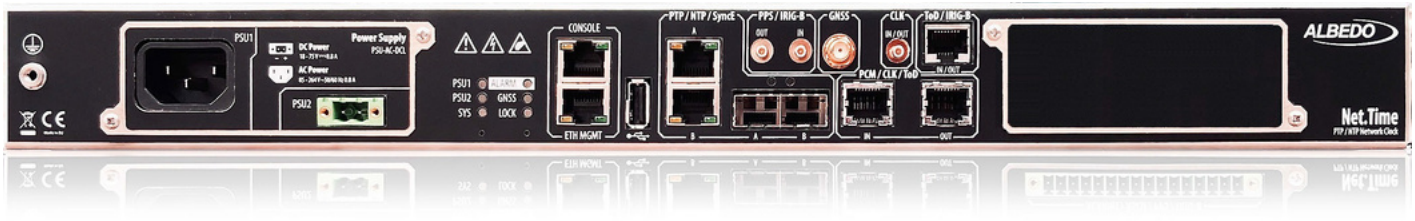
ALBEDO
Just in Time

wavetel
a simac group company



Net.Time τ a PTP/NTP/SyncE clock featuring dual 1 Gb/s optical and electrical interfaces. Once locked to a time reference, it delivers accurate phase, time and frequency synchronization with reliable holdover provided by its OCXO or Rubidium oscillator.

Net.Time τ - a rugged PTP/NTP clock

Datasheet

Updated on 10/2/26
DS-Net-Time-Tau-v6.fm

CONFIDENTIAL

Net.Time τ can operate as a Master, Slave, or Boundary clock with redundant reference inputs and outputs. Supports for GNSS, PTP, SyncE, ToD, PPS, T1/E1 and MHz signals enables flexible timing interworking between modern packet networks and legacy telecom architectures.

1. Mainframe Ports

Table 1. Signals and interfaces in the mainframe

	GNSS	PTP	NTP	SyncE	ToD	PPS	T1/E1	MHz
RJ45 (A)		out	out	out				
SPF (A)		out	out	out				
RJ45 (B)		in/out	in/out	in/out				
SPF (B)		in/out	in/out	in/out				
RJ48 (C)					in		in	in
RJ48 (D)					out		out	out
SMB (E)						out		
SMB (F)						in		
SMA (G)	in							
SMB (H)								in/out
RJ48 (I)					in/out		out	out

- RJ45 (A, B): PTP, NTP, SyncE
- SFP (A, B): PTP, NTP, SyncE
- RJ48 (C, D): ToD (NMEA, G.8271), 1/ 1.544/ 2.048/ 5/ 10MHz, T1/ E1
- SMB (E): PPS
- SMB (F): PPS
- SMA (G): GNSS
- SMB (H): 1.0/ 1.544 / 2.048 / 5.0 / 10.0 MHz
- RJ48 (I): ToD (NMEA, G.8271), 1/ 1.544/ 2.048/ 5/ 10MHz, T1/E1

1.1 Port Specification

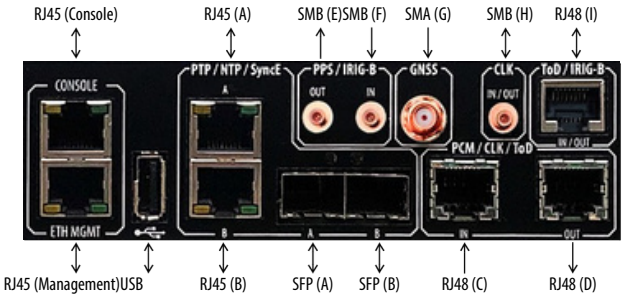


Figure1. Mainframe connector layout

2. Clock functions

ITU-T G.8272 PRTC-B compliant

- Hierarchical clock reference input configuration
- Automatic Reference switchover on detection of input degradation
- Custom and predefined time zones
- Unmanaged leap second adjustment and reporting

2.1 Oscillator Performance (Locked to GNSS)

Table 2. Frequency accuracy (1 day observation time)

Observation	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
Single-band	$2.0e^{-12}$	$1.0e^{-12}$	$1.0e^{-12}$	$1.0e^{-12}$	$1.0e^{-12}$
Multi-band	$1.0e^{-12}$	$5.0e^{-13}$	$5.0e^{-13}$	$5.0e^{-13}$	$5.0e^{-13}$

Table 3. RMS phase error

GNSS	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
Single-band	±30ns	±20ns	±20ns	±15ns	±15 ns
Multi-band	±15 ns	±10ns	±10 ns	±5 ns	±5 ns

Table 4. Locking time

	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
Locking Time	<5 n s	<10 min	<15 min	< 4 hours	<4 hours

2.2 Oscillator Performance (Holdover mode)

Table 5. Holdover time accuracy (±1ºC)

Phase within	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
± 100 ns	10 seconds	30 minutes	2 hours	8 hours	10 hours
± 500 ns	1 minute	2 hours	8 hours	14 hours	30 hours
± 1.0 µs	2 minutes	4 hours	18 hours	28 hours	60 hours
± 10.0 µs	10 minutes	1 day	2 days	8 days	12 days

Table 6. Holdover frequency accuracy after one day (±1ºC)

	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
Freq Accuracy	-	$1.0\ e^{-10}$	$2.0\ e^{-11}$	$1.0\ e^{-11}$	$5.0e^{-12}$

2.3 Oscillator Aging

Table 7. Aging

	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
Daily	$2.0e^{-8}$	$5.0e^{-10}$	$1.0e^{-10}$	$5.0e^{-12}$	$2.5e^{-11}$
Monthly	-	$1.0e^{-8}$	$3.0e^{-9}$	$5.0e^{-11}$	$5.0e^{-11}$
Yearly	$5.0e^{-7}$	$5.0e^{-8}$	$1.0e^{-8}$	$1.5e^{-9}$	$6.0e^{-10}$

3. GNSS Synchronization Inputs

Connector: SMA(50 ⌧⌧)

- Fixed position mode for GNSS references
- Automatic setting of UTC-to-TAI offset (leap seconds) through GNSS
- 4V - 5V DC output in GNSS port to feed an external antenna
- Cable delay compensation
- Automatic antenna detection

3.1 Single-band Receiver

- 72-channel receiver
- Sensitivity: -166 dBm (tracking), -148 dBm (cold start)
- Concurrent selection of up to three satellite constellations.
- Anti-jamming technology
- Bands: (1) GPS L1, (2) GLONASS L10F, (3) Galileo E1B/C, (4) BeiDou B1

3.2 Multi-band Receiver

- 184-channel receiver
- Sensitivity: -167 dBm (tracking), -148 dBm (cold start)
- Concurrent selection of up to three satellite constellations
- Simultaneous operation in two different frequency bands
- Anti-jamming and anti-spoofing technology
- Bands: (1) GPS L1C/A, L2C, L5, (2) GLONASS L10F, (3) Galileo E1B/C, E5b, E5a, (4) BeiDou B1I, B1C, B2a, (5) NavIC L5

4. Ethernet

RJ45 /SFPwork in combo mode, only one of each pair is active

- RJ45 interfaces: 10BASE-T, 100BASE-TX, 1000BASE-T
- SFP interfaces: 100BASE-FX, 1000BASE-LX, 1000BASE-ZX, 1000BASE-SX
- Auto-negotiation 10 / 100 / 1000Mb/s
- Ability to disable auto-negotiation and force line settings

5. Clock Reference Inputs

- PTPover RJ-45 andSFP
- Synchronous Ethernet over RJ.48 and SFP
- 1/ 1.544/ 2.048/ 5/ 10MHz and T1/ E1 over RJ-48
- SSM decoding in E1 and T1 inputs
- ToD over RJ-48 (ITU-T G.8271, China Mobile and NMEA)
- 1PPS over SMB
- RS-422 / ITU-T V.11 levels for PPS over RJ-48
- Custom delay compensation for phase and time inputs

6. Clock Reference Outputs

PTPand NTP over RJ-45and SFP

- Synchronous Ethernet over RJ.48 and SFP
- 1/ 1.544/ 2.048/ 5/ 10MHz and T1/ E1 over RJ-48 (square pulse 2.4Vpp)
- Compliant with E1 (ITU-T G.703) and T1 (ANSI T1.102) masks
- SSM generation in E1 and T1 outputs
- 1/ 1.544/ 2.048/ 5/ 10MHz over SMB (square pulse, 2.4Vpp)
- ToD over RJ-48 (ITU-T G.8271 and NMEA)
- PPS with configurable period in 1-second steps over SMB
- RS-422 / ITU-T V.11 levels for PPS over RJ-48
- Custom delay compensation for phase and time outputs

7. PTP

Upto 512 unicast users (256 per port)

- IEEE 1588-2008 Annex J, Default profiles
- ITU-T G.8265.1, Telecom frequency profile
- ITU-T G.8275.1, Telecom phase and time profile
- ITU-T G.8275.2, Telecom PTS / APTS profile

8. NTP Function

Up to 500.000 transactions/s in server mode

- NTP protocol versions: NTPv3 (RFC1305), NTPv4 (RFC5905)
- SNTP protocol versions: SNTPv3 (RFC 1769)
- MD5 and SHA1 authenticated NTP transactions

9. SyncE Function

- Synchronous Ethernet clock input or output from port B
- Synchronous Ethernet clock output from port A
- RJ-45: 100BASE-TX, 1000BASE-T
- SFP: 100BASE-FX, 1000BASE-SX / LX / ZX
- ESMC generation/decoding/forwarding as specified in ITU-T G.8261/ G.8262 / G.8264

10. Packet Services

- Packet Grandmaster: two independent PTP, NTP and SyncE outputs
- Protocol Translator: one PTP, NTP and SyncE input and one PTP, NTP and SyncE outputs

11. Protocols and Frames

- DIX andIEEE 802.1Q Ethernet frame formats
- Configuration of the VLAN VID
- User Priority if the VLAN encapsulation is enabled (IEEE 802.1Q format)
- Configuration of DSCP CoS labels
- ARP (IETF RFC826) for automatic resolution of remote MAC address in IP
- Endpoint mode (IPv4 network protocol)
- DHCP (client side) (IETF RFC2131)
  Static IPv4 local profile configuration

12. Statistics

- Current, max / min traffic in b/s, frames/s, % channel capacity
- Unicast, multicast, broadcast traffic in b/s, frames/s, % channel capacity
- IPv4 and IPv6 statistics in b/s, frames/s, % channel capacity
- UDP traffic in b/s, frames/s, % channel capacity
- Simultaneous per-port statistics for ports A and B

13. Platform

13.1 Po r ts

- RJ45: RS-232 console
- RJ45: Ethernet management
- USB: Storage

13.2 Management

- Web application running over HTTP or HTTPS
- Custom SSL certificates for the web application
- CLI management interface through Console interface
- SSH and Telnet remote management through ETH MGMT interface
- USB soft and firmware updates
- RFC 3164 Syslog event reporting (device role)
- Support of SNMPv2c as defined in RFC 1901
- Support of SNMPv3 as defined in RFC 3410, RFC 3411, RFC 3412
- Support of SNMP traps to report events trough SNMPv2c and SNMPv3
- Ability to enable or disable management protocols separately

13.3 User Access Control

- Creation, configuration and management of user accounts
- RADIUS (Remote Authentication Dial-In User Service)
- TACACS+ (Terminal Access Controller Access-Control System Plus)
- User roles with custom access rights
- Advanced user access management policies
- Ability to grant or deny access based on user location (IP address)

13.4 E rgonomi cs

- Fanless operation
- Dimensions: 44mm x228 mmx435mm (equivalent to 1U in 19" rack)
- Weight: 1.9kg / 4.2 lb
- MTBF: 150,000 hours (T/OCXO models), 140,000 hours (Rub. models)

13.5 Power Supply

- Redundant power supply (Single or Double)
- AC: 100 ~ 240VAC, 50- 60 Hz (IEC 60320 C13/C14)
- DC: 18 ~ 75VDC (2-pin 5.1 mm)
- AC/DC: 85 - 264 VAC and 100 - 370 VDC (2-pin 5.1mm)
- Power consumption: 10W (T/OCXO models), 14W (Rubidium models)

13.6 LEDs

Platform: PSU1, PSU2, System

- Application: Alarm, GNSS, Locked

13.7 USB

- Software and firmware upgrade
- Configuration, results, user files

13.8 Environmental

- Storage:-40~ +85ºC
- Operating: -40 ~ +70ºC temp. / 0 ~ 95%RH (non-condensing)

14. Certifications

14.1 Summary

Communications devices installed in substations: IEEE1613, IEC 61850-3

- Electromagnetic compatibility: CISPR 22/EN55022, CISPR24/EN55024,
- IEC61000-3-2, IEC61000-3-3, CFR 47 part 15 Environmental: IEC61850-3 Safety: IEC/EN 61850-3, IEC/EN/UL/CSA 62368-1 Other: EN 63000 (RoHS), EN 303 413 V1.1.1 (RED)

14.2 Electromagnetic Compatibility (Emission)

- Conducted Disturbance: CISPR22/EN55022 (Class B), CFR 47 Part 15
- Radiated Emissions: CISPR22/EN55022 (Class B), CFR 47 Part 15
- Harmonics of Current: IEC 61000-3-2 (Class A)
- Voltage Fluctuation and Flicker: IEC 61000-3-3

14.3 Electromagnetic Compatibility (Immunity)

Radiated RF Susceptibility (RS)

IEEEC37.90.2: 80 ~ 1000MHz, 20V/m, 80% AM (1kHz)

- IEC61000-4-3: 80 ~3000 MHz, 10V/m, 80% AM (1kHz)

Conducted RF Susceptibility(CS)

- IEC 61000-4-6: 0.15 ~80 MHz, 10Vrms, 80% AM (1kHz)

Electrostatic discharge (ESD) immunity

- IEEEC37.90.3: 15kV air discharge, 8kV contact discharge
- IEC61000-4-2: 2008: 8kV air discharge, 6kV contact discharge

Electrical fasttransient / burst(EFT)immunity

- IEEEC37.90.1: 4kV in power and telecom ports
IEC61000-4-4: 2kV in power and earth ports, 4kV in telecom ports

Damped oscillatory wave immunity

IEEE C37.90.1

2.5kV (1 MHz) in power and telecom ports

IEC 61000-4-18

- 0.5kV diff./1kV comm, (1MHz) in power port
1kV diff./2.5kV comm, (1MHz) in telecom ports

Surge immunity

IEC 61000-4-5

Power port line to line 1kV, line to ground 2kV

- Telecom port line to line: 2kV, line to ground: 4kV

Power frequency immunity

IEC 61000-4-16

30V (continuous) and 300V (1s) in telecom port

- 10V (continuous) and 100V (1s) in power port

Powerfrequency magneticfield immunity

IEC 61000-4-8

- 100 A/m (continuous) and 1000 A/m (1s)

Power supply immunity

- IEC 61000-4-11
- IEC 61000-4-17
- IEC 61000-4-29

14.4 Reliability

- Cold storage: IEC60068-2-1, -40ºC, 16 hours
- Cold operation: IEC60068-2-1, -40ºC, 16 hours
- Dry heat storage: IEC60068-2-2, +85ºC, 16 hours
- Dry heat operation: IEC60068-2-2, +70ºC, 16 hours
- Change of temperature: IEC60068-2-14, -10 ~ + 65ºC, 5 cycles
- Damp heat cyclic: IEC60068-2-30, +25~+40ºC, 55~93%RH, 6 cycles
- Damp heat steady state: IEC60068-2-78, +40ºC, 55%RH, 10 days
- Vibration response: IEC60255-21-1 (Class 1)
- Vibration endurance: IEC60255-21-1 (Class 1)
- Shock response: IEC60255-21-2 (Class 1)
- Shock Withstand: IEC60255-21-2 (Class 1)
- Bump: IEC60255-21-2 (Class 1)
- Seismic test: IEC60255-21-3 (Class 2)
- Degrees of protection provided by enclosures: IEC 60529 (IP30)

14.5 Safety

- Communications devices installed in power substations IEC / EN 61850-3
- Audio/Video, information and communication technology equipment IEC / EN 62368-1, UL 62368-1, CSA C22.2 No. 62368-1

15. Ordering Information

Table 8. *Base configuration*

Code	Description
NT.TAU.GM.AC	Net.Time Grandmaster Clock with dual 10/100/1000 Mb/s electrical and dual 100/1000 Mb/s optical Ethernet ports supplying synchronization as specified in IEEE 1588-2008 Annex J "Default Profiles", ITU-T G.8261.1 "Telecom frequency profile", ITU-T G.8275.1 "Telecom phase and time profile" and ITU-T G.8275.2 "PTS / APTS profile" to a maximum of 64 clocks. Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769) server functionality. Internal TCXO timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. Synchronous Ethernet input / output and ESMC generation and decoding as specified in ITU-T G.8261, G.8262 and G.8264. 1PPS, 1PP2S and time-of-day inputs and outputs. 2048 kHz, 2048 kb/s, 1544 kHz, 1544 kb/s, 10 MHz and 5 MHz clock reference inputs and outputs. Frame and network statistics. Con- sole and Ethernet management ports. Simple Network Management Protocol (SNMP) management. Web Server. USB firmware upgrade. Single AC 100 – 240 V, 50 – 60 Hz (IEC 60320 C13/C14) power supply unit (PSU-AC).
NT.TAU.GM.ACDC	Net.Time Grandmaster Clock with dual 10/100/1000 Mb/s electrical and dual 100/1000 Mb/s optical Ethernet ports supplying synchronization as specified in IEEE 1588-2008 Annex J "Default Profiles", ITU-T G.8261.1 "Telecom frequency profile", ITU-T G.8275.1 "Telecom phase and time profile" and ITU-T G.8275.2 "PTS / APTS profile" to a maximum of 64 clocks. Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769) server functionality. Internal TCXO timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. Synchronous Ethernet input / output and ESMC generation and decoding as specified in ITU-T G.8261, G.8262 and G.8264. 1PPS, 1PP2S and time-of-day inputs and outputs. 2048 kHz, 2048 kb/s, 1544 kHz, 1544 kb/s, 10 MHz and 5 MHz clock reference inputs and outputs. Frame and network statistics. Console and Ethernet management ports. Simple Network Management Protocol (SNMP) management. Web Server. USB firmware upgrade. Single AC 85 – 264 V / DC 100 – 370 V (2-pin 5.1 mm) power supply unit (PSU-ACDC).
NT.TAU.GM.DCL	Net.Time Grandmaster Clock with dual 10/100/1000 Mb/s electrical and dual 100/1000 Mb/s optical Ethernet ports supplying synchronization as specified in IEEE 1588-2008 Annex J "Default Profiles", ITU-T G.8261.1 "Telecom frequency profile", ITU-T G.8275.1 "Telecom phase and time profile" and ITU-T G.8275.2 "PTS / APTS profile" to a maximum of 64 clocks. Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769) server functionality. Internal TCXO timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. Synchronous Ethernet input / output and ESMC generation and decoding as specified in ITU-T G.8261, G.8262 and G.8264. 1PPS, 1PP2S and time-of-day inputs and outputs. 2048 kHz, 2048 kb/s, 1544 kHz, 1544 kb/s, 10 MHz and 5 MHz clock reference inputs and outputs. Frame and network statistics. Console and Ethernet management ports. Simple Network Management Protocol (SNMP) management. Web Server. USB firmware upgrade. Single DC 18 – 75 V (2-pin 5.1 mm) power supply unit (PSU-DCL)

Table 9. *Optional features*

Code	Description
NT.TAU.BC	Adds PTP profile translation functionality, PTP to NTP protocol translation and Synchronous Ethernet frequency input.
NT.TAU.GM.USR128	Increases number of client unicast clocks from 64 to 128.
NT.TAU.GM.USR256	Increases number of client unicast clocks from 64 to 256.

Table 10. *Hardware options*

Code	Description
NT.TAU.FHM.OCXO	OCXO oscillator.
NT.TAU.FHM.OCXOHQ	OCXO HQ oscillator.
NT.TAU.FHM.RB	Rubidium oscillator.
NT.TAU.FHM.RBHQ	Rubidium HQ internal oscillator.
NT.TAU.FHM.MB	Replaces the standard GNSS receiver by multi-band receiver. Compatible with GPS, GLONASS, Galileo, BeiDou and NavIC. Jamming and spoofing detection and mitigation.
NT.TAU.PSU.AC	Adds an additional AC 100 – 240 V, 50 – 60 Hz (IEC 60320 C13/C14) power supply unit.
NT.TAU.PSU.ACDC	Adds an additional AC/DC 85 – 264 VAC / 100 – 370 VDC (2-pin 5.1 mm) power supply unit.
NT.TAU.PSU.DCL	Adds an additional low voltage DC 18 – 75 V (2-pin 5.1 mm) power supply unit.

Table 11. *Ac ce ss or ie s*

Code	Description
NT.ANT	GNSS kit for fixed installation up to 50 m. Includes surge arrester, 3 m TNC-SMA patch cable. Cable not included.
NT.ANTC	GNSS kit for fixed installation up to 200 m. Includes antenna, surge arrester, in-line amplifier 25 dB gain, 3 m TNC-SMA patch cable, 20 cm TNC-TNC low loss coaxial cable. Cable not included.
NT.ANT.MB	GNSS antenna kit for fixed installation up to 50 m. Compatible with L1 and L5 frequency bands. Includes antenna, surge arrester, 3 m TNC-SMA patch cable and accessories. Cable not included.
NT.ANTC.MB	GNSS antenna kit for fixed installation up to 200 m. Compatible with L1 and L5 frequency bands. Includes antenna, surge arrester, in-line amplifier 25 dB gain, 3 m TNC-SMA patch cable, 20 cm TNC-TNC low loss coaxial cable and accessories. Cable not included.