 ms (Auto) or zero (Manual)
- High sensitivity (-33 dBm)
- Statistical processing and graphical histogram, trend and modulation display
- Affordable microwave frequency counting

Leading Performance
- High resolution is vital for R&D and production testing. CNT-90XL meets this requirement with 100 ps single shot (time) or 12 digits/s (frequency). Obtained values are displayed with up to 14 digits.
- For calibration purposes, the CNT-90XL offers very high accuracy through stable internal OCXO time base, plus high resolution.
- Both USB and GPIB interfaces are standard. With USB you won't need to invest in a GPIB interface card for your PC. The GPIB operates in either SCPI/GPIB or 53131 emulation mode, for plug-and-play replacement in existing ATE systems.
- Menu-oriented settings reduce the risk of mistakes. Valuable signal information, given in multi-parameter displays, removes the need for other instruments like DVM’s and Scopes.
Battery Option
The CNT-90XL has an optional battery pack with 90 Wh capacity, capable of mains-free operation for at least 4.5 hours. In stand-by mode the battery pack can keep an OCXO warm and running for over 24 hours. Battery operation of a frequency counter/analyzer is valuable in three different applications:

- Mains-free operation in the field
- Transportation of high-stability OCXO to maintain stability, which gives instant use at destination without any warm-up time
- Battery backup acting as a built in UPS (Uninterrupted Power Supply)

TimeView®, Modulation Domain Analysis SW
The optional Modulation Domain SW TimeView® is the ultimate tool to view and analyze dynamic frequency changes in real-time, utilizing the high-resolution PC screen, marker read-outs and processing, FFT-calculation to find modulation frequencies, ADEV calculation of short-term stability and more.

Excellent Graphical Presentation
One of the great features of the CNT-90XL is the graphical display and the menu oriented settings. The non-expert can easily make correct settings without risking costly mistakes. The multi-parameter display shows auxiliary measurement values such as Power level in dBm in Frequency measurements.

Measurement values are presented both numerically and graphically. The graphical presentation of results (histograms, trends etc.) gives a much better understanding of the nature of signal jitter. It also provides you with a much better view of changes vs time, from long term trends like slow drift, to fast modulation and transients. Three statistical views of the same data set can be viewed: Numerical, Histogram and Modulation/Trend. It is very easy to capture and toggle between views of the same data.

When adjusting a frequency source to given limits, the Limit qualifying tool gives fast and accurate visual guidance. Tolerance limit markers are visually displayed and the actual frequency is graphically displayed inside or outside the limit markers. Passing the limits will cause an alarm indication.

The graphical display examples below show the frequency changes over time directly on-screen, for example Doppler frequency shift in speed radar sensors, fast power switching, FM or AM. Built-in statistical processing presents numerical stability data and also frequency distribution histograms on-screen for analysis of frequency stability or modulation.

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**Figure 1:** 1kHz FM with 12 ppm modulation depth

**Figure 2:** Pulse modulated frequency or FSK

**Figure 3:** Generator start-up power settling

**Figure 4:** Very small AM on carrier is visualized

**Figure 5:** Numeric statistics screen of the previous AM signal

**Figure 6:** Power step from generator [-30 to -5dBm in 5dBm steps]
NOTE: output is turned off shortly betw. power steps

**Figure 7:** Power step (close up)
Measuring Functions

Frequency A, B, C

Range:
- Input A, B: 0.002 Hz to 400 MHz
- Input C: 300 MHz to 27, 40, 46 or 60 GHz

Resolution: 12 digits in 1 s measuring time

Acquisition C: Auto or Manual

Aux. Parameters: 25 ms in Auto (typ.)

Frequency Burst A, B

Range:
- Input A, B: 0.002 Hz to 400 MHz
- Input C: Requires option 28 - see “Pulsed RF” specs

Minimum Burst Duration: Down to 40 ns

PRF Range: 0.5 Hz to 1 MHz

Start Delay: 10 ns to 2 sec., 10 ns resolution

Smart Calculation: Range of Time Interval A to B, B to A, A to A, B to B

-10^6 sec. to +10^6 sec.

Aux parameters: Vmin, Vmax, Vp-p

Time Stamping A, B, C

Raw time stamp data together with pulse counts on inputs A, B or C, accessible via GPIB or USB only.

Max Sample Speed: See GPIB specifications

Max Frequency: 160 MHz

Timestamp Resolution: 70 ps

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 @10 ms measuring time

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

Acquisition C: Auto or Manual (within ±40 MHz)

Aux parameters: 20 to 30 ms in Auto (typ.)

Pulsed RF parameters (Option 28)

Pulse ON voltage range:
- 0.4 to 40 GHz: -15 dBm to +13 dBm
- 40 to 46 GHz: -10 dBm to +13 dBm
- 46 to 60 GHz: 0 dBm to +10 dBm

Min ON/OFF ratio: 15 dB

Pulse Width

Range: 30 ns to 1 sec.

Resolution: 200 ps rms

Accuracy: <10 ns + TBE*P_width

PRI (pulse repetition interval)

Range: 60 ns to 1 sec.

Resolution: 200 ps rms

Accuracy: <2 ns + TBE*PRI

PRF (pulse repetition frequency)

Range: 1 Hz to 16.7 MHz (20 MHz typ.)

Resolution: (200 ps/Meas_time)*PRF Hz

Frequency in Burst

Range: 400 MHz to 60 GHz

Pulse width: down to 100 ns

Resolution: 50 ps/[V/VGate_time]*FREQ Hz

Acquisition: Manual

Peak Power in Burst

Range: -20 dBm to +10 dBm

Pulse width: down to 50 us

Acquisition: Manual

Resolution: 0.1 dBm < 1 ms pulse

Input and Output Specifications

Inputs A and B

Frequency Range:
- DC-Coupled: DC to 400 MHz
- AC-Coupled: 10 Hz to 400 MHz

Technical Specifications: CNT-90XL

Impedance:
- 1 MΩ, 20 pF or 50 Ω (VSWR ≤ 1:1)

Trigger Slope: Positive or negative

Max. Channel Timing Difference: 500 ps

Sensitivity:
- DC 200 MHz: 15 mVRms
- 0.3 to 0.5 MHz: 25 mVRms
- 0.3 to 1 MHz: 35 mVRms

Attenuation: x1, x10

Dynamic Range (x1):
30 mVp-p to 10 Vp-p within ±5 V window

Trigger Level: Read-Out on display

Resolution: 3 mV

Uncertainty (x1): ±(15 mV + 1% of trigger level)

Auto Trigger Level: Automatically set to 50% point of input signal (10% and 90% for Rise/Fall Time)

AUX Hysteresis:
Freq. range: 1 Hz to 300 MHz

Time: Min hysteresis window (hysteresis compensation)

Frequency: 40% of input signal amplitude (typ.)

Analog LP Filter: Nominal 100 kHz, RC-type

Digital LP Filter: 1 Hz to 50 MHz cutoff frequency

Max Voltage Without Damage:
1 MΩ: 350 V (DC + AC pk) ± 440 Hz, falling to 12 Vrms at 1 MHz; 50 Ω: 12 Vrms

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 Ω 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: ±25 dB

Overload indication:
ON when input C power > ±10 dBm

Connector:
27 and 40 GHz: 2.92 mm sparkplug female
46 and 60 GHz: 1.85 mm sparkplug female

(All connectors are field replaceable)

Rear Panel Inputs and Outputs

Reference Input: 1, 5, or 10 MHz; 0.1 to 50 Vrms sine; impedance ≥ 1 kΩ

Reference Output: 10 MHz; > 1 Vrms sine into 50 Ω

Arming Input:
Arming of all measuring functions

Impedance: Approx. 1 kΩ

Freq. Range: DC to 80 MHz

Connector: BNC
Technical Specifications: CNT-90XL

Included with Instrument: 3 years product warranty, line card, user documentation on CD, and Certificate of Calibration. The warranty period may be dependent on country.

Pulsed RF Option
Option 28: Pulsed RF measurements

Time Base Options
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

Option 23/90 Battery Unit
Battery Type: Li-Ion, 90 Wh
External DC input: 10 to 18 Vdc; max 6A
Operating temp. range: 0°C to 40°C
Storage: -20°C to +60°C, 1 month
-20°C to +45°C, 3 months
-20°C to +20°C, 1 year
Battery operating time (at 25°C): ON: >4.5 hours
Stand-by: >24 hours
Charging: Automatically when AC or ext DC is connected

Battery status indicator: On-screen with Low battery warning
Weight: 2.3 kg (4.9 lb)

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 90/06: Calibration Certifi cate with Protocol, Oven oscillator
Option 90/00: Calibration Certifi cate with Protocol; Frequency aging/week
Option 95/05: Extended warranty from 3 to 5 years
OM-90: Users Manual English (printed)
PM-90: Programmers Manual English (printed)
SM-90: Service Manual English
GS-90-EN: Getting Started English
GS-90-FR: Getting Started French
GS-90-DE: Getting Started German

Specifications subject to change or improvement without notice.