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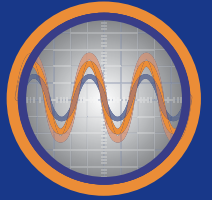
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Time & Frequency Test & Measurement



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pendulum
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Spectracom is a company of the Orolia Group.



Time & Frequency Calibration, Measurement and Analysis

When it comes to time & frequency calibration, measurement and analysis, the Pendulum line of test & measurement instruments offers world-leading performance. Application-specific products are designed for specific requirements for a variety of industries:

- high-speed, high-resolution analysis for R&D
- fastest throughput in manufacturing tests
- ease-of-use to optimize network installation and maintenance
- accuracy and traceability for metrology

In more than 80 countries all over the world, wherever accuracy and precision for time and frequency are required, you can find Pendulum instruments:

- metrology institutes
- defense forces
- aerospace and defense industries
- telecom manufacturers
- telecom operators and installers
- research institutes
- oscillator manufacturers
- wireless and RF industry and services
- calibration labs
- electronics and equipment manufacturers

50 Years of Expertise

Pendulum products have roots in Philips' test & measurement division. Pendulum Instruments AB was formed as a spin-off of Philips in 1998. XL Microwave, Inc. was integrated into Pendulum in 2005, which extended the range of products to microwave test instruments. In 2008, Pendulum Instruments was acquired by the Orolia Group and its operations continue today as part of the global Spectracom organization. In addition to test & measurement products, Spectracom offers timing & synchronization products, systems and services.

Quality and Recognition

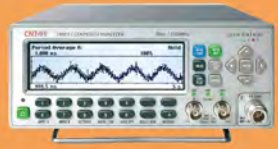
Spectracom operations meet the highest standards for quality, electro-magnetic compatibility and safety and all locations are ISO 9001 certified. Pendulum products are certified to CSA and Russian GOST. We have received several international awards, for example "The Electronic Company of the Year" in Sweden, and "Best-in-Test" honorable mention from Test & Measurement World magazine four times.

Product Summary

Time & Frequency Measurement

Time & Frequency Counters/Analyzers: World-leading time and frequency counter/analyzers up to 60 GHz, featuring ultrahigh speed and resolution with advanced graphics, zero deadtime, Allan deviation measurements and overall highest-performance.

Modulation Domain Analysis System: Combine a Pendulum counter with the unique TimeView software package to transform a Windows PC into a powerful, yet affordable, modulation domain analyzer to fully characterize frequency changes over time.



Signal Generation & Distribution

Frequency References/Standards: Ultra-precise reference clocks offer near-caesium stability through a combination of ovenized or Rubidium-locked oscillators and GPS synchronization. Stand-alone and portable versions are available.

Coax/Fiber Signal Distribution: Frequency Distribution Amplifiers for high performance fiber optic or coax transmission and distribution of reference clock signals to multiple locations.

GPS Signal Simulators: Single- and multi-satellite signal generation and simulation for fast testing of GPS receivers in manufacturing and development.



Network Testing

Synchronization Testing: A new generation of modular and portable synchronization test and analysis instruments for traditional and next-generation networks.

Microwave Path Alignment System: The only microwave antenna alignment solution that optimizes microwave link reliability in 20 minutes or less without site power or any other equipment.



Time & Frequency Counters/Analyzers

Pendulum Frequency Analyzers provide the ultimate speed, resolution and analysis of even the most complex signals with feature sets specific for a variety of applications:

For the R&D Laboratory:

Continuous: Zero-deadtime frequency sampling to 250kSa/s
 High resolution: 50 ps resolution, 12 digits/sec
 Range: to 60 GHz

For Manufacturing:

Fast: 15,000 measurements/second over GPIB
 Integration: USB, GPIB, HP/Agilent emulation
 Affordable: CNT-90 basic model

For the Calibration Laboratory:

Accurate: Rubidium time-base version

For Field Use:

Portable: Battery option, light-weight and compact
 Easy to use: Intuitive menu-oriented user interface
 Rugged: Meets MIL-PRF-28800T, class 3

CNT-91/91R Timer/Counter/Analyzer

- The most powerful frequency analyzer
- 0.001 Hz to 400 MHz, 20 GHz option
- 50 ps resolution
- Continuous measurements
- Rubidium time-base option for frequency calibration and analysis



CNT-90 Timer/Counter/Analyzer

- Affordable frequency measurements
- 0.001 Hz to 400 MHz, 20 GHz option
- 100 ps resolution



CNT-90 XL Microwave Counter/Analyzer

- Microwave frequency analyzer up to 60 GHz
- Frequency, power, CW, or burst
- Battery option



CNT-85/85R Frequency Counter

- Economical solution for portable (GSM base stations) or stationary calibration applications
- Battery option
- Rubidium option

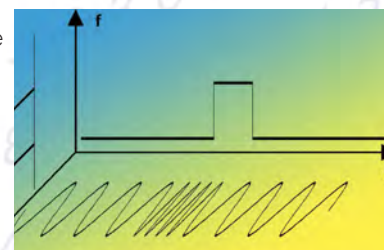


Counter/Timer/Analyzer Comparison

Model	CNT-91/91R	CNT-90	CNT-90XL	CNT-85/85R
Frequency range Std/opt (Hz)	400M/20G	400M/20G	400M/60G	300M/8G
Time Interval, Rise/fall time, Phase, V _{pp}	X	X	X	
Frequency resolution digits/s (max)	12	12	12	10
Time resolution single shot (ps)	50	100	100	250
Time base oscillator options	OCXO/Rb	OCXO	OCXO	OCXO/Rb
Mathematics/Statistics	X	X	X	Math
Interface	USB/GPIB	USB/GPIB	USB/GPIB	GPIB
Max GPIB speed (block)	15k/s	5k/s	5k/s	500/s
Max GPIB speed (individual)	4000/s	500/s	500/s	100/s
Measurements/s to internal memory/storage size	250k/s 3.75M results	250k/s 750k results	250k/s 750k results	1600/s 2.6k results
Graphical UI, Trends/Histogram/Modulation	X	X	X	
Power measurements			-35 dBm to +10 dBm	
Battery option		X	X	X
Modulation domain analyzer	TimeView™ 2 or 3	TimeView™ 2	TimeView™ 2	

Modulation Domain Analysis

Amplitude, frequency and time are the three most important properties of any signal. While oscilloscopes analyze changes in amplitude over time and spectrum analyzers measure amplitude over frequency, a modulation domain analyzer is needed to measure frequency changes over time.



The Pendulum Modulation Domain Analyzer includes a Pendulum counter/analyzer as a fast sampling front end. It transfers its results to a Windows PC running the TimeView™ SW. The latest version, TimeView™ 3, can emulate the behavior of the Agilent 53310A Modulation Domain Analyzer. Make measurements and analyze signals otherwise not possible, or very difficult using complex/expensive equipment, for example:

- Frequency agile communications
- Radar bursts and chirps
- Communication clock or data jitter
- Oscillator analysis via zero-deadtime ADEV
- Accurate calibration of FM parameters



PicoTime Test Set

The PicoTime™ is a low-cost, high-performance measurement test set for phase comparison and frequency stability measurements. It can be used stand-alone or as a frequency down-converting front-end to the CNT-91. The main application is clock characterization such as quartz crystal oscillators, Rubidium atomic clocks and cesium clocks or calibration of quartz crystal oscillators, and atomic clocks.

- Easy to use
- Small footprint
- 1 picosecond resolution
- No calibration required
- DUT frequency range: 1MHz-30 MHz
- Improves the ADEV measuring range for CNT-91 plus TimeView



Signal Generation & Distribution

Frequency References/Standards

Pendulum frequency standards are high stability reference clocks for telecommunications applications and metrology. GPS-disciplined and stand-alone ovenized oscillators with optional Rubidium generate low noise frequency signals 1/5/10 MHz and 1.544/2.048 MHz, and 1 pulse-per-second timing.

GPS-12/12R/12RG GPS Frequency Standard

- Portable standard with built-in GPS receiver
- GLONASS option
- Battery/-48 VDC options



GPS-88/89 Metrology Frequency Standard

- Fully traceable GPS frequency standard
- Print calibration reports
- Documents internal calibration of local oscillator to GPS
- Not available in United States or Canada

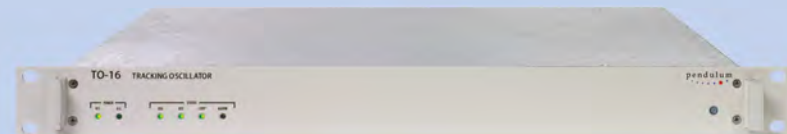


6688/6689 Stand-alone Frequency Standard

- For use in areas where GPS is not accessible
- Internal distribution amplifier



TO-16 Tracking Oscillator



- Tracks an external 5 or 10 MHz frequency signal
- Provides 4 ultra-low phase noise outputs phase-locked to the input

PicoReference Test Set



- Combines PicoTime measurement module with GPS frequency reference
- 1 picosecond resolution for phase comparison and frequency stability measurements
- Also provides precise frequency and 1PPS outputs

Frequency Standard Comparison

Model	GPS-12/12R	GPS-88/89	6688/6689	PicoReference
GPS controlled	X	X		X
Glonass/GPS controlled	GPS-12RG			
Rubidium/OCXO version	X/X	X/X	X/X	X/-
Traceable to UTC		X		
10/5/1 MHz output	X/X/X	X/X/X	X/X/-	X/-/-
1-PPS output	X	X		X
2.048/1.544 MHz outputs	X/X	X/X		X/-
2.048/1.544 Mbps outputs	X/X			
13/26 MHz outputs	X/-	X/X		
Battery option	X			
Interface	USB	RS232, ETH (opt)		RS232
Pulse output		To 5 MHz (programmable)		To 20 MHz (synthesizer)

Fiber/Coax Signal Distribution

- 200 kHz to 16 MHz frequency distribution
- Up to 2 km over optical fiber offers smaller cable size, no electromagnetic noise pickup nor ground-loop currents



DA-36

- Compact optical/electrical transceiver with 4 coax outputs
- Economical point-to-point distribution, or multi-point by cascading



DA-35

- Modular distributor with 10-slot or 2-slot rack enclosures
- Up to 36 fiber or 40 coax outputs per unit

GPS Signal Simulation

GPS receivers appear everywhere for positioning, navigation and timing. These receivers, and the devices that use them, require fast and thorough testing during development and manufacturing. Spectracom's expertise in precision signal generation for test and measurement, and in GNSS, allows us to offer compact, simple, yet powerful GPS signal generators and constellation simulators for developers and manufacturers of GPS-based electronics.

GSG-54/55 GPS 8-/16-Channel Simulator

- Versatile GPS Simulators with pre-configured and user defined test scenarios
- SBAS (EGNOS, WAAS) simulation (GSG-55)
- White noise generation for receiver SNR-test (GSG-55)
- Easy to use, fully operational via front-panel
- Multiple interfaces for remote control: ETH, USB, GPIB
- Repeatable and fast testing of position accuracy, simulated movements, multi-path, atmospheric conditions
- 1PPS output for timing receiver testing



GSG-L1 GPS Signal Generator

- Affordable one-channel GPS signal generator
- Over-the-air or conducted receiver testing of satellite acquisition and sensitivity

Network Testing

Synchronization Testing

STA-61 Sync Tester/Analyzer

The STA-61 is the only field instrument for testing synchronization quality for both legacy and next-generation communications network clocks; SDH/SONET, Synchronous Ethernet, Precision Time Protocol (PTP). Ideal for installation, qualification and troubleshooting the interface between core networks and Ethernet backhaul and backhaul networks and wireless nodes.



- Portable and compact
- Easy-to-use color LCD touch screen
- Modular and upgradeable
- Up to 6 simultaneous test points and remote operation via web interface
- High accuracy Rubidium reference self-calibrates to GPS option

Microwave Path Alignment System

2200/2400 Path Align-R

The Path Align-R™ is the only complete test solution designed to optimize microwave path alignment. The test set is a pair of tunable synthesized signal sources and narrow-band receivers in a variety of configurations and packages to match your needs. Endorsed by leading wireless communications suppliers, it provides quantitative alignment results in less than 20 minutes without the need for power, radios, other test equipment, ground technicians, or cell phones. It provides the highest confidence by documenting the actual path loss of wireless microwave links along with date, time, and location.



- Portable, battery-powered, lightweight unit with backpack for field applications
- Full duplex voice communication during path alignment over link
- Calibrated transmitter and receiver ensures accurate path loss readout
- Four tunable operating frequency bands
- Data logger with embedded GPS receiver for recording date/time, position, and path-loss data
- Accurately document antenna alignment with Log View-R software

Customer Testimonials

"I recommend Pendulum counters (CNT-90 and CNT-91) to all my customers because they are cost effective in providing many precise functions as compared to other counters of same or higher price."

Dr. Alex Lepek
Newton Metrology Ltd.

"We use Pendulum CNT-90XL in production and engineering. The combination of fast power and frequency measurements greatly improves our production throughput. Another advantage is the USB interface compared to GPIB."

Robert Mock
General Manager
InnoSenT GmbH, Germany



"NHK uses the Pendulum GPS-12R as the reference clock for our digital broadcasting field analyzers. We chose it because of the built-in battery enabling it to run with no warm-up time in the field and also because it is so light and small that it can be carried around easily."

Taisuke Sugawara
Metropolitan Area Engineering Center
Japan Broadcasting Corporation

"Our Path Align-R 2200A has been indispensable over the years. The units save time and effort when it comes to aligning our back haul antennas, ease of use and reliability are top notch. Even with long links in excess of 40 miles. Thank you Path Align-R."

CommSpeed LLC

