

## Precision Timing For Rail Application



Rail applications, such as railway network timing, railway signalling systems, track to train radio systems, station clocks. Passenger information systems, ticketing systems, and CCTV, all require synchronised precise and accurate time. Step Global provides a broad range of smart GNSS antennas, GPS disciplined clocks, display clocks and time servers



## Precise Time Synchronisation and Clock Reference Systems for Rail Applications

Many rail networks now use time as the safety separator between passenger trains travelling on the same track, this enables more trains per track and provides precise speed control when there are delays. Obtaining precise location, speed, and time stamps, provides a chronological audit trail that may be vital for safety information records and incident identification.

Track to train communications also benefit from precise time, message transmission and reception must be precisely synchronised or there can be loss of, or scrambled, messages.

Station clocks and passenger information systems need to be synchronised across the network, giving the travellers correct times for departure and arrival. Station management systems also require accurate time, CCTV, computer networks, automated announcements, automated ticketing systems, security systems, are all dependent on time.



# Smart GNSS Antennas

## Acutime™ 360 Multi-GNSS Smart Antenna

The Protempis Acutime™ 360 Multi-GNSS smart antenna is the latest generation Acutime product of integrated GNSS technology in a rugged and weatherproof self-contained unit. The Acutime 360 is an integrated pipe thread-mounted multi-GNSS receiver, antenna and power supply solution in a single environmentally sealed easy to install enclosure.

The Acutime 360 multi-constellation smart antenna design continues Protempis's line of GPS smart antennas, which have been in production since 1991.

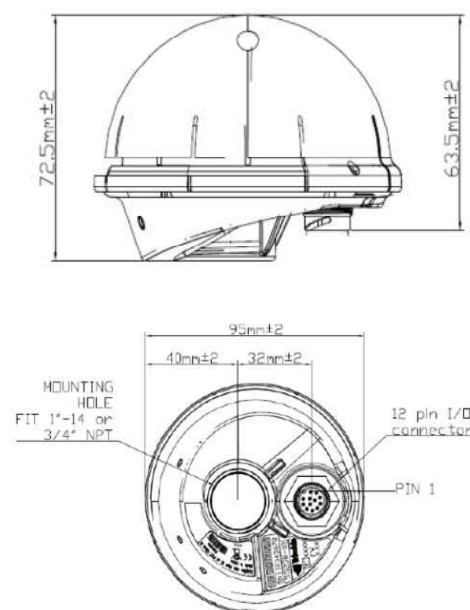
This antenna is the perfect solution for precise timing and network synchronization needs, including broadband wireless applications. It provides an extremely cost-effective and independent (within the firewall) timing source for any application, such as fault detection systems and synchronization of wireless networks.



## Acutime 720™ GNSS Smart Timing Antenna

A ruggedized weatherproof dual-band (L1 & L5) multi-constellation receiver for timing that integrates the antenna and receiver into an enclosure that is ideal for outdoor installations. Offers precision time synchronization within 5 nanoseconds stability in its normal mode of operation. GPS (L1/L5), GLONASS (G1), Galileo(E1/E5a), Beidou (B1/B2a), QZSS (L1/L5) & NavIC (L5)

Constellations	Bands	Frequency (MHz)		
		Center	Lower	Upper
GPS	L1	1575.42	1573.42	1590
	L5	1176.45	1166.22	1186.68
QZSS	L1	1575.42	1573.42	1577.42
	L5	1176.45	1166.22	1186.68
GALILEO	E1	1575.42	1563.144	1587.696
	E5a	1176.45	1166.22	1186.68
GLONASS	G1	N/A	1598.0625	1605.37
BEIDOU	B1	1575.42	1559.052	1591.788
	B2a	1176.45	1166.22	1186.68
IRNS/NavIC	L5	1176.45	1164.45	1188.45



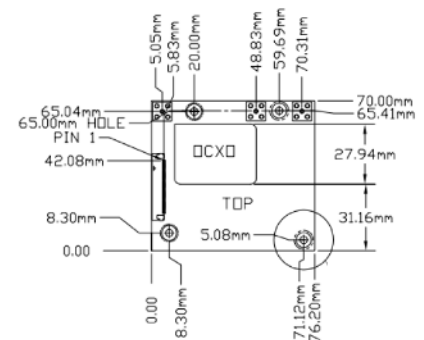
# GPS Disciplined 10MHz and 1PPS Clock

## Mini-T™ GG Multi-GNSS Disciplined Clock Board

Protempis's Mini-T™ GG disciplined clock module is a multi-GNSS (GPS and GLONASS) receiver, optimized for stationary applications to generate a precise timing signal. The Mini-T GG is designed to cover the large range of applications from radio base stations to digital broadcasting and smart grid.

The Mini-T GG gives OEMs the opportunity to embed a low-cost precise time and frequency reference, in our smallest form-factor yet. The Mini-T GG includes many of Protempis's standard timing features, including the Disciplined Clock Autonomous Integrity Monitoring (TRAIM) algorithm, and automatic self-survey.

The Mini-T GG generates pulse per second (PPS) and a precise 10MHz reference clock for synchronization of user applications.



## Thunderbolt E GPS Disciplined Clock

The Protempis Thunderbolt® E GPS Disciplined Clock is Protempis's latest offering for GPS synchronization devices providing a 10MHz output and PPS.

This fifth-generation GPS clock combines a high-quality GPS receiver, control circuitry, and a reliable ovenized oscillator on a single board, providing increased integrity and reliability at a lower size and cost.

The Thunderbolt E GPS clock outputs a 10 MHz reference signal and a 1 PPS signal with an overdetermined solution synchronized to GPS or UTC time. The PPS output accommodates applications requiring sub-microsecond timing



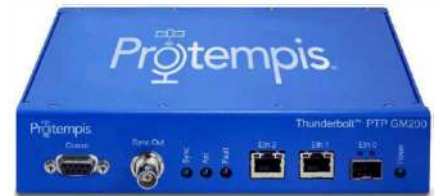
# Time Servers

## Thunderbolt® PTP Grandmaster Clock GM200

The Protempis Thunderbolt® PTP Grandmaster Clock is designed for the telecom market, for use at the edge of wireless networks requiring phase synchronization. The GM200 provides continuous availability of UTC traceable time for phase synchronization, a must for LTE-Advanced networks and services.

The Thunderbolt PTP GM200 employs industry-leading Protempis GNSS performance, and world class holdover technology.

The PTP GM200 tolerates harsh environmental conditions, supporting both indoors and outdoors deployments with an extended operating temperature range (-40 to +85 C). The Thunderbolt PTP GM200 supports small cells networks that require phase synchronization. Although it is designed with keeping small cells in mind, it meets Marco base station requirements for synchronization.

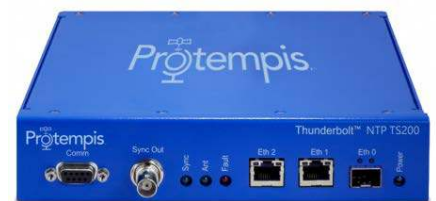


## Thunderbolt® NTP Time Server TS200

The Protempis Thunderbolt® NTP TS200 Time Server is designed for demanding applications that require high-accuracy NTP time stamping.

It supports synchronization of thousands of workstations, routers, switches and other network elements for logging and security forensics. The Thunderbolt NTP TS200 supports multiple GNSS constellations, utilizing GPS, GLONASS, Galileo and Beidou satellites, thereby enhancing redundancy and satellite availability.

The NTP TS200 is optimized to deliver extremely stable and accurate time of day (TOD) synchronization for a variety of time-sensitive applications, such as telecom networks, data centers, factory automation, and SCADA systems.



# Grand Master Clock Quazar 100

Integrated 72-channel high-precision GNSS receiver with support for GPS / QZSS, GLONASS, BeiDou, Galileo

- GNSS receiver sensitivity (max/min): -167dBm/-159dBm with LNA option
- IEEE 1588-2008v.2 (PTPv2): Precise time synchronization protocol with hardware support
- GNSS PPS Precision:  $\pm 40$ ns (Clear sky)
- OCXO generator with -40 to +70°C stability of  $\pm 20$  ppb and holdover time of  $\pm 1.5$   $\mu$ s at constant temperature for 0.5 hours.
- 100/1000Mbit/s UTP interface with M12 connector, IP65 waterproof
- Synchronous Ethernet (SyncE) support - ITU-T G.8261 and ITU-T G.8264
- Hardware and software support for SSM for Synchronous Ethernet,
- Built-in NTP / SNTP server
- Designed in accordance with the requirements of IEC61850-3, IEEE1613
- IP, HTTP, telnet, SSH, SNMP v1/v2c/v3 management,
- Power: PoE IEEE802.3af PD over STP/UTP cable
- Optional STP/UTP patchcord up to 100m with M12-RJ45 connectors
- Integrated ITU-T K-44 surge protection for the transmission path only.
- Operating temperature -40 to +70°C



- IEEE C37.238- 2011 or 2017 Power Profile I
- IEC61850-9-3
- ITU-T G.8265.1
- ITU-T G.8275.1 (L2 multicast)
- ITU-T G.8275.2 (L3 unicast)
- Telecom 2008 over Ethernet

# Quazar-200 Time Server

Industrial Time Server with GPS module equipped with 4-port 10 Gigabit Ethernet switch and optional 8x/100M/1G RJ45 or 8x 100M/1G SFP interfaces

- Managed time server for network synchronization equipped with interfaces of 4 SFP+ 1/2.5/10Gbps slots and 1x RJ45 10/100/1000Mbps ports; 1x PPS IN; 1 PPS OUT; 1x 10MHz IN/10MHz OUT; 1 x E1 G703/G.704; 1x ToD IN/ToD OUT optionally equipped with additional interfaces of 8x (10M/100M/1G) RJ45 or 8x 100M/1G SFP
- Supported synchronization protocols PTPv.2, NTP, SNTP, ToD, SSM, SyncE,
- GNSS PPS signal precision:  $\pm 40$ ns (Clear sky),
- Multisystem receiver for GPS, Galileo, Glonass, Beidou systems
- Additional NMI UTP RJ45 10/100Mbit/s management port
- Support for STP, RSTP and MSTP protocols.



- PTPv2 default IEEE 1588
- ITU-T G.8275.1
- ITU-T G.8275.2
- ITU-T G.8265.1
- IEC 61850-9-3
- IEEE C37.238-2011 and 2017

# Quazar 500 Time server

## Manageable Signal Quality Analyzer

- Managed network synchronization quality analyzer equipped with 4 SFP+ 1/2.5/10Gbps slots and 1 or 8 SFP+ 1/2.5/10Gbps slots and 2x RJ45 10/100/1000Mbps ports or 12 SFP+ 1/2.5/10Gbps slots 3x RJ45 10/100/1000Mbps ports (version with 12 slots only in 2U housing)
- Qualitative analysis by 4 instances of IEEE1588 PTPv.2 for profiles G.8275.1 (Telecommunications) and C37.238 (Energy)
- Qualitative analysis of up to 2 or 4 or 6 clock domains of Synchronous Ethernet with analysis of SSM ITU.T - G8264 messages.
- Accurate local OCXOs or DOCXOs for long-term holdover
- High-performance CPU for system management
- Built-in LCD display for reading selected parameters
- Radius authentication
- Internal data memory for local data archiving (up to 72h)
- IPv4, IPv6, WWW, telnet, SSH and local CLI console management, SNMP v1/v2c/v3
- Redundant power supply 80-360 V DC, 75-270 V AC or 45 - 60 V DC



Multi-system GNSS receiver supporting:

- GPS, Galileo, Glonass, Beidou
- PTPv.2
- NTP
- SyncE
- SNTP time server
- ToD
- PPS 10MHz
- G.703/G.704

# Quazar-700 Time Server

## Network Synchronisation Probe

- Quazar-700 enables monitoring of time and frequency synchronization in the radio access network (RAN), which allows for stable and efficient operation of the network. Thanks to this, the operator can provide a very good quality of services to its customers.
- The device allows for quick detection of PTP/SyncE failures (place and cause), which translates into quick operator response and minimization of failure repair costs. Thanks to Quazar-700, the operator can achieve very good service availability.
- Quazar-700 enables calibration, which translates into very good time precision. This allows the provision of new types of services offered by the 5G network, in particular IoT (Internet of Things), autonomous vehicles, etc.
- The Quazar-700 monitoring probes measure inaccuracy parameters in the existing DWDM infrastructure, allowing cTE and asymmetry values to be measured and corrected. This saves investment costs.
- The Quazar-700 can be used as a portable probe, offering flexible monitoring scenarios. Thanks to this, the operator can monitor time and frequency synchronization in different places of the network, which translates into quick response to problems



- PTPv2
- IEEE 1588
- ITU-T G.8275.1
- ITU-T G.8275.2
- ITU-T G.8265.1
- IEC 61850-9-3
- IEEE C37.238-2011 and 2017

## Display Clocks

### Power over Ethernet Clocks Deliver Accurate Time anywhere in the World

Power over Ethernet (PoE) clocks are a durable and precise technology that delivers accurate time anywhere. Easy to install with hardly any maintenance, these beautiful analog or digital locks give you peace of mind.



### Wi-Fi Clocks use a Wi-Fi Network for Fast and Cost-Effective Synchronised Time

Wi-Fi clocks pull the correct time from your existing Wi-Fi network. Hang them anywhere you get a Wi-Fi signal, no electrician required.

Quality construction and five-year battery life means that the maintenance staff won't have to spend time fixing clocks. Keep events on time and get better productivity with all clocks, computers, phones, and other devices displaying the same time!



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