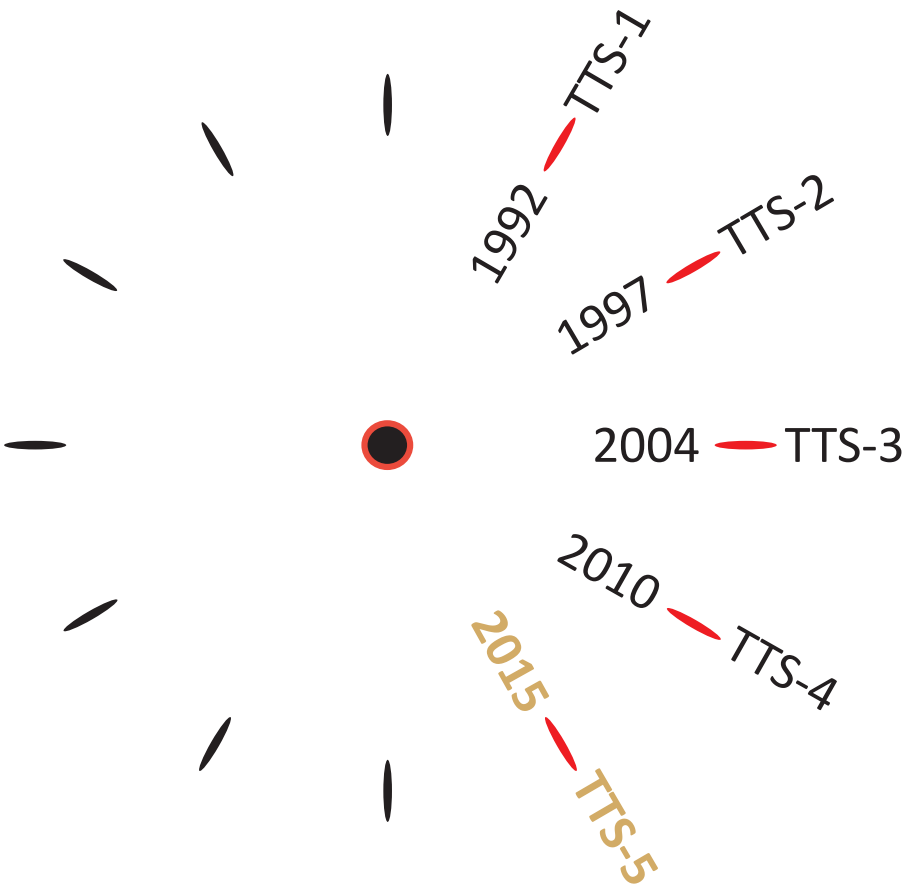



# Product catalogue
January 2016

AGH

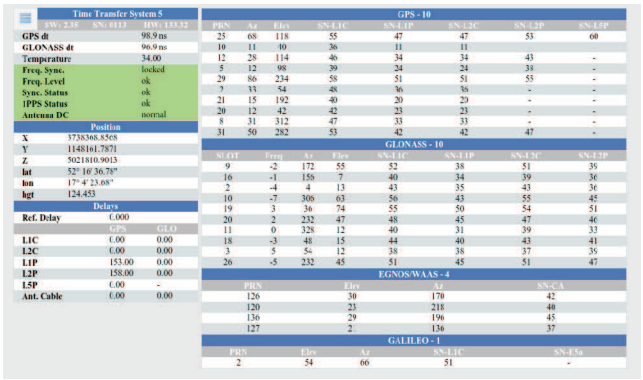
PIK Time Systems®

WAT

## Time Transfer System TTS-5 - confidence through experience

It has been over 23 years since first “TTS” was introduced. Single frequency TTS-1 as first in the family, a very successful TTS-2, then TTS-3 with GLONASS, now TTS-5 - developed from scratch, released in 2015 after 2 years of R&D work. Till the date 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 knowledge. Software upgrades are provided free of charge every 3 months on average. **Excellent observation results, long and stable operation, wide configuration 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 networks.

Time Transfer System TTS-5




Main screen of TTS-5

## Access, Operation & Configuration

- **built-in touch** screen offers immediate access to observations, configuration and main parameters: delays, antenna position, key system status indicators.
- via WEB interface
- via USB keyboard

## Data recording & storage

Date can be:

- downloaded from WEB interface (using WEB browser)
- downloaded from integrated FTP server
- sent to external FTP server (using WEB browser)
- saved on USB memory (using console or WEB interface)
- 1TB redundant data storage (RAID1 2*1TB)

## Tracking features

Supported navigation systems:
GPS, GLONASS, Galileo, WAAS/Egnos
Number of channels: 216
Number of satellites: all-in-view
Supported frequencies:
GPS: L1, L2, L5
**GLONASS: L1,L2 option: L3**
GALILEO: E1, E5A , option: E5B, altBoc, E6
Supported codes:
GPS: L1C, L2C, L1P, L2P, L5P
GLONASS: L1C, L2C, L1P, L2P option: L3
GALILEO: E1, E5A , option: E5B, altBoc, E6

## Input/Output

3-20 MHz frequency input (adjustable)
Local 1 PPS input
1PPS output
Antenna TNC connector
1000BASE-T Ethernet port
2 USB connectors on the front panel
2 USB connectors on the rear panel

## Data characteristics & availability

Data type: Code and Carrier
Data output format: CGGTTS, RINEX. **The only CGGTTS Glonass/Galileo receiver on the market.**
Data formats meet all formal requirements.
Data availability:
CGGTTS: 30 sec after each 13-min. observation session is finished
RINEX: real time

## Physical & Enviromental

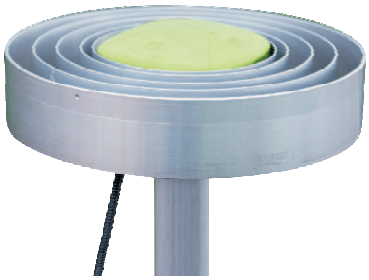
Main unit dimensions:
(410mm x 298mm x 133mm)
Rack ready, chassis made of heavy duty metal
Screen - 7” TFT LCD
Resolution 1024 x 600
Operating voltage: AC 230V +/-10%, 45 to 60 Hz
or AC 110V +/-10%, 55 to 65 Hz
Redundant power supply support
Operating temperature: 0ºC to +50 ºC

## 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

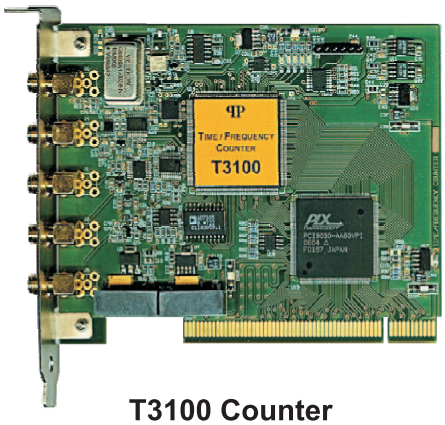
Temperature stabilized choke ring antenna

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

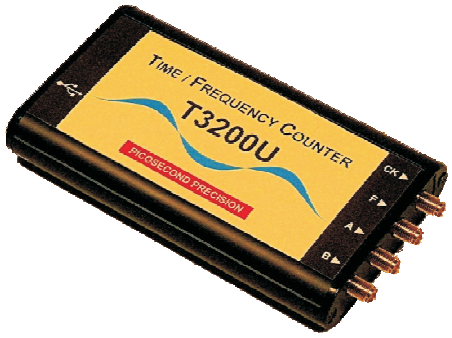
Time Transfer System TTS-5 is in compliance with requirements of European Union laws. CE

## Precise time counters

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 scientific applications. The counters, equipped with Temperature Compensated Crystal Oscillators (TCXO), or Oven-Controlled Crystal Oscillators (OCXO), provide **high accuracy and stability** of the measurements. 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 USB2.0 interface (T3200U), or in a single slot PCI card (T3100(S)).




**T3100 Counter**

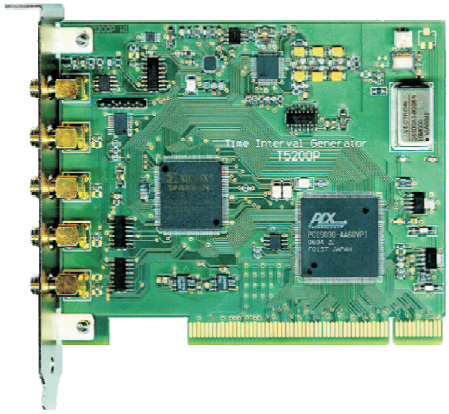



**T3200U Counter**

## Precise time generators

The T5000 family contains precise and low-jitter delay/pulse/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), or Oven-Controlled Crystal Oscillators (OCXO), providing **high accuracy and stability at reasonable cost.** Digital controllers combine picosecond precision of time-interval generation with affordable cost and reliability for thorough industrial and scientific applications, and come in USB 2.0 interface equipped case, or single slot PCI card (T5200(S)).

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.




**T5200 Generator**

**T5300U Generator**

# Fiber-optic time and frequency distribution system OSTT-2

## Introduction and key features

OSTT-2 has been developed by Polish AGH University of Science and Technology.
The local module of the system accepts the frequency and time signals (10 MHz and 1PPS) and transmits them via an optical fiber 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 fiber. Besides metrological applications, as clock comparisons, the system may be used for time and frequency distribution to the users not maintaining their own clocks.
The system connects two Polish UTC laboratories; GUM (Polish Central Office of Measures) and AOS (Astrogeodynamical Observatory in Borowiec) since February 2012. The optical path is 420km long, with total attenuation of 120 dB. It should be emphasized that this is the first in the world permanent fiber optic link between two UTC laboratories which delivers the data to BIPM.

## Active delay stabilization

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

## 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  output delay is constant and there is no need for any further measurements or data exchange.

## Specifications

Frequency signal: 10MHz (5 MHz, 100MHz options),
Time signal: 1PPS, 100PPS, 1000PPS (phase synchronous with frequency signal),
Optical fiber requirement: one singlemode fiber of any type (dark fiber) or two neigbour DWDM channels in one fiber (two dark channels),
Optical signals: bidirectional transmission, 1550 nm wavelength window, launched power 3 dBm max,
Maximum optical path attenuation: 25 dB (equivalent to 50 - 100 km of fiber, depends on link quality),
Delay correction range: 110 ns (enough for 100 km of fiber in typical environmental conditions).
Extensions available - dedicated optical amplifiers and extended compensation range for long-haul installations up to 1000 km.

## System components

OSTT-2 Local Module

OSTT-2 Remote Module

# Multichannel time counter MTC108

The only solution in the world (integrated eight channel counter)
Standalone equipment !
Operated by keyboard or touch screen, remote control by USB interface or Ethernet
Function:Measurement of time intervals
Equipped with rubidium standard (option) – a source of 1 PPS and 10 Mhz
Range 0 – 4400 s
Resolution (LSB)1.9 ps
Precision (Standard Deviation)< 6 ps
Measurement Rateup 10 000 000 stamps/second/channel !!!

PIK TIME SYSTEMS®

- Designing and manufacturing scientific equipment for long-distance precise atomic clocks comparison (time transfer systems),
- Development of time based products and services (navigation, security, data and document exchange, time stamping),
- Advisory on precise time and time scales,
- Time & frequency software and algorithms,
- Time & frequency counters and generators,
- Designing and execution of complete time laboratories on a turn-key basis.

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**Continous improvement process. We reserve a right to provide you with better solutions than covered in the brochure.**
**Brochure released - 01.2016**