

# NTS-9000A

**NTP/PTP IEEE1588 HYBRID  
Real Cesium Network Appliance**

# Cesium Time Server

- HYBRID System 4U rack'19
- 10 YEAR Cs BEAM 10890A



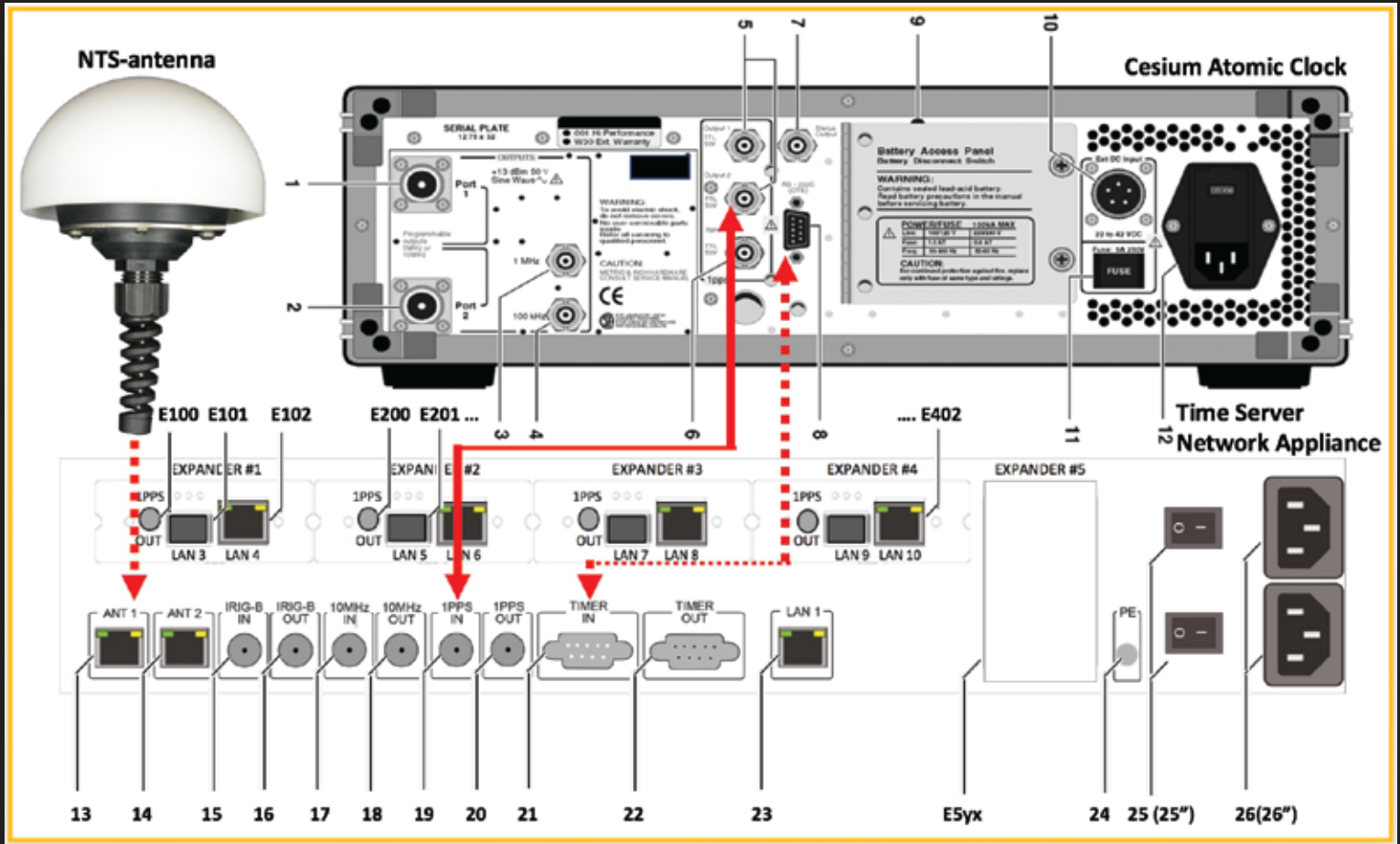
- CESIUM ACCURACY  $> 10E^{-12}$
- OUTPUTS 100kHz 1/5/10MHz
- 1PPS TTL 50Ω Input & Output
- TIME CODES IRIG-B SYSPLEX
- 10x LAN\* (SFP/RJ45)  
8x GE\* hardware PHY stamps  
2x 100Mbps software stamps
- NTP v 2, 3, 4 SNTP
- PTP IEEE1588 (SyncE\* inside)
- SNMP v3,v2 MIB2 RADIUS
- MD5 RSA DSA SSL security
- CRYPTO authentication MD5
- REMOTE server onfiguration  
SSH HTTPS HTTP TELNET
- RS232/485 & USB interfaces
- REDUNDANT power-supply\*



 **ELPROMA**

[www.elpromatime.com](http://www.elpromatime.com)

# NTS-9000A Cesium



This is CORE PTP module (2x2 cm). It is low-level component located on each of 1-4 PTP GRANDMASTER modules. It ensures private IP stack and HW (PHY) timestamping ensuring accuracy of nanoseconds.



CORE PTP (FPGA) is a basic component of PTP Grandmaster card. There are max. 4 cards, each located in Expander 1-4.



On the right side are output pairs of LAN3-4, 5-6, 7-8, 9-10. On the left side there are internal analogue sync interfaces. They are internally connect via analogue signals SyncBUS.



This is back view of Time Server with 1-4 Expander cards. Cards are autonomous GRANDMASTERS. Only card #1 can be set to operate SLAVE mode, but all 4 can act MASTER. Cards support PTP profiles: DEFAULT, ENERGY, TELECOM. The National Physical Laboratory in London (UK) confirms 50ns accuracy of synchronization to cesium clock UTC-NPL.

**NTS-9000A** is cesium hybrid server system (4U). It includes 2 components: (1) Cesium Clock – providing time & frequency reference; (2) Network Appliance – a time server delivering time to networks (max. 10x LAN) using protocols like: NTP, SNTP, PTP IEEE1588.

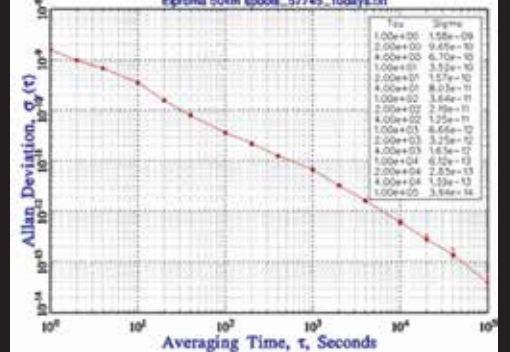
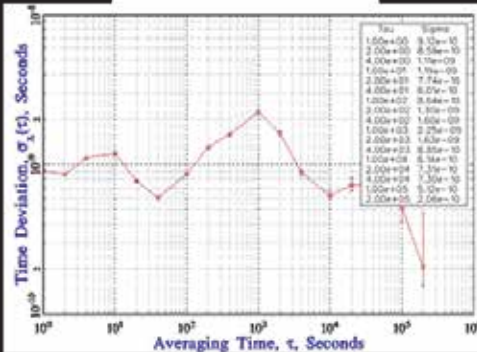
**LAN1-LAN2** are std. 100Mbps (RJ45) interfaces. They support software time stamps. This is compatibility layer available at all Elproma NTS family product since year 2000.

**LAN3-LAN10** are optional GE (SFP/RJ45). They support hardware time stamps. There are max. 4 Expanders. Each supports 2 LAN. Each card is exclusive GRANDMASTER has own private IP stack that improves security. Network cards are 100% isolated each other using one-way analogue synchronization signals (PPS/ToD) of Time-BUS.

Server is equipped with 2 independent GNSS receiver inputs (ANT1-2). It can support NTS-antenna-STD or PRO antyjamming/spoofing version. Other 3rd part SAT receivers can be connected to NTS-9000A using RS232/422/485 and NMEA183 frame w/ PPS. The Cesium component (1) guarantees time for long period of missing GNSS signals. Both ANT1-2 interfaces can be switched to output mode emulating GPS NMEA 0183.

## Tested in NPL London (UK)

NTS-9000A Time Server basis on NTS-5000. This product has been well NMI laboratory tested at NPL (UK) ensuring 50ns accuracy on 50km fiber. Left side presents NPL 2017 measurements: Time Deviation (TDEV), right Allan Deviation (TDEV).





## (1) Cesium Clock Synchronization I/O:

## (2) Time Server Network Appliance I/O:

Item Number	Function	Connector Type	Signal Characteristics
1	Output- Port 1, 5 or 10 MHz	Type N Female	Sinusoidal, 1 Vrms into 50Ω, Nominal
2	Output- Port 1, 5 or 10 MHz	Type N Female	Sinusoidal, 1 Vrms into 50Ω, Nominal
3	1 MHz Output	BNC Female	Sinusoidal, 1 Vrms into 50Ω, Nominal
4	100 kHz Output	BNC Female	Sinusoidal, 1 Vrms into 50Ω, Nominal
5	1pps Outputs	BNC Female	1pps, 20 μs wide, TTL compatible, into 50Ω
6	1pps Sync Input	BNC Female	100 ns to 100 μs wide, +2 to +10V into 50Ω/TTL Threshold
7	Status Output, Active Low	BNC Female	TTL Open Collector, 1.6 kΩ pull-up to 5V
8	Remote Data Transmission	9Pin, Male, D-sub miniature	RS-232C, DTE Configuration
9	Internal Standby Battery Disconnect Switch Access	N/A	Switch disconnects Internal Standby Battery.
10	External dc Power	5-Pin Cannon, Series ME	22-42 Vdc, 100 Watts, Pinout: +22 to +42 Vdc (pin A), Neg. dc (pin C), Chassis Gnd (pinE), pins B and D are not used
11	External dc Power Fuse	Cartridge Fuse	Fuses external dc power, 5 Amp fuse
12	AC Power Input and Fuse	3-prong, Grounded	120/240 Vac, 1.5/0.75 Amp slow-blow fuse.

- 13. GNSS Input #1 /NTS-antenna/ (RJ45, RS485)
- 14. GNSS Input #2 /NTS-antenna/ (RJ45, RS485)
- 15. IRIG-B AM Input (BNC, 50 Ω)
- 16. IRIG-B AM Output (BNC, 50 Ω)
- 17. 10MHz Sine Input (n/a) (BNC, 50 Ω)
- 18. 10MHz Sine Out (BNC, 50 Ω)
- 19. 1PPS Input (BNC, 50 Ω)
- 20. 1PPS Output (BNC, 50 Ω)
- 21. TIMER Input (IRIG-B DCLS) (DSUB9 F, RS232C)
- 22. TIMER Output (IRIG-B DCLS) (DSUB9 M, RS232C)
- 23. LAN1 100/10Mbps SW stamps (RJ45, 100Base-T)
- 24. PE (rack'19 connection)
- 25\* Power Switch #1 ON/OFF
- 25\*\* Power Switch #2 ON/OFF\* (redundant)
- 25\* Power Supply #1
- 25\*\* Power Supply #2\* (redundant)

### Expander #1

- E100 PPS-output (SMA, 50 Ω)
- E101 LAN3 HW stamping (PHY) (SFP, GE)
- E102 LAN4 HW stamping (PHY) (RJ45, GE)

### Expander #2 (optional)

- E200 PPS-output (SMA, 50 Ω)
- E201 LAN3 HW stamping (PHY) (SFP, GE)
- E202 LAN4 HW stamping (PHY) (RJ45, GE)

### Expander #3 (optional)

- E300 PPS-output (SMA, 50 Ω)
- E301 LAN3 HW stamping (PHY) (SFP, GE)
- E302 LAN4 HW stamping (PHY) (RJ45, GE)

### Expander #4 (optional)

- E400 PPS-output (SMA, 50 Ω)
- E401 LAN3 HW stamping (PHY) (SFP, GE)
- E402 LAN4 HW stamping (PHY) (RJ45, GE)

## Cesium Specification

Accuracy (better than)  $\leq \pm 1 \times 10^{-12}$  s

Allan Deviations:

- $\sigma(\tau) < 1.2 \times 10^{-11}$  T = 0.1s
- $\sigma(\tau) < 1.2 \times 10^{-11}$  T = 1s
- $\sigma(\tau) < 2.7 \times 10^{-12}$  T = 100s
- $\sigma(\tau) < 5.0 \times 10^{-14}$  T = 5 days
- $\sigma(\tau) < 5.0 \times 10^{-14}$  T = 30 days

### Front Panel I/O:

- LAN2 100/10Mbps (RJ45)
- 2x USB 2.0 (firmware)
- 1x DSUB-9 (M, TTY)

### Network Time Protocol (NTP, SNTP) supported

- RFC1305 • RFC1119 • RFC5905- RFC5909 • RFC2030 • RFC1769 • RFC4430
- LAN1-2 LAN1-2 LAN1-2 LAN1-2 LAN1-10 LAN1-10 LAN1-10
- NTP performance is up to 10 000 request per second. VLAN is supported: LAN1-LAN2

### Precision Time Protocol (PTP IEEE1588:2008 and SyncE)

- LAN 3-10 Hardware timestamping PHY (FPGA) w/ sync accuracy better than 50ns (nanoseconds)
- Profiles: Default, Telecom, Energy, Finance\*
- Supports: one-step, two-step (clock)
- Operates: with peer-to-peer, end-to-end, transparent clocks
- Supports: multicast and unicast PTP
- Capability: Synchronous Ethernet (SyncE) transmit capability
- Slave mode: available for Expander #1 (LAN3-4)
- Output Sync rate up to 128 sync packet per second (individually programmable per slave)
- Fully compliant to telecom ITU-T G.8261 (supporting SSU), and energy IEC 61850, IEEE C37.128
- LAN 1-2 supports software timestamping. This interface supports VLAN and CISCO extenders.

### Remote configuration

- SNMP (v1,2,3) • MIB 2 • RADIUS • HTTP • HTTPS • SSH • TELNET • NTPQ/NTPDC

### Time Server (Network Appliance) Sync Accuracy

- MultisAT GNSS receiver: better than 15ns (NTS-antenna)
- LAN (PTP/IEEE1588): better than 50ns (typically 25ns)

### Mechanical/environmental

- Size Network Appliance: 484 x 300 x 88,8 mm
- Size Cesium Clock 426 x 523 x 133 mm
- Power: 20- 70 VDC (max 2A) - dual redundant\*
- 110-230 VAC (max 1A) - dual redundant
- 120-370 VDC (max 1A) - dual redundant
- Operating temperature: 0°C to +60°C
- Storage temperature: -40°C to +80°C
- Humidity: up to 95%



Cesium Beam Replacement Tube  
10 Year Life Available

\* extra feature

Cesium Clock (3U rack'19)



Time Server Network Appliance w/ 1x Expander



Time Server Network Appliance w/ 4x Expanders

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