TIME & FREQUENCY SOLUTIONS

UNRIVALLED EXPERTISE & TECHNOLOGIES FOR A DEMANDING WORLD

Timetrace

GPS Common View Measurement System

NPL National Physical Laboratory

The Timetrace is an exceptionally accurate time and frequency standard which, when used in conjunction with a similar device in a National Standards Laboratory, brings the accuracy and traceability of your National Time standard into your laboratory. Timetrace can then be used to calibrate clocks and frequency sources in real time without having to resort to using travelling clocks.

Features

- **Ultra-high accuracy Time & Frequency Transfer Standard**
- **Utilises Global Positioning System (GPS) data in common-view mode**
- **Provides global traceability when linked to your National Standards Laboratory**
- **Developed in conjunction with the UK National Physical Laboratory (NPL)**

Timetrace uses the Global Positioning System (GPS) common-view technique to achieve these highly accurate measurements. By carrying out simultaneous observations of GPS signals, measurements of the clock times of the same satellites are made against the local clocks at each site.

Through the technique of inter-comparison of the same event time at the two sites, any deviation of the satellite timing is completely removed. The GPS common-view technique has been used for time and frequency transfer between National Metrology Institutes for many years. The Bureau International des Poids et Mesures (BIPM) has published a series of Technical Directives that standardise this measurement method and data formats.

Timetrace is the result of a collaboration with the National Physical Laboratory (NPL) in the UK to develop a GPS common-view measurement system that follows BIPM directives and generates the recognised CGGTTS format files developed at the BIPM.

Timetrace uses a GPS multi-channel receiver capable of simultaneously tracking up to 8 satellites to offer high performance and reliability at an accessible cost. It is used in conjunction with a PC that runs the 'GPSCView' software, which performs the data processing as defined by the BIPM directives. GPSCView is installed on the PC together with a small text file containing the BIPM Schedule allowing the start times of satellite track observation to be calculated. GPSCView automatically decrements each track start time in the schedule by four minutes each day to account for GPS sidereal orbits.

The user is strongly advised to work with their National Metrology Institute and make direct comparisons with a national time standard which has a published performance. For special applications, a user can also make comparisons between clocks located at their own sites. Additionally, Timetrace may also be used to make stand-alone GPS time measurements against GPS Time with an uncertainty of 30ns (1σ).

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Specifications

Signal Inputs

User 5/10MHz Frequency Standard. For optional connection of user's 5MHz or 10MHz laboratory standard. Signal input 1V rms nominal into a 50Ω load (50Ω or high impedance load selectable by PC). Connection via 50Ω BNC Socket.

User 1pps signal. For connection of the user's 1pps signal from the laboratory clock. Signal level 0 to 5V into high impedance or 50Ω load (50Ω or high impedance load selectable by PC). Connection via 50Ω BNC Socket.

Signal Output

User 1pps signal. Signal derived from either User 1pps input or User 5/10MHz Frequency Standard Input. Source selectable by PC. Signal level 0 to 5V from 50Ω source. Connection via 50Ω BNC Socket.

Measurement Source

Measurement can be performed using either User 1pps input signal or internally generated 1pps from User 5/10MHz Frequency Standard input (if no User 1pps signal available). Selection made using PC.

Internal Time Interval Measurement

10 picosecond resolution with built-in self calibration

Status Indicators

Power Available:	Power available to unit
User 1pps:	User 1pps is available.
User 1pps Selected:	User 1pps is used for measurement
GPS 1pps:	GPS 1pps is available
User 5MHz:	User 5MHz clock is available
User 10MHz:	User 10MHz clock is available
Not Locked:	Internal OCXO is not locked to the User 5/10MHz input.
Satellite Tracked:	The GPS Receiver is tracking at least one satellite
Time Interval:	Indicates each time interval measurement.

Power: 120/230V AC +6% -10% 48-62Hz Load 30VA

Mechanical: 19 inch rack mounting 2U high 350mm deep.

Environmental (Operation & Storage)

Temperature:	0°C to +40°C
Humidity:	Up to 95% RH (non-condensing)
EMC:	CE Compliant

NPL Time and Frequency Transfer Service with Timetrace

Clock Time

10 ns uncertainty relative to UTC(NPL) (1σσ)
20 ns uncertainty relative to UTC (1σσ)

Clock Frequency

5×10^{-14} fractional frequency uncertainty relative to UTC(NPL) (1σσ)
5×10^{-14} fractional frequency uncertainty relative to UTC (1σσ)

Clock Stability

σ(y), Mod σ(y) and σ(x) (with confidence intervals) will be computed weekly for averaging time (τ□) between 1000 s and 100000 s.

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