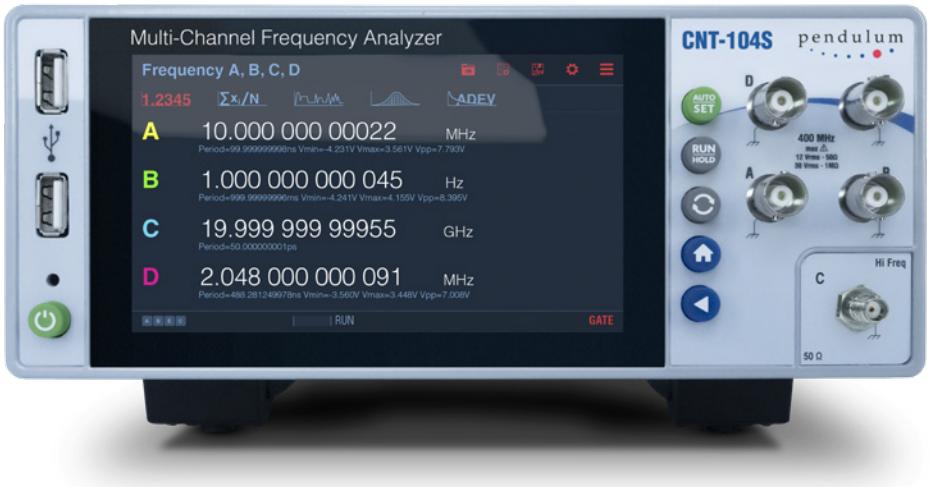
CNT-104S

Multi-channel Frequency Analyzer

DATA SHEET

- Four channel 400 MHz Frequency Analyzer - plus optional RF-channel up to 24 GHz
- NEW measurement modes: 4 parallel counters in one box; Multi-stop Time Interval
- Gap-free zero-dead-time frequency/ period measurements
- Ultra-high resolution: Time: 7 ps; Freq.: 12-13 digits/s
- Ultra-high meas. speed: up to 20M meas./s to internal memory
- Fast bus speed; 170k meas./s in block mode
- Graphic touch screen display for settings and display of values, statistics (numeric and distribution graph), trend & modulation domain
- The instrument can be controlled locally via touch screen or mouse, or remotely (from anywhere in the world) - via web interface or VNC
- Intelligent and easy-to-use



The Pendulum CNT-104S is a revolutionary concept for super-performance ***multi-channel*** frequency and time-interval analysis in a bench-top unit. You can track parallel frequency, phase or time simultaneously on 4 input channels on the large graphic screen. These instruments feature gap-free measurements, and have down to 7 ps time resolution, up to 13 digits/s frequency resolution, and a measuring speed of up to 20M results/s.

CNT-104S can replace and outperform any existing Timer/Counter/Analyzer on the market.

Highest Performance for R&D and metrology

- The ultra-high single-shot resolution gives better insights in the design under test, faster results in phase comparisons between clocks, more accurate calibration, and allows capture of very small time/phase changes. Track and compare 4 parallel signals with 7 ps resolution/time-stamp, at a speed of 50 ns between samples in each channel.
- Gap-free, zero-dead-time counting provides back-to-back measurements without losing any cycle, even for very long measurements.
- The CNT-104S is also a high-performance Modulation Domain Analyzer (MDA). Thanks to the high speed of up to 20M meas./s for 4 parallel signals, very fast frequency or phase/ time changes can be captured in real time.
- CNT-104S has a unique 4-channel design, plus an optional RF input. All channels perform parallel, independent, and gap-free time-stamping of the input signal. This allows for new measurements that earlier required many instruments, like phase comparison of 4 atomic clocks, without the need for a switch. And Multi-stop Time-Interval measurements (1 start and 3 stop events) for time-of-flight measurements in physical research.

Save money in production test

- The 4-channel design enables 4 parallel frequency measurements. One CNT-104S can replace 4 existing frequency counters in a test system at a lower cost/counter.
- Using the option 22/05 rackmount adapter, you will have 8 parallel frequency counters in a 19", 2U high rack space.
- Choose between Ethernet, WLAN*, USB** or GPIB as a communication interface to a PC/Laptop/Tablet, or to the test system controller.
- High bus speed reduces test time in ATE test systems. Perform fast block measurements up to 170k meas/s. Test time is reduced compared to existing solutions, and time is money.

** Requires an external USB Wi-Fi dongle*

*** Later availability. USB full SW functionality will be avilable as future SW upgrades for early purchased units*

Easy-to-understand Graphical Presentation

One of the great features of the CNT-104S is the graphic display with its menu oriented settings. The non-expert can easily make correct settings, thanks to the guided instruction on most setting pages.

Valuable signal information, given in multi-parameter displays, removes the need for other instruments like DVM's and Scopes for quick signal verification.

Measured values are presented as both numerics and graphics. The graphical presentation of results (distribution, trends etc.) gives a better understanding of the nature of jitter. It also provides you with a much better view of changes vs time, from slow drift to fast modulation. The same data set can be viewed in Numerical, Statistics, Distribution, Time-line and ADEV plot views. It is very easy to capture and toggle between views of the same data set.



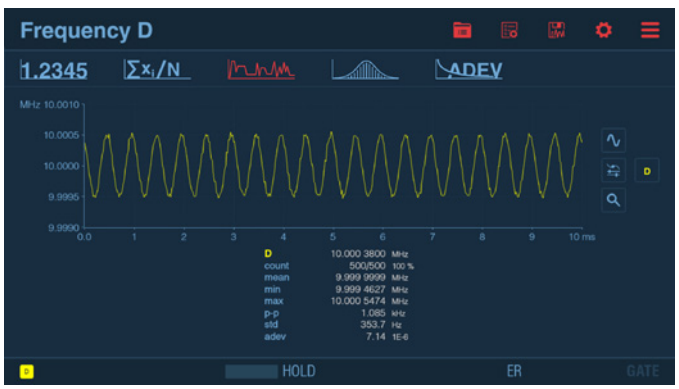
View 4 signals simultaneously on screen. 4 instruments in one!

Modulation Domain Analysis

The CNT-104S features built-in modulation domain analysis, displaying frequency changes vs. time, on one to four input channels.

Thanks to the high resolution, and the high measurement speed of down to 50 ns between individual samples in each channel, you can follow and verify for example:

- FM, FSK, BPSK, PWM, PPM and other time, phase or frequency modulation schemes
- Frequency sweep
- Frequency transients
- Frequency settling in oscillators, VCOs and PLLs
- Synthesizer switching
- Frequency instability, incl. jitter
- Frequency hopping agile communication



View fast FM, or any time/phase/frequency modulation, on screen, on one or more channels

Full flexibility for remote control

The CNT-104S comes as standard with a Gbit Ethernet interface for remote control and data transfer.

Using a Wi-Fi dongle in the front panel USB port, enables you to connect CNT-104S to your local wireless network.

A USB 2.0 communication interface is HW ready from start, with later full SW capabilities, via free future SW upgrade.

GPIB interface is also available as an option.

You can access and control the instrument from your lab bench, or from anywhere in the world, using the integrated web interface function.

Very flexible configuration

The CNT-104S can be configured as you like it to fit performance demands and/or budget.

- Add an optional extra channel C for RF frequency measurements. Choose either a 3 GHz, or 10 GHz, basic HW (the 10 GHz channel is SW key upgradable to 15, 20, or 24 GHz)
- Choose between 3 timebase oscillator options; TCXO and 2x OCXO
- Add an optional 0.5 Hz to 100 MHz pulse generator (SW license key)
- Add optional TIE, Frequency Offset measurement functions or ADEV plot (availbale via SW license keys)

Outstanding ease-of-use

The big color touch screen with its intuitive menus lets you make your settings via a simple finger touch. Alternatively you can connect a wireless mouse to the front USB host port, and make your settings via mouse clicks on screen instead. Or you can use the web-server interface to control CNT-104S from a large PC-screen.

The intelligent AUTO SET will help you to make best settings for each measurement function.

You do not even need to be close to your instrument. The web server functionality lets you connect to the CNT-104S over Ethernet, view the front panel, and control the measurements and read results via a few mouse clicks.

When adjusting a frequency source to given limits, the graphic display gives fast and accurate visual calibration guidance.

You can pan and zoom in graphs to view individual samples with cursor read-outs.

Any measured signal can be smoothed, to reveal underlying trends in the presence of excessive noise.

The CNT-104S Multi-channel Frequency Analyzer outperforms every existing benchtop frequency counter and time interval analyzer on the market, independent of measurement task.

The super-high-performance CNT-104S is the optimal tool you need for time & frequency measurement, analysis, and calibration.

Measuring Functions

Display modes

Values/Statistics: Numeric display of Measurement values or Statistics parameters with large digits. Values mode also display auxiliary parameter values.

Time-line/Distribution: All measurements are displayed graphically. Multi-channel graphs are color-coded. Statistics values are displayed beneath the graphs.

ADEV Graph (Option 161): Enables calculation of ADEV values for a range of intervals, displays results in graphical and textual form, with possibility to save them into a file.

Resolution Measure up to 4 input signals in parallel with down to 7 ps resolution per timestamp (Period single, Time Interval, Pulse width, Rise/Fall time, Duty cycle, TIE), or 12 digits/s (frequency and period average).

Smart Frequency/Period avg. calculation mode

Statistics resolution enhancement algorithm (*smart mode*) gives up to one extra result digit depending on input signal and measurement setting.

Frequency A, B, D, E

Mode: ***Parallel measurements*** on up to 4 inputs. Back-to-back, with or without smart calculation
Range: 0.001 Hz to 400 MHz
Aux. Parameter: Vmax, Vmin, Vp-p

Frequency C (option)

Mode: Back-to-back, with or without smart calculation
Range: See input C
Aux. Parameter: Period C

Frequency Ratio (A,B,C,D, or E) / (A,B,C,D, or E)

Mode: ***Parallel measurements*** on 2 to 4 inputs.
Range: (10^{-9}) to 10^{11}
Input Frequency: See input A, B, D, E and C
Aux Parameters: Freq 1, Freq 2

Frequency Difference (A,B,C,D,E) - (A,B,C,D,E)

Mode: ***Parallel measurements*** on 2 to 4 inputs
Input Frequency: See input A, B, D, E or C
Aux Parameters: Freq 1, Freq 2

Frequency Offset A,B,C,D,E (Option 152)

Mode: ***Parallel measurements*** on up to 4 inputs, measures relative Frequency Offset from nominal frequency.
Range: see Frequency for inputs A, B, C, D, E
Input frequency: see input A, B, C, D, E

Period A, B, C, D, E average

Mode: ***Parallel measurements*** on up to 4 inputs. Back-to-back, with or without smart calculation
Range: See the inverse of Frequency specifications
Aux. Parameter:

- Ch. A, B, D, E: Vmax, Vmin, Vp-p
- Ch. C: Frequency C

TIE A, B, C, D, E (Option 151)

TIE = Time Interval Error, calculated as: *Accumulated period - Expected ("ideal") accumulated period*
Mode: ***Parallel measurements*** on up to 4 inputs. Back-to-back.
Freq range: See Frequency specifications
Aux. Parameter: Ref Frequency

Period A,B,D or E single

Mode: ***Parallel measurements*** on 1 or 2 inputs
Range: 2.5 ns to 1000 s
Aux. Parameter (A, B): Vmax, Vmin, Vp-p

Time Interval A,B,D,E (single or continuous)

Mode: ***Parallel timestamping*** of trigger events on up to 4 channels on continuous or single-shot signals.
Start and stop channel(s): any of A, B, D, E
Note: each input can produce 1 or 2 trigger events with individual trigger level and slope
Accumulated Time Interval: ON or OFF (adding or subtracting one start channel period to the Time Interval, when required)
Range: -1000 s to +1000 s
Repetition rate: up to 300 MHz or single-shot events
Min. Pulse width: 1.5 ns

Positive and Negative Pulse Width A,B,D,E

Mode: ***Parallel measurements*** on 1 or 2 inputs
Range: 1.5 ns to 1000 sec.
Repetition rate: up to 300 MHz or single-shot events

Rise/Fall Time A,B,D,E

Mode 1: ***Parallel measurements*** on 1 or 2 inputs of Rise OR Fall time, or
Mode 2: ***Single*** input measurement of Rise AND Fall time on the same pulse
Range: 1.5 ns to 1000 s
Aux. Parameters: Slew rate, Vmax, Vmin

Positive and negative Slew Rate A,B,D,E

Mode: ***Parallel measurements*** on 1 or 2 inputs
Calculation: (80% of Vp-p) / (Rise or Fall Time)
Aux. Parameters: Rise/Fall time, Vmax, Vmin

Positive and Negative Duty Cycle A,B,D,E

Mode: ***Single*** input meaurement
Range: 0.000001 to 0.999999
Repetition rate: up to 300 MHz
Aux. parameters: Period, Pulse width

Phase A Relative B, B Relative A

Mode: Intended for phase shift or delay measurements of two signals with identical frequency
Accumulated Phase: OFF or ON (adding or subtracting 360° to the Phase, when required)
Range: -180° to +180° (Acc. Phase is OFF)
Resolution: 0.00003° to 100 kHz, decreasing to 0.03° >100 MHz. (10k sample statistics averaging)
Freq. Range: up to 300 MHz
Aux. Parameters: Freq (A), Va/Vb (in dB)

Totalize A,B,D,E

Inputs: up to 4 inputs (A, B, D, E)
Mode: Tot A, B, D, E; Tot A+B, D+E; Tot A-B, D-E: Tot A/B, D/E
Range: 1 to 10^{10} counts
Freq range: up to 400 MHz
Start control: Manual, start arming
Stop control: Manual, stop arming, timed

Vmin, Vmax, Vp-p, DC Offset A,B,D,E

Range: -5 V to +5 V, -50 V to +50 V
Freq. Range: DC, 100 Hz to 200 MHz
Coupling: Sine (AC or DC), Square (DC only)
Resolution: 1 mV (5 V range), 10 mV (50 V range)
Uncertainty (5V range):

- DC, 1 Hz to 1 kHz: <1% +15 mV
- 1 kHz to 20 MHz sine: 3% +15 mV (typ.)
- 20 to 100 MHz sine: 10% +15 mV (typ.)
- 100 to 200 MHz sine: 30% +15 mV (typ.)

(For square waves add 10% to Vmax,/min & 20% to Vp-p)
(For 50V range, add 2% + 150 mV)
Aux parameters: Vmin, Vmax, Vp-p

Input Specifications

Inputs A, B, D and E

Frequency Range:

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

Impedance: 1 MΩ // 40 pF or 50 Ω (VSWR ≤2:1 typ.)
Trigger Slope: Positive or negative
Channel-channel skew: 100 ps rms (after calibration)
Sensitivity (typical):

- DC-400 MHz: <70 mVrms (PreAmp=OFF)
- DC-100 MHz: 15 mVrms (PreAmp=ON)
- 100-200 MHz: 25 mVrms (PreAmp=ON)
- 200-350 MHz: 35 mVrms (PreAmp=ON)
- 350-400 MHz: 50 mVrms (PreAmp=ON)

Hysteresis window: approx. 20 mV (PreAmp=OFF)
Attenuation: x1, x10
Dynamic Range (x1):
PreAmp = OFF: 0.2 to 10 Vp-p within ±5 V window
PreAmp = ON: 0.04 to 2 Vp-p within ±1 V window
Trigger Level: Read-out in menu

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

Trigger Level modes: Manual, Relative (to Vp-p), Auto
Auto Trigger Level is set to:

- 50% point of input signal's Vp-p, combined with a wide hysteresis between the 40% and 60% points, for frequency, period average, TIE
- 10% and 90% points, for Rise/Fall Time, Slew rate, combined with minimum hysteresis
- 50% point with minimum hysteresis for all other functions
- Min. voltage 200 mVp-p

Analog LP Filter: Nominal 10 or 100 kHz selectable
Max Voltage Without Damage:

- 1 MΩ: 350 V (DC + AC pk) to 440 Hz, falling to 12 Vrms at 1 MHz.
- 50 Ω: 12 Vrms

Connector: BNC

Input C (Option 10)

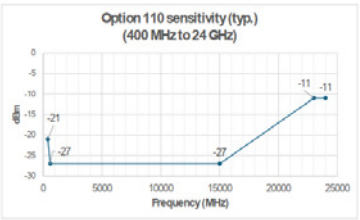
Operating Input Power Range opt. 10:

- 100 to 300 MHz: -21 dBm to +35 dBm
- 0.3 to 2.5 GHz: -27 dBm to +35 dBm
- 2.5 to 2.7 GHz: -21 dBm to +35 dBm
- 2.7 to 3.0 GHz: -15 dBm to +35 dBm

Prescaler Factor: 16
Impedance: 50 Ω nominal, VSWR <2.5:1 typ.
Max Power without Damage: +35 dBm
Connector: Type N Female

Input C (Option 110)

Freq. Range: 0.4 to 24 GHz; As standard SW limited by 10 GHz. Upgradable by SW license to 15, 20 or 24 GHz



Max Operating Input Power Level: +20 dBm
Prescaler Factor: 64
Impedance: 50 Ω nominal, VSWR <2.0:1 typ.
AM tolerance: > 90% within sensitivity range
Max Power Without Damage: +27 dBm
Connector: 2.92 mm, SMA compatible Female

Rear Panel Inputs and Outputs

Reference Input

Frequency: 1 MHz: 0.2 to 5 Vrms sine;
5 or 10 MHz: 0.1 to 5 Vrms sine
Impedance: 50Ω (nom.)

Reference Output

Source: External input if used, otherwise internal
Frequency: External ref freq., or 10 MHz (internal)
Output impedance: 50 Ω
Amplitude: 1Vrms sine into 50 Ω (nom.)

Arming Input

Arming of all measuring functions

- Impedance: Approx. 1 kΩ
- Freq. Range: DC to 160 MHz
- Trigger level: approx. 1.5 V fixed
- Trigger slope: Pos. or neg. selectable

Programmable Pulse Output (Option 132)

Pulse mode: Pulse generator, Gate open, Alarm
Period range: 10 ns - 2 s in 2 ns steps
Pos. Pulse width range: 4 ns - 2 s in 2 ns steps
Min negative pulse width : 6 ns
Rise time: 2.5 ns (nom.)
Output impedance: 50 Ω (nom.)
Output level: Low <0.4 V; High: 4.5-5.25 V (open output); 2.0-2.5V (50 Ω load)

Auxiliary Functions

Trigger Hold-Off

Time Delay Range: 20 ns to 2 s in 10 ns steps

External Start and Stop Arming

Modes:

- Start Arming
- Stop Arming
- Ext. Gate (combined Start and Stop Arming)

Arming channels: A, B, D, E or rear panel ARM
Arming delay to first trigger ready: <5 ns
Start/Stop Time Delay Range: 20 ns to 2 s

Statistics

Functions: Maximum, Minimum, Mean, Δmax-min, Standard Deviation and Allan Deviation
Display: Numeric or frequency distribution graph
Sample Size: 2 to 16x10^6 samples
Max. sample rate:

- up to 140 kSa/s calculated
- up to 20 MSa/s captured

ADEV Graph (Option 161)

Besides the "Statistics" block, ADEV values for different τ values can be calculated and displayed on a separate plot.
Supported measurement functions:
Frequency, Period Average, Frequency Offset, Time Interval, Time Interval Single, TIE functions.
Support for down-converted signals with Math function K×X+L.
ADEV range: 50 ns to >24 h, selectable via Sample Interval and Sample Count
Floor @ 1 s: 1x10^{-11}
Floor @ 1000 s: 1x10^{-14}

Limit alarm

Graphical indication of limits with Pass/Fail message on front panel, SNMP notifications or Pulse Output.
Limit Qualifier: OFF or Capture values above, below, inside or outside limits

Sample Interval (Gate time)

The Sample Interval sets the measuring time (gate) in Frequency/Period modes, the timing gate in Totalized timed measurements, and the time between measurements/samples in all other modes except Voltage mode (fixed interval) and Frequency Offset mode (preset gate time, depending on set required accuracy).
Range: OFF or 50 ns to 1000 s

Mathematics

Functions: OFF, (K*X-L)/M, (K/X-L)/M, X/M-1
X is current reading, and K (Scale factor), L (Nulling value) and M (Reference value) are constants

Other Functions

Timebase Reference: Internal, External or Auto-selected
Restart: Aborts current measurement and starts a new
Run/Hold: Switch between RUN (continuous measurements) and HOLD (Freezes result, until a new measurement is initiated via Restart)

Save and Recall Settings and Measurements

Instrument Set-ups can be saved/recalled. Setups saved to internal memory can be user protected.
Measurement results (RAM) can be accessed by connected PC, and/or saved in internal non-volatile memory, and moved to USB stick.
Max. Measurement Speed and Storage size (RAM):
20 MSa/s (1 to 4 inputs): 16k samples
12.5 to 3.125 MSa/s (1 to 4 inputs): 32M samples

Display

Display: Graphic screen for menu control, numerical read-out, status information, plus distribution, trend and time-line graphs
Resolution: 1280x720 pixels
Type: Color Touch 5" TFT LCD display with backlight
Front panel accessible tools: Graph smoothing, pan and zoom, cursor read-out

Remote interfaces

Remote operation

Programmable Functions: All front panel accessible functions
Data Output format: ASCII, IEEE double precision floating point, or packed

USB interface

USB version: 2.0
Connectors:
Rear panel: 1x Type B; (Device) used for remote communication and data transfer both ways
Protocol: RNDIS (Ethernet over USB)*
Front panel: 2x Type A; (Host) 5 V (nom.) max. 0.5 A. Used for FW updates, mouse/keyboard connection, external result storage, WiFi dongle.

**later availability*

LAN & WLAN interface

Speed: 10/100/1000 Mbps
Max. measurement rate (depending on measurement settings):
Block mode: up to 170k readings/s
Individual results: up to 425 readings/s
Capabilities:
- Web server
- SCPI over HiSLIP protocol, compatibility with VISA

Supported WiFi USB-dongles:
TP-Link TL-WN321G, TP-LINK Archer T4U v.2, TP-LINK Archer T4U v.3

GPIB (Option 26)

Compatibility: IEEE 488.2-1987, SCPI 1999
Interface Functions: SH1, AH1, T6, L4, SR1, RL1, E2, DC1
Max measurement speed:
220 readings/s for individual measurements
7300 readings/s for block measurements

Time Base Options

Option model	STD	30	40
Time base type:	TCXO	OCXO	OCXO
Uncertainty due to: -Aging per 24h per month per year -Temperature variations: 0°C to 50°C 20°C to 26°C (typ. values)	 n/a <2x10^{-7} (typ.) <1x10^{-6} <5x10^{-7} not specified	 <5x10^{-10} (1) <1x10^{-8} <5x10^{-8} <5x10^{-9} <1x10^{-9}	 <3x10^{-10} (1) <3x10^{-9} <1.5x10^{-8} <2.5x10^{-9} <4x10^{-10}
Short-term stability: τ =1s (Allan Deviation) τ =10s	<1x10^{-9} (typ.)	<1x10^{-11} <1x10^{-11}	<1x10^{-12} <1x10^{-12}
Power-on stability: Deviation vs. final value after 24 h on time, after a warm-up time of:	 <1x10^{-6} 5 min	 <1x10^{-8} 10 min	 <5x10^{-9} 10 min
Typical total uncertainty, for operating temperature 20°C to 26°C, at 2σ (95%) confidence interval: -1 year after calibration -2 years after calibration	 <1.2x10^{-6} <2.4x10^{-6}	 <6x10^{-8} <1.2x10^{-7}	 <1.8x10^{-8} <3.5x10^{-8}

[1]*After 1 month of continuous operation*

Calibration of Timebase Oscillator

Mode: Closed case, electronic calibration, menu controlled. Calibration menu is password protected.

Ref. Cal. Frequencies: 1, 5, 10, 1.544 or 2.048 MHz

General Specifications

Environmental Data

Class: MIL-PRF-28800F, Class 3

Installation category: II

Operating Temp:
0°C to +50°C / 5 to 75% RH, bench-top,
0°C to +40°C / 5 to 75% RH, rack-mount

Storage Temp: -40°C to +71°C

Max altitude: 4600 meters

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 61010-1:2011, pollution degree 2, installation/over voltage category II, measurement category I, CE, indoor use only
CSA C22.2 No 61010-1-12

EMC: EN 61326-1:2013-06, increased test levels according to EN 61000-6-2:2008, Group 1, Class B, CE

Power Requirements

Max. Version: 100-240 V_{AC}
50-60 Hz (Nom.), <70 W

Dimensions and Weight

Width x Height x Depth: 210 x 90 x 395 mm
(8.25 x 3.6 x 15.6 in)

Weight: Net 3 kg (6.6 lb)

Ordering Information

Basic model

CNT-104S: 4-channel 400 MHz Frequency Analyzer, 7 ps resolution, std. TCXO timebase 1 ppm/year

Input C Frequency Options

Option 10: 3 GHz Input C (HW)
Option 110: 10 GHz Input C (HW)
Option 110/15: SW upgrade from 10 to 15 GHz
Option 110/20: SW upgrade from 15 to 20 GHz
Option 110/24: SW upgrade from 20 to 24 GHz

Timebase Oscillator Options (HW)

Option 30: Very High Stability, OCXO 50 ppb/year
Option 40: Ultra High Stability, OCXO 15 ppb/year

Other HW options (factory installed)

Option 11A: Rear panel inputs for inputs A,B,D,E (replace front panel inputs A, B, D, E)
Option 11C: Rear panel inputs for input C (replaces front panel input C)
Option 26: GPIB Interface

Other options (SW license enabled)

Option 132: Programmable pulse output
Option 151: TIE measurement function
Option 152: Frequency Offset measurement function
Option 161: ADEV Graph presentation view mode

Included with Instrument:

- 2 year product warranty[1]
- Line cord (*dependent on destination country*)
- Link to User documentation (PDF)
- Certificate of Calibration
- Important information document

1: Warranty period may be extended to 3 years, at no cost, by registering the product

Optional Accessories

- **Option 22/90:** Rack-Mount Kit- 1 unit
- **Option 22/05:** Rack-Mount Kit -2 units
- **Option 27:** Carrying Case - soft
- **Option 27H:** Heavy-duty Hard Transport Case
- **Option 31:** GPIB connector extender: used to enable simultaneous connection of GPIB and Ethernet cables
- **Option 90/03:** Calibration Certificate with Protocol; Standard TCXO oscillator
- **Option 90/06:** Calibration Certificate with Protocol; Oven oscillator
- **Option 90/06A:** ISO17025 Accredited Calibration Certificate with Protocol; Oven oscillator
- **Option 95/05:** Extended warranty 2 extra years
- **OM-100:** User's Manual English (printed)[2]
- **PM-100:** Programmer's Manual English (printed)[2]
- **SM-100:** Service Manual English
- **GS-100-EN:** Getting Started English (printed)[2]

2: Always available as download from the Pendulum website

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04.03.2026 CNT-104S rev.23
Specifications subject to change or improvements without notice.
4031 601 10011