MY2020

NTS-9000A Cesium

NTP/PTP IEEE1588 HYBRID Time Server

Real Cesium Network Appliance



- HYBRID rack'19 system
- NTS-5000 base platform

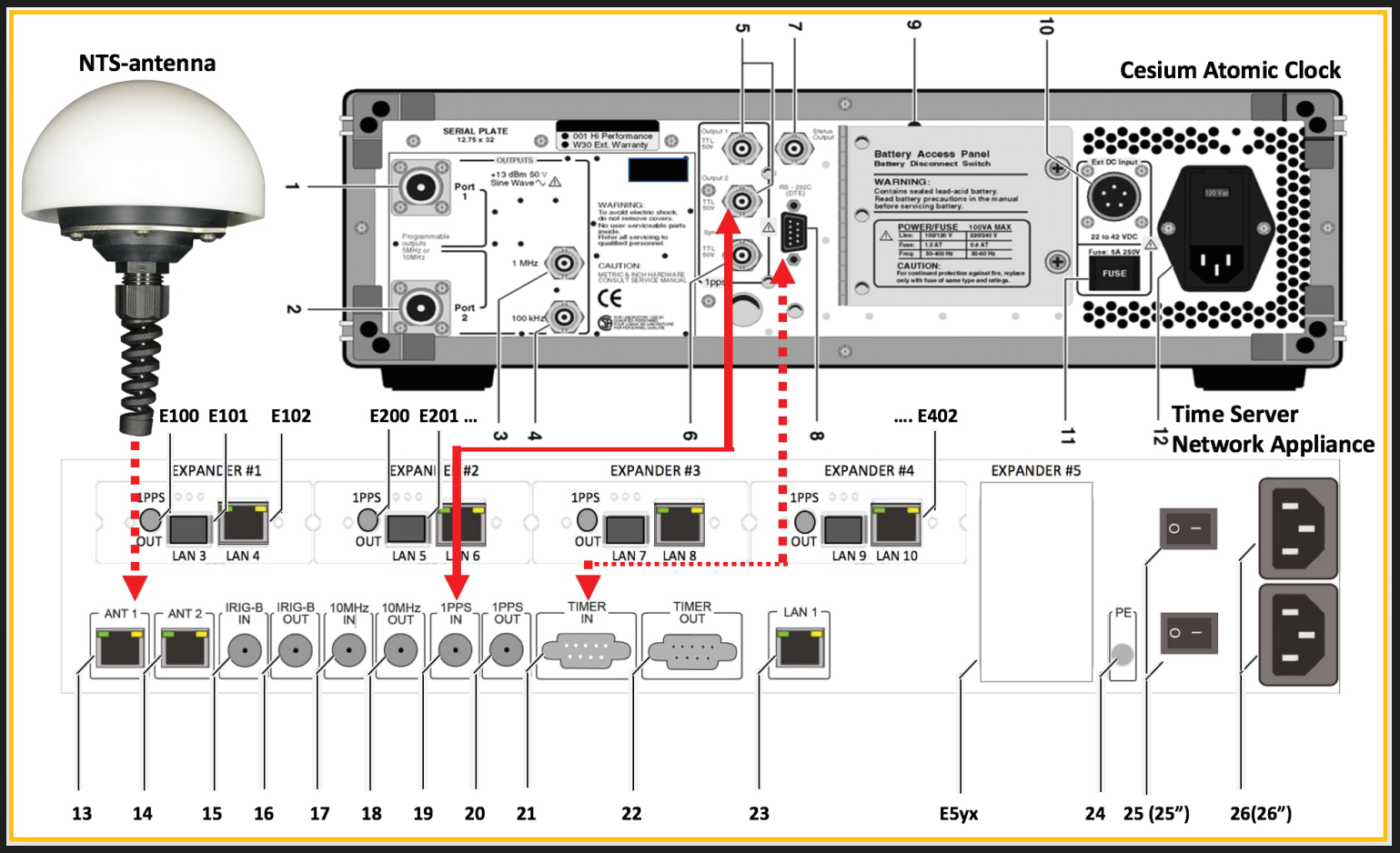
- 10 YEAR Cs BEAM 10890A 5071A 100% compatible
- CESIUM ACCURACY > 10E $^{-12}$
- OUTPUTS 100kHz 1/5/10MHz
- 1PPS TTL 50Ω Input & Output
- TIME CODES IRIG-B SYSPLEX
- 10x LAN* (SFP/RJ45)
  8x GE* hardware PHY stamps
  2x 100Mbps software stamps
- NTP v 2, 3, 4 SNTP
- PTP IEEE1588 (SyncE* GM)
- SNMP v3,v2 MIB2 RADIUS
- MD5 RSA DSA SSL security
- CRYPTO authentication MD5
- REMOTE server onfiguration SSH HTTPS HTTP TELNET
- RS232/485 & USB interfaces
- REDUNDANT power-supply*

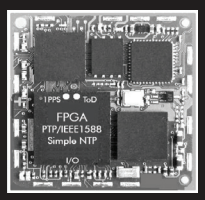
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ELPROMA

* extra feature requiring additional hardware and/or software firmware upgrade

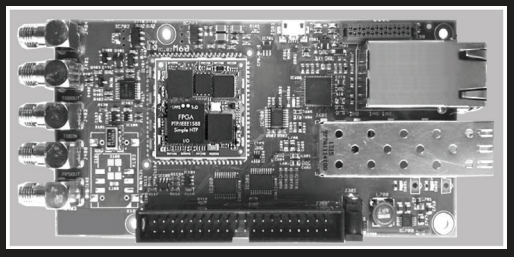
NTS-9000A Cesium





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 PTPT(FPGA) i a basic component of PTP Granmaster card. There are max. 4 cards, each located in Expander 1-4.



On the right side are output pares of L AN3-4, 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 i n 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 delive-ref. time to networks (max. 10x LAN) using prototocls like: NTP, SNTP, PTP IEEE1588.

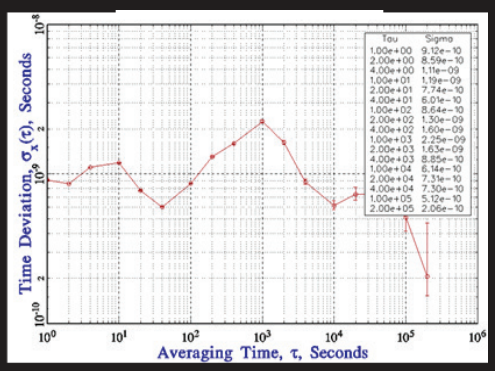
LAN1-LAN2 are std. 100Mbps (RJ45) interfaces. They support software time stamps. This is compatibility layer available at all Elproma NTS family product since year 2000.

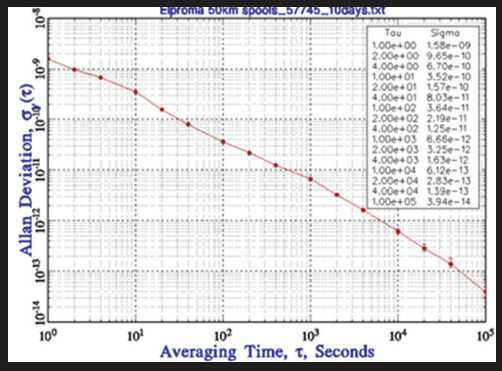
LAN3-LAN10 are optional GE (SFP/RJ45). They support hardware time stamps. There are max. 4 Expanders. Each supports 2 LAN. Each card is exclusive GRANDMASTER has own private IP stack that improoves security. Netwtwork cards are 100% isolated each other using one-way analogue synchornization signals (PPS/ToD)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

Server is equipped with 2 independent GNSS receiver inputs (ANT1-2). It can support NTS-antenna-STD or PRO antyjammig/spoofing version. Other 3rd part SAT recevers can be coneccged 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 meaurements: Time Deviation (TDEV), right Allan Deviation (TDEV)





(1) Cesium Clock Synchronization 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 50ΩTTL) 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.

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



Cesium Clock (3U rack'19)



Time Server Network Appliance w/ 1x Expander



Time Server Network Appliance w/ 4x Expanders

(2) Time Server Network Aplliance I/O:

13. GNSS Input #1 /NTS-antenna/ (RJ45, RS485)
14. GNSS Input #2 /NTS-antenna/ (RJ45, RS485)
15. IRIG-B AM Input (BNC, 50Ω)
16. IRIG-B AM Output (BNC, 50Ω)
17. 10MHz Sine Input (n/a) (BNC, 50Ω)
18. 10MHz Sine Out (BNC, 50Ω)
19. 1PPS Input (BNC, 50Ω)
20. 1PPS Output (BNC, 50Ω)
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, 50Ω)
E101 LAN3 HW stamping (PHY) (SFP, GE)
E102 LAN4 HW stamping (PHY) (RJ45, GE)

Expander #2 (optional)

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

Expander #3 (optional)

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

Expander #4 (optional)

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

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 LAN1-2
- RFC1119 LAN1-2
- RFC5905- RFC5909 LAN1-2
- RFC2030 LAN1-2
- RFC1769 LAN1-10
- RFC4430 LAN1-10

NTP performance is up to 10 000 request per second. VLAN is supported: LAN1-LAN2

Precission Time Protocol (PTP IEEE1588:2008 and SyncE)

- LAN 3-10 Hardware timestamping PHY (FPGA) w/ sync accuracy better than 50ns (nanoseconds)
  Profiles: Default, Telecom ITU-I G.8275.1 G.8275.2, SyncE, Energy IEEEC37.238 / IEC 61850-9-3
  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.8265 (supporting SSU), and energy IEC 61850, IEEE C37.238
- LAN 1-2 supports software timestamping. This interface supports VLAN and some CISCO models.

Remote configuration

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

Time Server (Network Appliance) Sync Accuracy

- MultisSAT GNSS receiver: better than 15ns
- LAN (PTP/IEEE1588): better than 50ns

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

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Made in EU

* extra feature