

Time and Frequency Solutions



Pendulum Instruments

*Experts in Time & Frequency Calibration,
Measurement and Analysis*

pendulum
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Incorporating XL Microwave

Time & Frequency Counter Products

Timer / Counter / Analyzers

A revolution in time & frequency analysis

With the CNT-90 and CNT-81 timer/counter/analyzers, Pendulum Instruments offers the ultimate tools for measurement, analysis and calibration of frequency, time interval or phase. Whether in test systems, on the R&D bench, in the calibration lab or out in the field, the CNT-90 is the state-of-the-art timer/counter/analyzer and outperforms any existing counter on the market. The CNT-90 is fastest in the world and offers a unique ease-of-use with graphical display and built-in modulation domain analysis, all at an outstanding price. The CNT-81 comes in 2 versions: the ultra-high performance CNT-81 with 50 ps single-shot time resolution; and the ultimate CNT-81R including a built-in Rubidium time-base reference.

CNT-90 Counter and Modulation Domain Analyzer

- Display of jitter, histogram, trend and modulation domain
- Fastest in the world: 250k measurements/s to internal memory
- High resolution: 12 digits/s (freq.), 100 ps (time)
- 14 digit display
- Frequency range: 300 MHz / 20 GHz
- Unique ease-of-use: Multi-parameter display and graphic presentation of results
- USB and GPIB are standard
- Outstanding performance/price ratio
- Zero dead-time between measurements



CNT-81/81R Ultimate Time & Frequency Calibrator

- High resolution: 50 ps (time, single-shot), 11 digits/s (freq.), 0.001° (phase)
- Fast: 8000 measurements/s to internal memory
- Rubidium stability: 0.0001 ppm (CNT-81R)
- High trigger resolution: 1.25 mV
- Advanced arming/hold-off gives total measurement control



CNT-90

CNT-81

CNT-81R

Frequency Counters

With the CNT-85 and CNT-85R frequency counters and calibrators, Pendulum Instruments offers fast, accurate and easy-to-use tools for stationary and portable calibration of frequency, from LF to 8 GHz. These counters are designed for on-site calibration of the master clock in various radio base stations, and offer a test uncertainty ratio more than 50:1 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 low cost model CNT-85 or the ultra stable CNT-85R with a Rubidium timebase oscillator.

CNT-85, CNT-85R

- High resolution: 10 digits in 1s
- Low uncertainty: 0.0001 ppm (Rb) (CNT-85R)
- Short warm-up time: 10 min. to 4×10^{-10} (CNT-85R)
- Smarte input trigger system for any type of input signal, incl. bursts, AM, FM and noisy signals
- Display of input signal strength



Microwave Counters

Pendulum Instruments offers two microwave counter families. The 3000-series with integrated power measurements and an outstanding 60 GHz range; or the ultrafast CNT-90 with 20 GHz prescaler for precise measurements of CW, burst, sweep and frequency-agile signals. Our microwave counters and power meters suit both field, lab bench and test rack environments. For field applications like installation, maintenance and calibration of microwave links, radar (CW, burst and chirp measurements), satellite groundstations or radio basestations, the models give you ultra-high accuracy in a portable, compact, lightweight and rugged design.

XL 3000-series

- CW frequency and power measurements
- Wide frequency range to 60 GHz
- Compact, portable, rugged and battery operated
- 5-year warranty



CNT-90 with 20 GHz Input

- CW, burst, sweep, hopping, chirp, etc measurements to 20 GHz
- Follow very fast frequency changes, within 4 μ s, in real time
- Ideal for radar, satellite communication, military communication and missile guidance systems
- World's only 20 GHz Modulation Domain Analyzer (with zero dead time)



CNT-85

CNT-85R

XL-3200

XL-3260

XL-3400A

XL-3460A

XL-3600

CNT-90

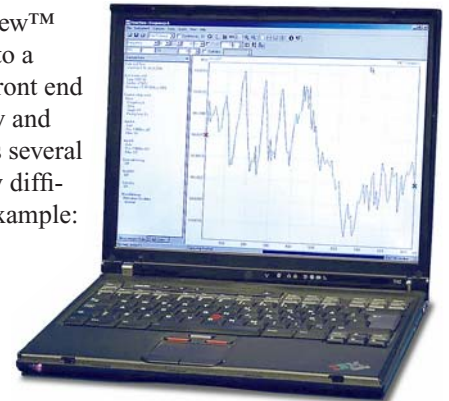
Modulation Domain Analysis

Amplitude and frequency are the two most important properties of any signal. Oscilloscopes are used for analyzing changes in amplitude over time. Spectrum Analyzers are used to analyze amplitude over frequency.

However, to view frequency changes over time, a third type of tool is needed: the Modulation Domain Analyzer (MDA).

The Pendulum MDA solution is the TimeView™ SW that converts the CNT-90 or CNT-81 into a MDA. The counter acts as a fast sampling front end that transfers its results to the PC for display and analysis. With TimeView™ you can address several applications, previously not possible or very difficult/expensive using other equipment, for example:

- Frequency agile communication
- Radar bursts and chirps
- Communication clock or data jitter
- Oscillator analysis via zero-deadtime ADEV
- Frequency hopping spread spectrum analysis



TimeView™ for CNT-90 and CNT-81

- Frequency range: Up to 20 GHz
- Sample speed: up to 250 000 samples/s
- Display mode:
 - Modulation domain (frequency vs time)
 - Any measured parameter vs time
 - Statistical distribution (histogram analysis)
 - FFT analysis (detect modulation frequencies)
 - ADEV / MADEV / Phase mod / Period back-to-back (CNT-90)
 - Waveform of input A or B signals

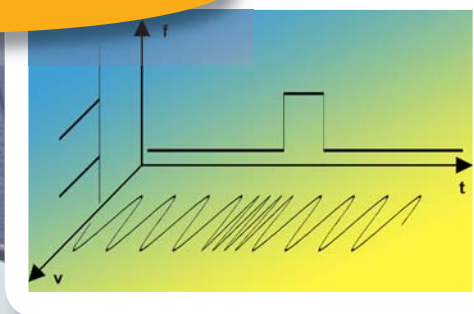
Counters Summary

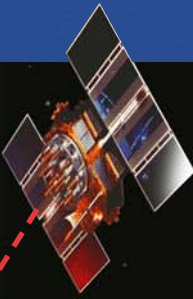
MODEL:	CNT-90	CNT-81/R	CNT-85/R	3000
Frequency range std/opt (Hz)	300M/20G	300M/8G	300M/8G	20G-60G
Time interval, Rise/fall time, Phase, Vp-p	✓	✓	–	–
Frequency resolution digits/s	12	11	10	up to 11
Time resolution single-shot (ps)	100	50	250	–
Timebase oscillator options	OCXO	OCXO/Rb	OCXO/Rb	OCXO/Rb
Input signal level meter	✓	–	✓	✓
Mathematics/Statistics	✓	✓	Math	–
Interface	USB/GPIB	GPIB	GPIB	GPIB
GPIB measurements/s (individually trgd)	550	250	100	15
Measurements/s to internal memory	250k	8k	1,5k	–
Graphical UI	✓	–	–	–
Trends/Histogram/Modulation	✓	via SW	–	–
Power measurements	–	–	–	✓
Battery option	–	–	✓	✓
Modulation Domain Analyzer	✓	✓	–	–

TimeView

CNT-90

CNT-81





GPS-controlled Frequency Standards

The Pendulum GPS-12R portable reference clock is an ultra-stable GPS-disciplined Rubidium reference, targeted for telecommunication applications and metrology. Its portability (internal battery), high stability and low noise output, make it the ideal reference source for telecom instrumentation and testers, like SDH/PDH/Sonet analyzers. When locked to GPS, the GPS-12R performs like a Cesium frequency standard, which makes it an ideal calibrator for Wandermeters of all brands. The frequency references are also suited for calibration laboratories, calibrating various instrumentation, like frequency counters and synthesizers.

GPS-12R

- GPS-disciplined Rubidium clock for close-to-Cesium clock stability
- 2.048 MHz or 1.544 MHz plus 1 pps standard outputs
- 5 & 10 MHz optional low-noise outputs for general lab use
- Internal battery option for transportation and mains-free field use
- Optional -48 VDC option for stationary use in telephone exchange stations



Stand-alone Frequency Standards

The models 6688 (OCXO) and 6689 (Rb) frequency standards are designed for use in test systems where a very high stability frequency reference is required and where multiple instruments or testers need to be supplied.

6688, 6689

- Rubidium or high stability oven-controlled frequency reference standard
- Distribution amplifiers for 10x10 MHz and 1x5 MHz outputs
- 0.001 ppm aging in 10 years (Rubidium)



GPS-12R

6688

6689

DA-35

DA-36

Frequency Distribution

The DA-35/36 distribute a reference frequency from the central standard to several receivers, via optical fibers, to assure freedom from noise pick-up and ground loops. The DA-35/36 drive any standard reference sine wave signal between 200 kHz to 16 MHz over any distance up to 2 kilometers.

DA-35 is designed for point-to-multipoint distribution and is modularly constructed, with plug-in cards to a rack backplane. There are two types of rack enclosures; one with 2 card slots, the other with 10 card slots.

DA-36 is designed for cost-effective point-to-point distribution, both for fiber and coax cables, and can also be used for multi-point distribution, by cascading several DA-36:s.

DA-35, DA-36

- No noise pick-up in optical fibres and EMP-proof
- No ground-loops
- Up to 2 km distance
- Up to 36 fibers and up to 1440 receiving outputs (DA-35)



Wandermeters

Wandermeters for SDH, PDH and SONET synchronization testing WM-11, WM-10

Bad synchronization in digital communication networks can cause severe transmission problems. Voice calls are lost, faxes misprint, and data are lost or frequently re-transmitted. In any case, network performance is degraded, the operators' service costs are up and revenues are down.

The main cause for synchronization problems in transport networks is wander of the synchronization clock. Measurement of wander often means bulky, complex and very expensive instrumentation, involving e.g. multi-box-solutions (external atomic-clock frequency standards and/or external PCs) and operation by a very costly expert during the days of use.

Not any more! Pendulum Instruments offer two affordable Wandermeter models that overcome these obstacles:

WM-10, a light-weight, accurate and very easy-to-use portable Wandermeter, for E1 clock and data signals (2.048 MHz / Mbps).

WM-11, for a multitude of data rates in SDH, PDH, SONET and frequency reference distribution networks, with the same accuracy and ease-of-use as WM-10. It can be remotely controlled from anywhere in the world via its Ethernet interface.

The Wandermeters can be used for several applications, for example synch audits, commissioning of networks, verification of network and equipment to ITU-T standard masks, trouble-shooting, preventive maintenance and quality control (incoming inspection) of network synchronization elements.

WM-11

WM-10



WM 10/11

- Wander measurements to 52 Mbits/s (data) and to 65 MHz (clock)
- MTIE and TDEV masks
- Everything included (Rubidium reference, SW, local graph display, synch clock output)
- Anyone can operate – no expert needed
- - 48V DC supply and Ethernet interface (WM-11)
- Affordable

Test Set for Antenna Alignment

The Path Align-R™ (models 2200/01 & 2240/01) test set is a high performance, affordable, and complete test solution designed for quick and accurate optimization the transmission path between two microwave antenna sites – all in a matter of minutes! The Path Align-R™ directly drives the site's antennas, there is no need for the antenna site's radios, expensive test equipment, ground technicians, on-site AC power, two-way radios, etc. The crew installing the antennas can align the link as soon as the antennas are hung – even before the rest of the equipment is on site! The Path Align-R™ comes complete with everything needed to align a microwave link and communicate between sites. All you'll need to supply is the appropriate waveguide-to coax adapters and the antennas!

2200/2240 Path Align-R™

- Battery-powered alignment test set of two transceivers
- Continuous Talk&Listen over link via included headsets
- Tuneable operating bands: 1.8 to 23.5 GHz (2240/2241)
- Available with Record-R™ Data Logging
- Tone ranging indication of path loss
- Path loss displayed in dB



Spectrum Monitor/Analyzer

The Analyze-R™, model 2261A, is an affordable, easy-to-use, application specific Spectrum Monitor/Analyzer that addresses the 900 MHz & 2.4 GHz unlicensed ISM bands; the 3.4 – 3.6 GHz licensed/unlicensed bands; the 4.9 GHz Public Safety band; the unlicensed 5 GHz U-NII / ISM bands; and, the 5.8 GHz DSCR band. The Analyze-R™ is designed for non-technical personnel doing site spectrum monitoring and analysis, surveying, installing, maintaining, and troubleshooting of the latest wireless communication systems. The optional power meter feature provides front panel observation and calculation of 'Total Channel Power' within a defined bandwidth – in real-time. This unique instrument is designed for field use and is a fraction of the cost of a general-purpose spectrum analyzer... and far easier to use!

2261A Analyze-R™

- Designed for spread-spectrum power measurement and interference identification
- 38 Selectable 100 MHz-wide bands to 6 GHz
- Data Logger with embedded GPS
- Auto C/I (carrier to interference) calculation
- Unattended Data Recording
- Sensitivity is > -103 dBm (1 MHz RBW)
- Battery-powered, 5 – 6 hrs.
- Rugged and light weight (7 lbs./3.2 kg)
- Total channel power measurements



2200

2240

2261A

About Pendulum Instruments

We are a world leading test & measurement company focused on solutions for calibration, measurement, and analysis of time and frequency. We have received several Honorable Mentions in the Test & Measurement World's "Best in Test" awards and we were also elected "Electronic Company of the Year" in Sweden 2004.

One of our great advantages is that all our products are developed in close co-operation with our customers. If our standard products do not fit your application, we are open to discuss a custom modification.

From our 40 years of experience in the test & measurement business as a spin-off company from Philips T&M division, we have now grown and have offices in Stockholm (Sweden), Oakland CA (USA), St Petersburg (Russia), and Beijing (China). Moreover, we have sales representatives located all over the world and we provide service/calibration in all continents.

We are proud to produce the world's highest performance timer/counter/analyzers and the world's only 20 GHz Modulation Domain Analyzer. We supply an extensive product line for calibration, measurement and analysis of time and frequency. Our products are characterized by high performance and quality, ease-of-use, excellent EMC-immunity and, last but not least, an unsurpassed performance/price value.

We are an ISO-9001 certified company. Our products are certified by CSA (Canada) and GOST (Russia) and compliant with the CE-requirements.



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