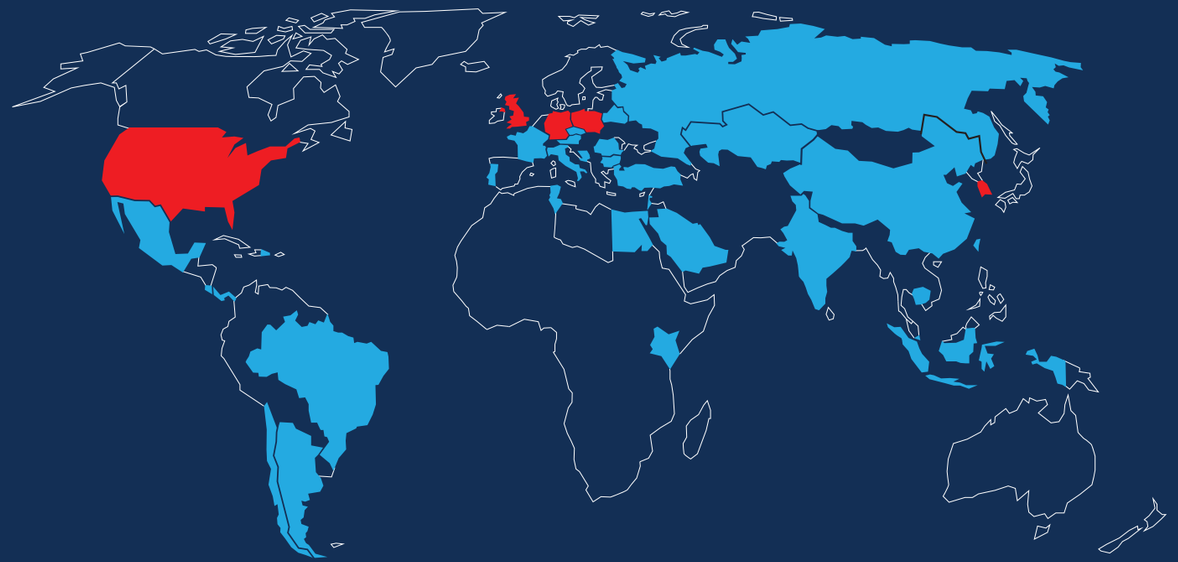
PIK TIME SYSTEMS®

PRECISE TIME AND FREQUENCY COMPANY

PRODUCT CATALOGUE 2023

KEY PARTNERS AND CUSTOMERS

Over 160 various time transfer systems delivered to nearly 40 countries.



MAP KEY:

TTS users

OSTT and TTS users

AFRICA: Egypt, Tunisia, Kenya.

AMERICA: United States, Mexico, Dominican Republic, Costa Rica, Panama, Brasil, Chile, Argentina.

ASIA: Russia, China, Kazakhstan, India, South Korea, Hongkong, Taiwan, Singapore, Indonesia, Turkey, Israel, Saudi Arabia.

EUROPE: Austria, Belarus, Bosnia, United Kingdom , Bulgaria , Montenegro, Netherlands, Germany, Romania, Portugal, Poland, Ukraine, Italy, France.

Piktime Systems Sp. z o.o. - precise time and frequency sector company, established in 2007. We focus on research, development and manufacturing equipment for:

- precise, long-distance atomic clocks comparison (TTS-5),
- dissemination of precise time & frequency signals using optical ibres, in co-operation with AGH University of Science and Technology in Kraków (OSTT-4),
- precise time & frequency counters with precision of a few picoseconds for direct comparisons (e.g. T3200, T4100),
- turn-key solution for power, telecommunication, intech, public sectors – secure time and frequency distribution (STDS-8).

Main Activities:

- development of time related products and services (navigation, security, data and documents exchange, time stamping), especially based on satellite navigation systems,
- advisory on precise time and time scales,
- time & frequency software and algorithms,
- designing and execution of time and frequency laboratories on a turn-key basis, with precise clocks, time & frequency comparisons equipment and distribution units.

Core competences:

- sound knowledge and hands-on practice in precise time,
- proven capacity of software development according to ESA standards,
- access to necessary scientiic equipment and infrastructure,
- experience in production of precise equipment for time & frequency.

TTS SERIES RECEIVERS OPERATE, AMONG OTHERS, IN:

CONTROL SEGMENTS OF NAVIGATION SATELLITE SYSTEMS:

- GLONASS (Russia),
- GALILEO (Fucino/Italy, GALILEO Precise Time Facility),
- ISRO (Indian Space Research Organization).

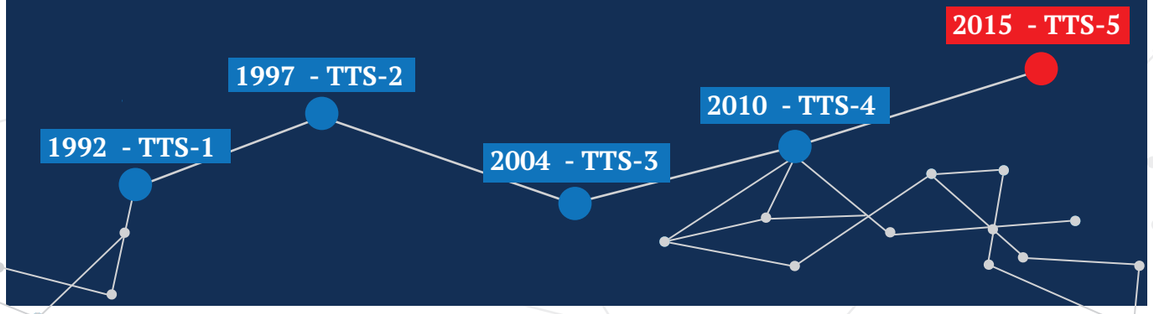
THE LEADING PHYSICAL LABORATORIES AND METROLOGICAL INSTITUTES:

- BIPM (Bureau International des Poids et Mesures),
- VNIIFTRI (Russian National Measurement Institute),
- USNO (United States Naval Observatory),
- INRIM (National Institute of Metrological Research, Italy),
- NPL (National Physical Laboratory, India),
- GUM (Central Ofice of Measures, Poland).

KEY USERS OF OSTT:

- National Institute of Standards and Technology (NIST) - Boulder, USA,
- The United States Naval Observatory (USNO) - Washington, USA,
- Physikalisch-Technische Bundesanstalt (PTB) - Germany,
- The National Physical Laboratory (NPL) - United Kingdom,
- Deutsche Telekom (Germany).

HISTORY OF TTS



It has been over 23 years since the irst, single frequency TTS-1 receiver the irst in the family was introduced, followed by a very successful TTS-2, irst multi-channel GPS timing receiver. Then TTS-3, for many years the only GPS & GLONASS receiver on the market. Now TTS-5, developed from scratch, released in 2015, after 2 years of R&D work.

Till now more than 150 units have been delivered to over 30 countries. As our core product, TTS is being continuously improved towards better observation results and deployment of the recent time & frequency progress. Software upgrades are provided free of charge, on average every 3 months.

Excellent observation results long and stable operation, wide coniguration possibilities, as well as user friendly solutions are main advantages of the system. TTS-5 generates data on its own and requires no daily assistance. The system is working under LINUX providing multitasking and integration with the network.

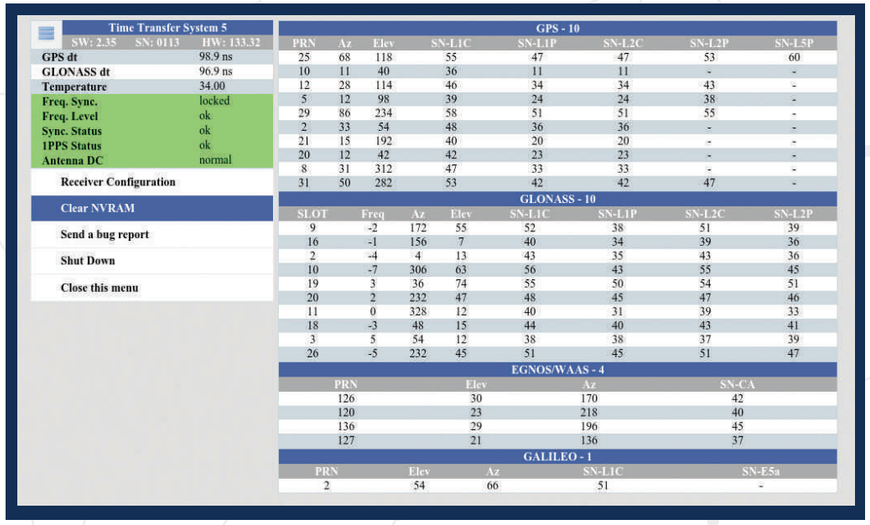
TIME TRANSFER SYSTEM TTS-5

Conidence through experience

TTS-5 approved CE

Development and certiication co-inanced by PARP

Main screen of TTS-5



Access, Operating & Coniguration
Immediate access to observations, receiver coniguration and main parameters using:
- built-in touch screen
- Web interface
- external USB keyboard

Data recording & storage
Data can be:
- downloaded using Web interface (using Web browser)
- downloaded using integrated FTP server
- sent to external FTP server (using Web browser)
- saved to USB memory (using console or Web interface)
- 1 TB redundant data storage (RAID 1 mirro-ring, 2x1TB HDD

Tracking features
Supported navigation systems:
GPS, GLONASS, Galileo, WAAS/EGNOS, Beidou

Supported frequencies *:
GPS: L1, L2, L5
GLONASS: L1, L2, L3
GALILEO: E1, E5A, E5B, altBoc, E6
BEIDOU B1,B2,B3

Supported codes *:
GPS: L1C, L1P, L2C, L2P, L5P,CA/L1
GLONASS: L1C,L1P,L2C,L2P,L3
BDS2 B1I, B2I, B3
BDS3 B1I, B1C ,B2A, B2B, B3, ALTBOC
GALILEO: E1, E5A, E5B, altBoc, E6

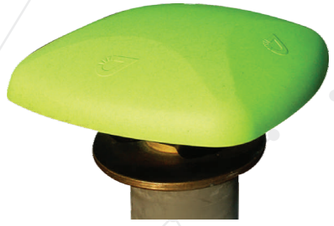
* depends from the options

Input / Output
3-20MHz frequency input (selected by user)
Local reference 1PPS input
1PPS output
Antenna TNC connector
1000BASE-T Ethernet port
2 USB connectors on the front panel
2 USB connectors on the rear panel

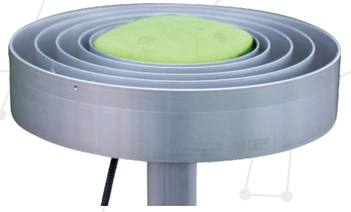
Physical & Environmental
Main unit dimensions:
410 mm x 298 mm x 133 mm
Rack ready, light aluminium housing
Touch screen – 7” TFT LCD
Display resolution 1024 x 600
Operating voltage: AC 90 ~ 264V 47 to 63 Hz Power Consumption < 40W Redundant power supply
Operating temperature: 0° C to +50° C

Time stability
Precision for phase observation: for a short term, short baseline precision 12ps RMS
Precision for code observation: 0.4ns RMS (receivers connected to the same reference standard)

Antennas:



Standard antenna



Choke ring antenna

Temperature stabilized choke ring antenna

Data characteristics & availability
Data type: Code and Carrier
Data output format: CGGTTS, RINEX.
Data formats meet all requirements.
Data availability:
CGGTTS: 30 sec after each 13-min. observation session
RINEX: in real time

Our main concern is improvement of TTS-5 performance. In result, every several months, software upgrade is released and all TTS-5 users are notiied. Software upgrades are free of charge.
We offer free of charge customer assistance.

Time Transfer System TTS-5 is in compliance with requirements of European Union law.

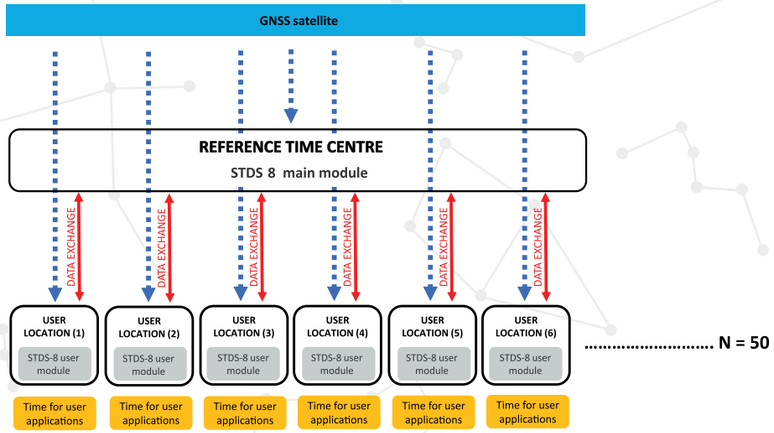
STDS 8

SAFE TIME DISTRIBUTION SYSTEM - 8

Introduction
Synchronization is mostly based on direct readings from GNSS (mainly GPS offering good accuracy at no cost). However, this is not a perfect way.
Such solution is a threat to users due to:
- Dependency on GPS
- Not providing a reference time
- Easy to be jammed
- Risk of spooing
- Dramatic consequences if the time source fails or become unreliable

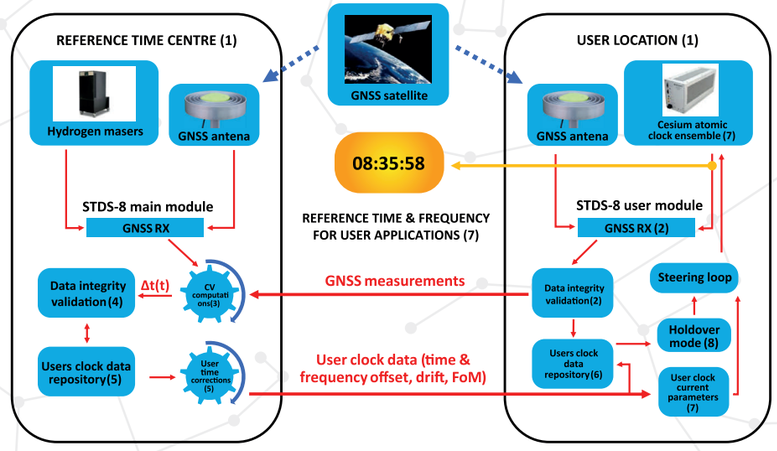
Improvement comes with our recent development – **STDS-8**. It stands for:
Safe because it makes your time scale independent from GNSS observation, resistant to spooing or jamming.
Time because the STDS-8 provides your critical business applications with the time signal at accuracy according to your needs.
Distribution because we implemented robust and eficient signal distribution and data exchange.
System because it can cover all elements essential for realization of your time scale.

Solution overview



Principle of operation of the STDS.

Solution architecture



Architecture of the STDS.

Solution - description

User and Reference Time Centre (RTC) perform simultaneous CV GNSS measurements, according to a predeined schedule;

Results of the User measurements are veriied before being sent to the RTC;

The RTC after receiving the results of the User measurements, determines the delay Δt (t) for measuring period t;

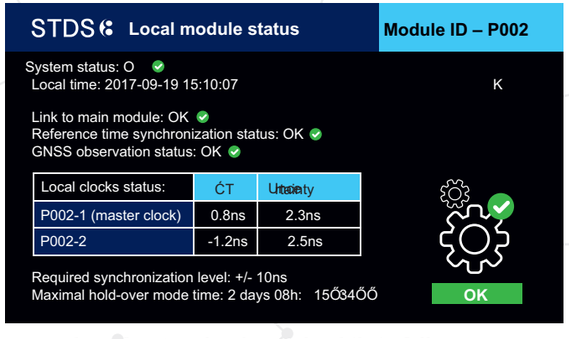
Δt (t) is veriied for the integrity of the measurements, using User data history;

Data are stored at the RTC, in the User repository, from where they are downloaded to calculate the best possible estimation of User clock parameters. This estimation is also performed if the last measurement is determined as invalid in the data integrity check. This is because the estimates are based on the full set of data stored for the User's clock;

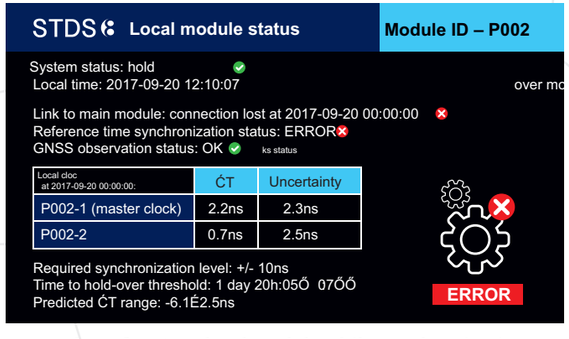
Data are authenticated and encrypted and then transmitted to the User where they are stored in local archives;

The current set of parameters is used to control the user clock which provides the physical User time realization, that can be further distributed to User applications;

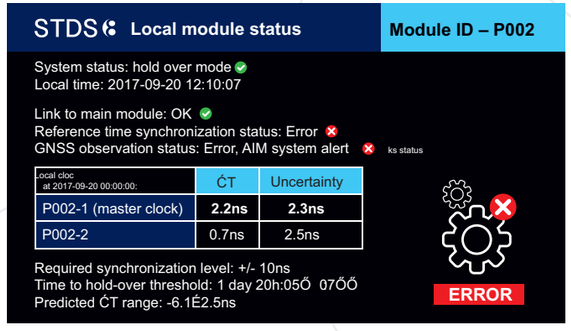
When current parameters are not available or not correct, the user can generate a local copy of the oficial time in the holdover mode but only if the local clock distribution's goodness factor relects its current status.



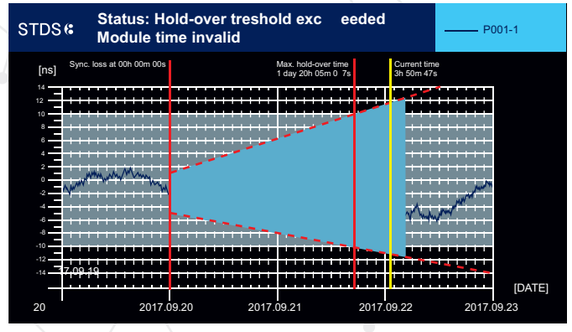
Screenshot of STDS-8 local module while in full Synchronization mode.



Screenshot of STDS-8 local module while Synchronization is lost due to connection failure.



Screenshot of STDS-8 local module while Synchronization is lost due to GNSS observation failure.



Screenshot of STDS-8 local module while in Hold-over module active.

Core features

Autonomus
The use of local atomic clocks at User premises allows independent integration of a local time from a stable frequency source (atomic clocks) with the time disseminated from the Master Reference Time Centre. Such solution allows to add autonomous local integrity to the time distributed from Master Reference Time Centre;

Reference time
The use of the CV (Common View) technique, based on GNSS signals, to transfer accurate reference time. In such solution, GNSS is only a medium for time comparison not a source of time as in other systems;

Tracebility
Data integrity validation system at Master Reference Time Centre constantly monitors User atomic clocks and tracks their behavior with respect to the reference time from the Master Reference Time Centre. All data are stored for the future veriication. Clocks behavior can be tracked and checked with help of www interface at any time;

Autonomous integrity monitoring
Autonomous integrity monitoring detects and removes outlier resulting from a measurement error or counterfeit attempt.

FIBER-OPTIC TIME AND FREQUENCY DISTRIBUTION SYSTEM OSTT-4

OSTT-4 Local Module

OSTT-4 Remote Module

Introduction and key features

OSTT-4 has been developed by Polish AGH University of Science and Technology.

The local module of the system accepts the frequency and time signals (10MHz and 1PPS) and transmits them via an optical iber to the remote module. In contrary to standard two-way systems, our solution delivers stabilized and calibrated *replica* of source signals, thus may be described as a virtual atomic clock at the end of the iber.
OSTT-4 may be used for clock comparisons, and is a great way for a perfect time and frequency distribution to users not maintaining their own clocks.

Clients are the best reference. Please see a list of some noted users below:
- National Institute of Standards and Technology (NIST) - Boulder, USA,
- The United States Naval Observatory (USNO) - Washington, USA,
- Physikalisch-TechnischeBundesanstalt (PTB) - Germany,
- The National Physical Laboratory (NPL) - United Kingdom,
- Deutsche Telekom - Germany.

Active delay stabilization

The unique features of the system are based on the concept of active compensation of variations of the iber delay. The signal reaching the remote module is redirected backward to the local module and used for compensation of path delay luctuations.

Autocalibration

Calibration of the time transfer is based on round-trip delay measurement, which is performed locally at the transmitting side of the system. After installation and initial calibration, the input-to-output delay is constant and there is no need for any further measurements or data exchange.

Speciications

1) OSTT-4 consists of a local and remote module for time and frequency transfer,
2) Transfers 10 MHz signals (100MHz as an option), ADEV below $3x10^{-13}$ for 1 s averaging, below $3x10^{-17}$ for 10^5 s averaging,
3) Transfers 1PPS signal (also 100PPS), phase synchronous with frequency signal, TDEV below 3 ps for 10 s averaging, below 1 ps for 10^5 s averaging,
4) Output 1 PPS position adjustment: 1 ps resolution, negative delay also possible,
5) Operates bi-directionally on a single optical iber in C band, maximum optical loss 25 dB,
6) OSTT-4 is actively stabilized against iber induced phase luctuations; the phase correction range is 2000 ns,
7) As an option the system can be enriched with optical ampliiers.

MULTICHANNEL TIME COUNTER MTC108

MTC108 is a unique, state of the art, autonomous system for high-precision metrology of time and frequency. This system allows for: (1) fast and accurate registering of physical events on a common time scale; (2) measuring the time intervals between any registered events; (3) measuring the frequency within a wide range; (4) evaluating the stability of frequency sources, especially reference atomic clocks; (5) transferring the measurement data for further external processing. A user-friendly control of the sys - tem is provided either locally, through the built-in keyboard or/and color touch panel, or remotely, with the aid of USB or Ethernet interfaces. The successful combination of programmable devices technology and sophisticated measurement method results in the broad functionality and exceptional parameters that meet the virtually all fundamental needs of time/frequency laboratory or Automatic Test Equipment environment.

Functions	Time Interval (between pulses at up to eight inputs or pulses appearing consecu - tively at a single, common input) Time Interval Error, Maximum Time Interval Error, Time Deviation Frequency Allan Deviation
Statistics	Mean, Min and Max Values, Standard Deviation
Time Interval	
Range	73 min
Resolution (LSB)	1.9 ps in single-shot measurements, Independent, Common High Speed and Source Comparison modes 0.95 ps in single-shot measurements, Averaging Mode 0.67 ps in single-shot measurements, Common High Precision Mode
Precision (Standard Deviation)	< 6.5 ps at time interval measured from 0 to 500 ms (internal rubidium) up to 4.5 ps in Common High Precision mode
Systematic Error	< ± (1 ns max + (Timebase Error x Interval) + Trigger Level Timing Error)
Range Limit (Overlow)	presettable: 1 s, 10 s, 100 s, 1000 s (w liczniku jest od 100ms do 10s!)
Start Enable	internal (controlled by software)
Dead Time	< 90 ns
Measurement Rate	up to $11 \cdot 10^6$ time stamps/sec/channel up to $50 \cdot 10^6$ time stamps/sec (Common High Speed, consecutive pulses delayed less than 10 ns to) up to $90 \cdot 10^6$ time stamps/sec (Common High Speed, consecutive pulses delayed less than 10 ns to) up to $250 \cdot 10^6$ time stamps/sec (Common High Speed, irst 8 pulses)
Frequency & Period	
Range	Inputs 1 - 8: 1 mHz to 250 MHz Sensitivity < 75 mV RMS typ. (0.01 to 250 MHz) Minimum slew rate: 10 V/µs Input F: 100 MHz to 3.5 GHz Sensitivity < -12 dBm (< 55 mV RMS) from 400 MHz to 3 GHz Sensitivity < - 3 dBm (< 160 mV RMS) from 100 MHz to 3.5 GHz
Gate Time	selected from1 µs to 10 s (reciprocal method)
Dead Time	0 ns between consecutive measurements
Measurement Rate	up to 10^6 measurements/sec (depends on selected gate)
Inputs 1-8	Impedance: 50 W, DC coupled; SMA sockets Amplitude: within ± 4 V Pulse edge: selectable, rising or falling Threshold: manually adjustable from -4 V to +4 V with 8 mV resolution, or set automatically
Internal Clock Generator	10 MHz TCXO, stability 5×10^{-7} (- 40 to +85 °C), ageing 1×10^{-6}/year 10 MHz rubidium (optional), stability 2×10^{-11} (- 55 to +85 °C), ageing 5×10^{-10}/year
External Clock Generator	10 MHz, min. 100 mV on 50 W input impedance, DC coupled; SMA socket
Capacity of on-board memory	32 M time stamps
Interfaces	
USB	Type A and B, USB 2.0
Ethernet	RJ-45
Series	RS-232/RS-485
Power Supply	230 V, 50 Hz, 100W
Software	example program and documentation (Programming Manual)
Size	444(L) × 137 (W) × 330 (H) mm / Rack 19” 3U
Weight	8 kg (9,7 kg with build-in rubidium clock)

PROGRAMMABLE DISTRIBUTION AMPLIFIER PDA 0816

KenBIT

The PDA 0816A Programmable Distribution Ampliier is intended to distribute a 10 MHz or 5 MHz frequency reference signal, for example from any atomic clock or other reference source of excellent frequency stability, or 1 PPS (Pulse Per Second) pulses. What single out these device from the others of this kind is very low additive jitter (below 5 ps rms), large number of inputs (eight) and outputs (sixteen) and both electric and optic connectors.

The PDA 0816A coniguration can be set locally with the use of front panel screen and buttons or remotely via USB or Ethernet interfaces. Both distribution scheme and electric input threshold are programmable.

Delay	
Electric input – electric output	<14 ns
Electric input – optic output	<35 ns
Optic input – optic output	<55 ns
Jitter	Output FREQ
Electric input – electric output	<5 ps
Electric input – optic output	<25 ps
Optic input – optic output	<40 ps
Electric inputs	
Impedance	50 W, DC coupled; SMA sockets
Amplitude	±4 V
Threshold	±4 V (selected manualy)
Optic inputs	
Connector	Straight Tip (ST),
Wavelength	1300 nm
Acceptable optic power	80 mW (-11.0 dBm @ 50 MHz, 1 ns PWD)
Electric outputs	
Impedance	50 W, DC coupled; SMA sockets
Amplitude	1 V_{pp}, tr < 250
Rise / Fall time (20 – 80%)	< 250 ps / <200 ps
Optic outputs	
Connector	Straight Tip (ST),
Wavelength	1300 nm
Maximum optic power	80 mW (-11.0 dBm @ 50 MHz, 1 ns PWD)
Interfaces	
USB	Type B, USB 2.0
Ethernet	RJ-45
Power Supply	230 V, 50 Hz, 50W
Size	444 (L) × 94 (W) × 330 (H) mm / Rack 19” 2U
Weight	6,7 kg

DELAY/ FREQUENCY GENERATOR TIG101

The TIG 101 Delay/Frequency Generator produces precise and low jitter time interval between the leading edges of pulses at two outputs (START – STOP) and simultaneously the pairs of such pulses are generated in the Common mode at a single output COMM. In the Width mode a pulse of width equal to preset time interval is generated at the COMM output. Both the time interval and width can easily be set using either front panel interface (screen, buttons, rotary knob) or by sending control commands by USB or Ethernet interfaces. Functionality of TIG 101 is also extended of rectangular waveform generation with variable frequency (output FREQ).
The build-in reference clock is generated by a Oven-Controlled Crystal Oscillator (OCXO), which provides high accuracy and stability at reasonable cost. However, an external (for example, atomic) frequency standard 10 MHz signal can also be used (input CLK on rear panel).

Functions	Time Interval between the leading edges of two pulses appearing at the START and STOP output, or between the leading edges of two pul - ses appearing consecutively at the COMM output in Common Mode Pulse Width at theCOMM output in Width mode Frequency of rectangular waveform generated at the FREQ output
Time Interval & Width	Output START, STOP and COMM
Range	100 ns – 10 second
Resolution	500 ps
Jitter	< 20 ps rms at TI from 100 ns to 200 ms (internal TCXO timebase) < 20 ps rms at TI from 100 ns to 500 ms (external rubidium clock)
Frequency	Output FREQ
Range	from 0.1 Hz to 1 MHz with 1 mHz step from1 MHz to 50 MHz with 1 Hz step
Outputs	START, STOP, COMM, FREQ
Impedance	50 W, DC coupled; SMA sockets
Amplitude	1 V referred to ground
Rise & Fall time (20 – 80%)	< 250 ps
Polarity	selectable, positive or negative leading edge (except output FREQ)
Pulse width	10, 20 50 or 100 ns ±1 ns at 0.5 V threshold (except outputs F and COMM/Width Mode)
Internal Clock Generator	10 MHz OCXO, stability 1×10^{-7} (- 20 to +70 °C) 10 MHz rubidium (optional), stability 2×10^{-11} (- 55 to +85 °C), ageing 5×10^{-10}/year
External Clock Generator	10 MHz, min. 100 mV on 50 W input impedance, DC coupled; SMA socket, sine or pulse
Interfaces	
USB	Type B, USB 2.0
Ethernet	RJ-45
Power Supply	230 V, 50 Hz, 100W
Software	documentation for (Programming Manual)
Size	444(L) × 94 (W) × 330 (H) mm / Rack 19” 2U
Weight	8 kg

PRECISE TIME COUNTER T3200U

PikTime Systems offers high-tech equipment for specifying time intervals. The T3000 series includes picosecond precision time/frequency counters which combines affordable cost and reliability for thorough industrial and scientiic applications. The counters, equipped with Temperature Compensated Crystal Oscillators (TCXO), provide high accuracy and stability of the measu - rements. The heart of the instruments: a newly developed FPGA counter device, which contains a complete interpolation time counter with two precision two-stage Time-to Digital Converters, a FIFO memory which allows for very high measurement rate, and a dedicated microcontroller, comes in small, light, and handy case with USB 2.0 interface (T3200U).

Small box with USB control and supply by notebook, netbook, or PC
Time interval measurement range: 0 – 4400 seconds
Precision (standard deviation) < 35 ps at time interval measured from 0 to 200 ms
Frequency range up to 3.5 GHz
Frequency sampling up to 2 MSa/s
Measurement of Allan Deviation (ADEV)
Measurement of Time Interval Error (TIE, MTIE), TDEV
Totalize mode
Built-in automatic calibrator

Functions	Time Interval (between two pulses at two inputs or pulses appearing consecutively at a single, common input), Period, Pulse Width, Frequ - ency, Frequency Sampling, Allan Deviation, Time Interval Error (TIE), Maximum TIE (MTIE), Time Deviation (TDEV), Totalize
Statistics	Mean, Min and Max Values, Standard Deviation
Graphics	Tables and plots of statistical distributions, display of frequency sam- pling in time domain to show possible frequency variation (Sampling mode)
Time Interval	
Range	0 – 4400 seconds (Inputs A and B)
Resolution (LSB)	25 ps in single-shot measurements, may be reduced with averaging
Precision (Standard Deviation)	
Frequency & Period	
Range	Inputs A and B: 0.1 Hz to 200 MHz Sensitivity < 75 mV RMS typ. (0.01 to 200 MHz) Minimum slew rate: 10 V/µs Input F: 100 MHz to 3.5 GHz Sensitivity < -12 dBm (< 55 mV RMS) from 400 MHz to 3 GHz Sensitivity < - 3 dBm (< 160 mV RMS) from 100 MHz to 3.5 GHz
Frequency Sampling	
Range	Inputs A and B: 1 to 200 MHz Input F: 100 MHz to 3.5 GHz
Sampling Rate	0.1, 0.2, 0.5, 1.0, 2.0 MSa/s
Totalize	
Range	0 to 10^{12} counts
Input frequency	max. 200 MHz
Inputs A and B	
Amplitude	within ± 4 V
Pulse edge	selectable, rising or falling
Threshold	manually adjustable from -4 V to +4 V with 40 mV resolution, or set automatically
Internal Clock Generator	10 MHz TCXO, stability 5×10^{-7} (-40 to +85 °C), ageing 1×10^{-6}/year
External Clock Generator	10 MHz, min. 100 mV on 50 Ω input impedance, DC coupled; SMA socket
Capacity of FIFO Memory	4 K time/delay measurements, 2.5 K frequency measurements
USB receptacle	Type B, USB 2.0
Power Supply	provided by the USB 2.0 interface
Supplied Software	for Windows® XP/Vista/7, DLL ile for other applications
Size	135 (L) × 70 (W) × 17 (H) mm
Weight	160 g

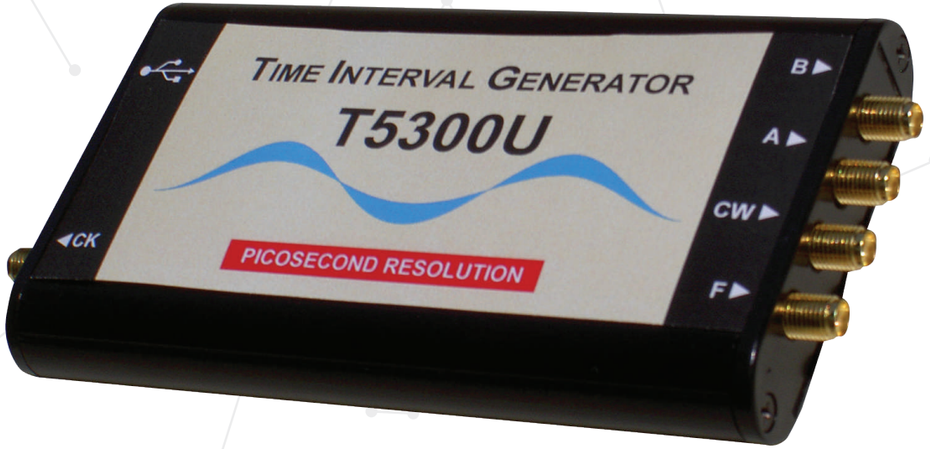
Precise Time Counter T4100U

PikTime Systems offers high-tech equipment for specifying time intervals. The T4000 series includes picosecond precision time/frequency counters which combines affordable cost and reliability for thorough industrial and scientiic applications. The counters, equipped with Temperature Compensated Crystal Oscillators (TCXO), provide high accuracy and stability of the measu - rements. The heart of the instruments: a newly developed FPGA counter device, which contains a complete interpolation time counter with two precision two-stage Time-to Digital Converters, a FIFO memory which allows for very high measurement rate, and a dedicated microcontroller, comes in small, light, and handy case with USB 2.0 interface.

Precise and versatile counter powered and controlled via USB port
Time interval measurement range: 0 – 1000 seconds
Precision (standard deviation) < 10 ps at time interval measured from 0 to 50 ms
Frequency range up to 3.5 GHz
Measurement rate up to 5·106 meas./s
Measurement of Allan Deviation (ADEV)
Totalize mode

Functions	Time Interval (between two pulses at two inputs or pulses appearing consecutively at a single, common input), Period, Pulse Width, Frequ - ency, Allan Deviation, Totalize
Statistics	Mean, Min and Max Values, Standard Deviation
Graphics	Tables and plots of statistical distributions and frequency stability
Time Interval	
Range	0 – 1000 seconds (Inputs A and B)
Resolution (LSB)	1.8 ps in single-shot measurements, may be reduced with averaging
Precision (Standard Deviation)	< 10 ps at time interval measured from 0 to 50 ms < $10/\sqrt{Sample\_Size}$ ps with averaging
Frequency & Period	
Range	Inputs A and B: 1 mHz to 200 MHz Sensitivity < 75 mV RMS typ. (0.01 to 200 MHz) Minimum slew rate: 10 V/µs Input F: 100 MHz to 3.5 GHz Sensitivity < -12 dBm (< 55 mV RMS) from 400 MHz to 3 GHz Sensitivity < - 3 dBm (< 160 mV RMS) from 100 MHz to 3.5 GHz
Totalize	
Range	0 to $5x10^{11}$ counts
Input frequency	max. 200 MHz
Power Supply	provided by two USB 2.0 ports (typical) or external supplier (ver. e)
Size	135 (L) × 70 (W) × 17 (H) mm
Weight	160 g

PRECISE TIME GENERATORS



The T5000 family contains precise and low-jitter delay/pause/frequency generators. The devices may work in width mode generating pulses of width equal to preset delay, or as pulse generators of variable frequency. The series is also equipped with Temperature Compensated Crystal Oscillators (TCXO), providing high accuracy and stability at reasonable cost. Digital contro - llers combine picosecond precision of time-interval generation with affordable cost and reliability for thorough industrial and scientiic applications, and come in USB 2.0 interface equipped case.
All the counters and generators come with supplied software, that creates a user-friendly graphic interface and provides many useful functions for accurate control, diagnostics and statistical processing of the measurement data.

Small box with USB control and power supply by notebook or PC
Precisely controlled time interval between the leading edges of output pulses
Precisely controlled width of pulses at a separate output
Time interval/width range: 10 ns – 10 seconds
Time interval/width resolution: 5 ps
Jitter: < 20 ps rms at time interval from 10 ns to 50 ms
Output pulses: positive, 2 V amplitude on 50 Ω load, rise- and fall time < 600 ps, selectable width (10, 20, 50 or 100 ns) and polarity
Precisely controlled frequency of rectangular waveform at a separate output
Internal trigger generator with variable frequency
User-friendly software for Windows

Functions	Time Interval between the leading edges of two pulses appearing at the A and B outputs or between the leading edges of two pulses appearing consecutively at the CW output in Common mode Pulse Width at the CW output in Width mode Frequency of rectangular waveform generated at the F output
Time Interval & Width	
Range	10 ns – 1 second (TI A -> B, Common mode (CW), Pulse Width (CW))
Incremental Resolution	5 ps
Jitter	< 20 ps rms at TI from 10 ns to 50 ms (internal TCXO timebase) < 20 ps rms at TI from 10 ns to 10 seconds (external atomic timebase)
Trigger generator	internal, with digitally variable frequency from 10 mHz to 1 MHz
Frequency	Output F
Range	0.1 Hz to 500 Hz with 1 µHz step; 500 Hz to 1 MHz with a 1 mHz step; 1 – 75 MHz with a 1 Hz step
Period jitter	< 20 ps rms from 10 kHz to 75 MHz
Outputs A, B, CW, F	
Load	50 Ω, DC coupled; SMA sockets
Amplitude	2 V referred to ground
Rise & Fall time (20 – 80 %)	< 600 psPulse width
Pulse width	10, 20, 50 or 100 ns ± 0.5 ns at 1 V threshold (except outputs F and CW/Width)
Internal Clock Generator	10 MHz TCXO, stability 5×10^{-7} (-40 to +85 °C), ageing 1×10^{-6}/year
External Clock Generator	Input CK - 50 Ω, DC coupled; SMA socket 10 MHz, sine or pulse, min. 100 mV on 50 Ω input impedance
Power Supply	provided by the USB 2.0 interface
Size	140 (L) × 70 (W) × 17 (H) mm
Weight	150 g

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