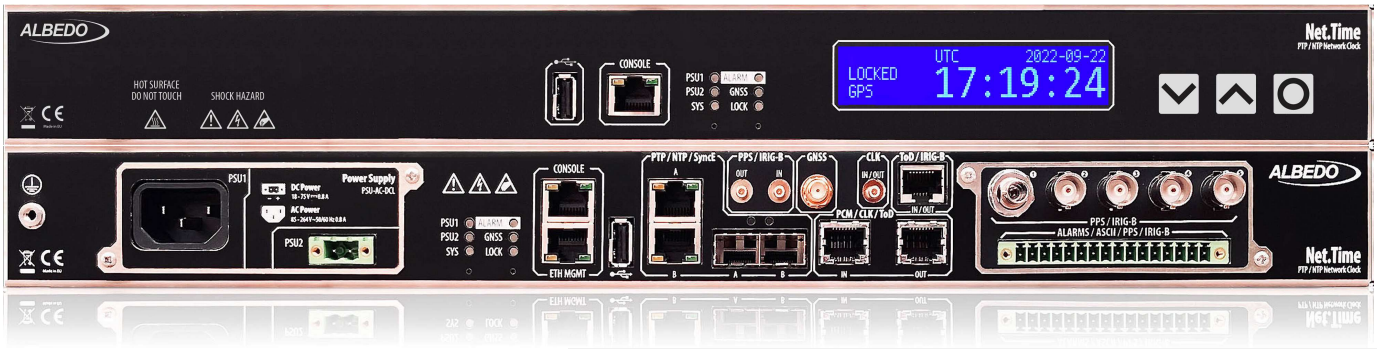

Net.Time φ is a versatile PTP / NTP over PRP clock capable to synchronize both IEEE 61850 and legacy devices making it ideal for the transition to new synchronization standards while protection existing investments.

Datasheet

Updated on 30/10/23
DS-Net-Time-Phi-v6.8.fm

Net.Time φ - a substation clock

Net.Time Phi has all the functionality required to provide synchronization to power substations. This clock has the ability to generate PTP and NTP to generate timing for IEC 61850 IEDs and at the same time it provides the IRIG-B and 1PPS clock sources for legacy devices. Net.Time φ accepts GNSS inputs but it is also compatible with a large number of backup or complementary inputs.

1. Clock Performance

- Default OCXO better than ±0.1 ppm
- Optional Rubidium better than ±5.0 e-11

1.1 Locking time

Table 1. *Locking time*

	OCXO	Rubidium
Locking time	< 5 min	< 4 hours

1.2 Performance 24h (Locked)

Table 2. *Oscillators performance*

Reference	OCXO	Rubidium
GNSS	± 45 ns	± 40 ns
1PPS / ToD	± 10 ns	±10 ns

1.3 Performance (Hold-over)

Table 3. *Oscillators performance*

	OCXO	Rubidium
Phase within ±100 ns	-	10 hours
Phase within ±500 ns	2 hours	24 hours
Phase within ±1.0 µs	4 hours	48 hours
Phase within ±5.0 µs	24 hours	-

2. Ports

Control

- 2 x RJ45: Console and Management
- 1 x USB: Storage

Timing

- 2 x SFP
- 2 x RJ-45
- 1 x SMA: unbalanced 50 Ω
- 3 x SMB: unbalanced 50 Ω
- 3 x RJ-48: balanced (RS-422) 100 Ω

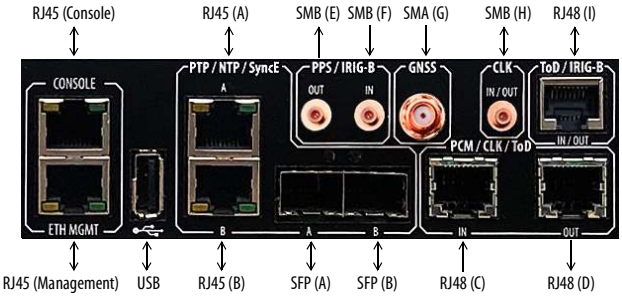

Figure 1. *Mainframe ports*

Table 4. *Signals and interfaces*

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

3. Ethernet

- 2 x RJ-45: 10BASE-T, 100BASE-TX, 1000BASE-T
- 2 x SFP: 100BASE-FX, 1000BASE-LX, 1000BASE-ZX, 1000BASE-BX
- RJ-45 / SFP work in combo mode, only one of each pair is active

4. 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

5. GNSS Synchronization Inputs

- Connector: SMA (50 Ω)
- Fixed position mode for GNSS references
- Automatic setting of UTC-to-TAI offset (leap seconds) through GNSS

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- 4V - 5V DC output in GNSS port to feed an external antenna
- Cable delay compensation
- Automatic antenna detection

5.1 Single-band Receiver

- 72-channel receiver
- Bands: GPS L1, GLONASS L10F, BeiDou B1, Galileo E1B/C
- Sensitivity: -166 dBm (tracking), -148 dBm (cold start)
- Single or multiple constellation selection
- Anti-jamming technology

5.2 Multi-band Receiver

- 184-channel receiver
- Bands: GPS L1C/A, L2C, L5 / GLONASS L10F / Galileo E1B/C, E5b, E5a / BeiDou B1I, B1C, B2a / NavIC L5
- Sensitivity: -167 dBm (tracking), -148 dBm (cold start)
- Single or multiple constellation selection
- Anti-jamming and anti-spoofing technology

6. Clock Reference Inputs

- PTP over RJ-45 and SFP
- 1.5 / 2.0 / 5 / 10 MHz and 1.5 / 2.0 Mb/s over RJ-48
- ToD over RJ-48 (ITU-T G.8271, China Mobile and NMEA)
- 1 PPS over SMB (ITU-T G.8271)
- IRIG-B00X, B15X, B22X over SMB (up to 25 Vpp with AC / DC coupling)
- IRIG-B00X, B22X over RJ-48 (RS-422 / ITU-T V.11)
- Custom delay compensation for phase and time inputs

7. Clock Reference Outputs

- PTP and NTP over RJ-45 and SFP
- 1.5 / 2.0 / 5 / 10 MHz, 1.5 / 2.0 Mb/s over RJ-48 (square pulse 2.2 Vpp)
- 2.048 Mb/s (ITU-T G.703), 1.544 Mb/s (ANSI T1.102)
- 1.5 / 2.0 / 5 / 10 over SMB (square pulse, 2.2 Vpp)
- ToD over RJ-48 (ITU-T G.8271 and NMEA)
- PPS with custom period over SMB (ITU-T G.8271)
- IRIG-B00X / B1XX / B22X over SMB (5 Vpp with AC / DC coupling)
- IRIG-B00X /B22X over RJ-48 (RS-422 / TU-T V.11)
- Custom delay compensation for phase and time outputs

8. Auxiliary Clock Reference Outputs

Implemented through factory configurable and replaceable modules.

8.1 RIC-50 Module

Provides a combination of 5 x BNC / ST ports (up) and 5 x BNC ports (down):

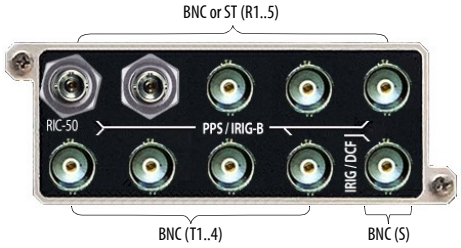

Figure 2. *RIC-50 connector layout*

- ST (R1..5): IRIG-B00X, PPS, 1.5 / 2.0 / 5 / 10 MHz
- BNC (R1..5): IRIG-B00X, PPS, 1.5 / 2.0 / 5 / 10 MHz
- BNC (T1..4): IRIG-B00X, PPS, 1.5 / 2.0 / 5 / 10 MHz
- BNC (S): IRIG-B1XX, DCF77

Table 5. *RIC-50 ports and interfaces*

	ToD	IRIGB	PPS	ASCII	DCF77	Alarm	MHz
ST (R1..5)		out	out				out
BNC (R1..5)		out	out				out
BNC (S)			out		out		
BNC (T1..4)		out	out				out

8.2 RIC-52 Module

Provides 4 x RJ48 (up) and 5 x BNC (down) ports:

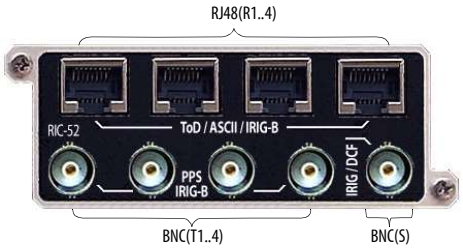

Figure 3. *RIC-52 connector layout*

- RJ48(R1..4): IRIG-B00X, ToD (NMEA, G.8271), ASCII (NMEA, Meinberg)
- BNC (T1..4): IRIG-B00X, PPS, 1.5 / 2.0 / 5 / 10 MHz
- BNC (S): IRIG-B1XX), DCF77

Table 6. *RIC-52 ports and interfaces*

	ToD	IRIGB	PPS	ASCII	DCF77	Alarm	MHz
RJ48 (R1..4)	out	out		out			
BNC (S)		out			out		
BNC (T1..5)		out	out				out

8.3 RIC-54 Module

Provides 5 x BNC (up) and a16-pin terminal block (down) ports:

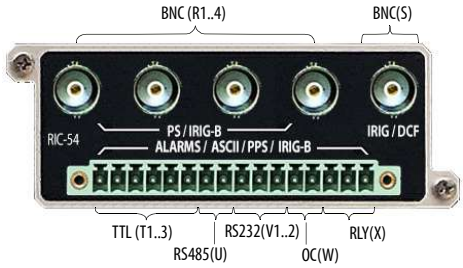

Figure 4. *RIC-54 connector layout*

- BNC (R1..4): IRIG-B00X, PPS, 1.5 / 2.0 / 5 / 10 MHz
- BNC (S): IRIG-B1XX), DCF77
- TTL (T1..3): IRIG-B00X, PPS
- RS232 (V1..2): ASCII (NMEA, Meinberg)
- RS485 (U): IRIG-B00X, ASCII (NMEA, Meinberg), PPS
- OC (W): PPS, Alarm (Electronic -MOSFET driver- relay)
- RLY (X): Alarm (Electro-mechanic relay)

Table 7. *SRIC-54 ports and interfaces*

	ToD	IRIGB	PPS	ASCII	DCF77	Alarm	MHz
BNC (R1..4)		out	out				out
BNC (S)		out			out		
TTL (T1..3)		out	out				
RS485 (U)		out	out	out			
RS232 (V1..2)				out			
OC (W)			out			out	
RLY (X)						out	

8.4 RIC-82 Module

Provides a combination of 5 x BNC / ST ports (up) and 16-pin terminal block:

- ST (R1..5): IRIG-B00X, PPS
- BNC (R1..5): IRIG-B00X, PPS
- TTL (T1..3): IRIG-B00X, PPS
- RS232 (V1..2): ASCII (NMEA, Meinberg)
- RS485 (U): IRIG-B00X, ASCII (NMEA, Meinberg), PPS
- OC (W): PPS, Alarm (Electronic -MOSFET driver- relay)

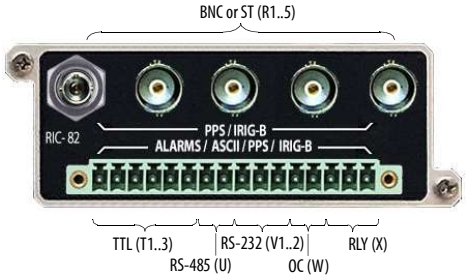

Figure 5. *RIC-82 connector layout*

- RLY (X): Alarm (Electro-mechanic relay)

Table 8. *RIC-82 ports and interfaces*

	ToD	IRIGB	PPS	ASCII	DCF77	Alarm	MHz
ST (R1..5)		out	out				
BNC (R1..5)		out	out				
TTL (T1..3)		out	out				
RS485 (U)		out	out	out			
RS232 (V1..2)				out			
OC (W)			out			out	
RLY (X)						out	

8.5 RIC-84 Module

Provides a combination of 5 x BNC / ST ports (up) and 16-pin terminal block:

- ST (R1..5): IRIG-B00X), PPS
- BNC (R1..5): IRIG-B00X), PPS
- TTL(T1..3): IRIG-B00X), PPS
- OC (U): PPS, Alarm (Electronic -MOSFET driver- relay)
- RS232(V1..2): ASCII (NMEA, Meinberg)
- OC (W): PPS, Alarm (Electronic -MOSFET driver- relay)
- RLY (X): Alarm (Electro-mechanic relay)

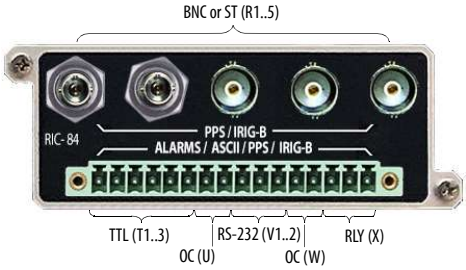

Figure 6. *RIC-84 connector layout*

Table 9. *RIC-84 ports and interfaces*

	ToD	IRIGB	PPS	ASCII	DCF77	Alarm	MHz
ST (R1..5)		out	out				
BNC (R1..5)		out	out				
TTL (T1..3)		out	out				
OC (U)			out			out	
RS232 (V1..2)				out			
OC (W)			out			out	
RLY (X)						out	

9. PTP Function

- Up to 256 unicast users per port
- IEEE 1588-2008 Annex J (Default profiles)
- IEC 61850-9-3 (Utility Profile)
- IEEE C37.238-2011 (Power Profile 2011)
- IEEE C37.238-2017 (Power Profile 2017)

10. NTP Function

- Up to 500,000 transactions / sec. in two ports in server mode
- NTP protocol versions: NTPv3 (RFC 1305), NTPv4 (RFC 5905)
- SNTP protocol versions: SNTPv3 (RFC 1769)
- MD5 authenticated NTP transactions

11. Protocol Translator Function

- When the Protocol Translator function is enabled the B port becomes a PTP slave while A port remains operating as a NTP / SNTP / PTP master
- PTP messages are forwarded / terminated as specified in IEEE 1588
- Ports A and B have independent PTP profiles

12. Protocols and Frames

- Auto-negotiation 10 / 100 / 1000 Mb/s
- Ability to disable auto-negotiation and force line settings
- DIX and IEEE 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 RFC 826) for automatic resolution of remote MAC address in IP Endpoint mode (IPv4 network protocol)
- DHCP (client side) (IETF RFC 2131)
- Static IPv4 local profile configuration

12.1 Parallel Redundancy Protocol

- Parallel Redundancy Protocol (PRP) Link Redundancy Entity (LRE) as IEC 62439-3, generation of RCT trailers on Ethernet frames
- Duplicate discard mode and PRP supervision generation / decoding
- PRP extensions for IEEE 1588-2088 / IEC 61588:2009 defined in IEC 62439-3 Annex A connected with grandmaster clock operation

13. 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

13.1 PRP LRE Statistics

- Port A, Port B and aggregated inbound and outbound frames
- Port A, Port B and aggregated inbound and outbound RCT frames
- Port A / LAN A and Port B / LAN B mismatches
- Port A, Port B and aggregated errors
- PRP node count, Port A and Port B unique entries, Port A and Port B single duplicated entries, Port A and Port B multiple duplicated entries
- Source MAC address, time to live and node time for each entry

14. Platform

14.1 Management

- Authentication TACACS and RADIUS
- Web Server
- CLI management interface through Console interface (RJ45)
- Remote management SSH 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

14.2 Ergonomics

- Fanless operation
- Dimensions: 44 mm x 228 mm x 435 mm (equivalent to 1U in 19" rack)
- Weight: 1.9 kg / 4.2 lb
- MTBF: 150,000 hours (OCXO model), 140,000 hours (Rubidium model).

14.3 Power Supply

- Redundant power supply (Single or Double)

- AC: 100 ~ 240 VAC, 50- 60 Hz (IEC 60320 C13/C14)
- DC: 18 ~ 75 VDC or 43 ~160 VDC (2-pin 5.1 mm)
- AC/DC: 85 - 264 VAC and 100 - 370 VDC (2-pin 5.1 mm)
- Power consumption: 10 W (OCXO model), 14 W (Rubidium model)

14.4 LEDs
- Platform: PSU1, PSU2, System
- Application: Alarm, GNSS, Locked

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

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

14.7 Other

Electromechanical relay rating
- Voltage: 240 VAC, 30 VDC (MOV protected)
- Current: 3 A

Solid state (open collector) relay rating
- Max. voltage: 300 V (MOV protected)
- Max. current: 120 mA

15. Certifications

15.1 Summary
- Communications devices installed in electric power substations: IEEE 1613, IEC 61850-3
- Electromagnetic compatibility: CISPR 22 / EN 55022, CISPR 24 / EN 55024, IEC 61000-3-2, IEC 61000-3-3, CFR 47 part 15
- Environmental: IEC 61850-3
- Safety: IEC / EN 61850-3, IEC / EN 62368-1, UL 62368-1, CSA C22.2 No. 62368-1
- Other: EN 63000 (RoHS), EN 303 413 V1.1.1 (RED)

15.2 Electromagnetic Compatibility (Emission)
- Conducted Disturbance: CISPR 22 / EN 55022 (Class B), CFR 47 Part 15
- Radiated Emissions: CISPR 22 / EN 55022 (Class B), CFR 47 Part 15
- Harmonics of Current: IEC 61000-3-2 (Class A)
- Voltage Fluctuation and Flicker: IEC 61000-3-3

15.3 Electromagnetic Compatibility (Immunity)

Radiated RF Susceptibility (RS)
- IEEE C37.90.2: 80 ~ 1000 MHz, 20 V/m, 80% AM (1 kHz)
- IEC 61000-4-3: 80 ~3000 MHz, 10 V/m, 80% AM (1 kHz)

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

Electrostatic discharge (ESD) immunity
- IEEE C37.90.3: 15 kV air discharge, 8 kV contact discharge
- IEC 61000-4-2: 2008: 8 kV air discharge, 6 kV contact discharge

Electrical fast transient / burst (EFT) immunity
- IEEE C37.90.1: 4 kV in power and telecom ports
- IEC 61000-4-4: 2 kV in power and earth ports, 4 kV in telecom ports

Damped oscillatory wave immunity

IEEE C37.90.1
- 2.5 kV (1 MHz) in power and telecom ports

IEC 61000-4-18
- 0.5 kV diff. / 1 kV comm, (1 MHz) in power port
- 1 kV diff. / 2.5 kV comm, (1 MHz) in telecom ports

Surge immunity

IEC 61000-4-5
- Power port line to line 1 kV, line to ground 2 kV
- Telecom port line to line: 2 kV, line to ground: 4 kV

Power frequency immunity

IEC 61000-4-16
- 30 V (continuous) and 300 V (1 s) in telecom port
- 10 V (continuous) and 100 V (1 s) in power port

Power frequency magnetic field immunity

IEC 61000-4-8
- 100 A/m (continuous) and 1000 A/m (1 s)

Power supply immunity
- IEC 61000-4-11
- IEC 61000-4-17
- IEC 61000-4-29

15.4 Reliability
- Cold storage: IEC 60068-2-1, -40ºC, 16 hours
- Cold operation: IEC 60068-2-1, -40ºC, 16 hours
- Dry heat storage: IEC 60068-2-2, +85ºC, 16 hours
- Dry heat operation: IEC 60068-2-2, +70ºC, 16 hours
- Change of temperature: IEC 60068-2-14, -10 ~ + 65ºC, 5 cycles
- Damp heat cyclic test: IEC 60068-2-30, +25~+40ºC, 55~93%RH, 6 cycles
- Damp heat steady state: IEC 60068-2-78, +40ºC, 55%RH, 10 days
- Vibration response: IEC 60255-21-1 (Class 1)
- Vibration endurance: IEC 60255-21-1 (Class 1)
- Shock response: IEC 60255-21-2 (Class 1)
- Shock Withstand: IEC 60255-21-2 (Class 1)
- Bump: IEC 60255-21-2 (Class 1)
- Seismic test: IEC 60255-21-3 (Class 2)
- Degrees of protection provided by enclosures: IEC 60529 (IP30)

15.5 Safety
- Communications devices installed in electric 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

16. Ordering Information

Table 10. *Base configuration*

Code	Description
NT.PHI.GM.AC	Net.Time Grandmaster Clock with built in LCD screen and keyboard. Includes dual 10 / 100 Mb/s electrical Ethernet port and dual 100 Mb/s optical Ethernet supplying synchronization as specified in IEEE 1588-2008 Annex J "Default Profiles", IEC 61850-9-3 "Utility Profile", IEEE C37.238-2011 "Power Profile 2011" and IEEE C37.238-2017 "Power Profile 2017" up to 64 slave clocks. Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769) server functionality. Internal OCXO timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. 1PPS, 1PP2S and time-of-day inputs and outputs. Inter Range Instrumentation Group type B (IRIG-B) time codes input and output over balanced or unbalanced interfaces. Frame and network statistics. Console and Ethernet management ports. Simple Network Management Protocol (SNMP) management. USB firmware upgrade. Single AC 100 - 240 V power supply unit (PSU-AC).
NT.PHI.GM.ACDC	Net.Time Grandmaster Clock with built in LCD screen and keyboard. Includes dual 10 / 100 Mb/s electrical Ethernet port and dual 100 Mb/s optical Ethernet supplying synchronization as specified in IEEE 1588-2008 Annex J "Default Profiles", IEC 61850-9-3 "Utility Profile", IEEE C37.238-2011 "Power Profile 2011" and IEEE C37.238-2017 "Power Profile 2017" up to 64 slave clocks. Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769) server functionality. Internal OCXO timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. 1PPS, 1PP2S and time-of-day inputs and outputs. Inter Range Instrumentation Group type B (IRIG-B) time codes input and output over balanced or unbalanced interfaces. Frame and network statistics. Console and Ethernet management ports. Simple Network Management Protocol (SNMP) management. USB firmware upgrade. Single AC 85 – 264 V / DC 100 – 370 V power supply unit (PSU-ACDC).

Table 10. *Base configuration*

Code	Description
NT.PHI.GM.DCL	Net.Time Grandmaster Clock with built in LCD screen and keyboard. Includes dual 10 / 100 Mb/s electrical Ethernet port and dual 100 Mb/s optical Ethernet supplying synchronization as specified in IEEE 1588-2008 Annex J "Default Profiles", IEC 61850-9-3 "Utility Profile", IEEE C37.238-2011 "Power Profile 2011" and IEEE C37.238-2017 "Power Profile 2017" up to 64 slave clocks. Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769) server functionality. Internal OCXO timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. 1PPS, 1PP2S and time-of-day inputs and outputs. Inter Range Instrumentation Group type B (IRIG-B) time codes input and output over balanced or unbalanced interfaces. Frame and network statistics. Console and Ethernet management ports. Simple Network Management Protocol (SNMP) management. USB firmware upgrade. Single DC 18 – 75 V power supply unit (PSU-DCL).
NT.PHI.GM.DCH	Net.Time Grandmaster Clock with built in LCD screen and keyboard. Includes dual 10 / 100 Mb/s electrical Ethernet port and dual 100 Mb/s optical Ethernet supplying synchronization as specified in IEEE 1588-2008 Annex J "Default Profiles", IEC 61850-9-3 "Utility Profile", IEEE C37.238-2011 "Power Profile 2011" and IEEE C37.238-2017 "Power Profile 2017" up to 64 slave clocks. Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769) server functionality. Internal OCXO timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. 1PPS, 1PP2S and time-of-day inputs and outputs. Inter Range Instrumentation Group type B (IRIG-B) time codes input and output over balanced or unbalanced interfaces. Frame and network statistics. Console and Ethernet management ports. Simple Network Management Protocol (SNMP) management. USB firmware upgrade. Single DC 43 – 160 V power supply unit (PSU-DCH).

Table 11. *Optional features*

Code	Description
NT.PHI.1GE	1 Gb/s Ethernet interfaces over electrical and optical interfaces.
NT.PHI.PTP.T	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" up to 64 slave clocks.
NT.PHI.BC	PTP profile translation functionality. PTP to NTP protocol translation.
NT.PHI.PRP	Parallel Redundancy Protocol following IEC 62439-3 for simultaneous transmission of information over two redundant Ethernet ports with zero seconds failover recovery time.
NT.PHI.FREQ	2048 kHz, 2048 kb/s, 1544 kHz, 10 MHz and 5 MHz clock reference inputs and outputs.
NT.PHI.GM.USR128	Increases number of client unicast clocks from 64 to 128.
NT.PHI.GM.USR256	Increases number of client unicast clocks from 64 to 256.

Table 12. *Hardware options*

Code	Description
NT.PHI.FHM.RB	Replaces OCXO internal timing source by an atomic (Rubidium) internal timing source
NT.PHI.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.PHI.PSU.AC	Adds an additional AC power supply unit.
NT.PHI.PSU.ACDC	Adds an additional AC / DC power supply unit.
NT.PHI.PSU.DCL	Adds an additional low voltage DC power supply unit.
NT.PHI.PSU.DCH	Adds an additional high voltage DC power supply unit.
NT.PHI.RIC.50.X	Provides additional clock reference outputs. Includes PPS, IRIG-B00X and frequency references in 5 x BNC / ST factory configurable ports. Includes PPS, IRIG-B00X and frequency references in 4 x BNC ports. Includes IRIG-B1XX and DCF77 in a single BNC port.
NT.PHI.RIC.52	Provides additional clock reference outputs. Includes ToD, ASCII and IRIG-B00X references in 4 x RS-232 ports (RJ48 connector). Includes PPS, IRIG-B00X and frequency references in 4 x BNC ports. Includes IRIG-B1XX and DCF77 in a single BNC port.

Table 12. *Hardware options*

Code	Description
NT.PHI.RIC.54	Provides additional clock reference outputs. Includes PPS, IRIG-B00X and frequency references in 4 x BNC ports. Includes IRIG-B1XX and DCF77 in a single BNC port. Includes miscellaneous references, time codes and alarm relay functions in 3 x TTL, 1 x RS-485, 2 x RS-232, 1 x open collector and 1 x electro-mechanic relay outputs.
NT.PHI.RIC.82.X	Provides additional clock reference outputs. Includes PPS, IRIG-B00X and frequency references in 5 x BNC / ST factory configurable ports. Includes miscellaneous references, time codes and alarm relay functions in 3 x TTL, 1 x RS-485, 2 x RS-232, 1 x open collector and 1 x electro-mechanic relay outputs.
NT.PHI.RIC.84.X	Provides additional clock reference outputs. Includes PPS, IRIG-B00X and frequency references in 5 x BNC / ST factory configurable ports. Includes miscellaneous references, time codes and alarm relay functions in 3 x TTL, 2 x RS-232, 2 x open collector and 1 x electro-mechanic relay outputs.

Table 13. *Accessories*

Code	Description
NT.ANT	GNSS kit. GNSS antenna kit for fixed installation up to 50 m. Includes antenna, surge arrester and accessories.
NT.ANTC	GNSS kit. GNSS antenna kit for fixed installation up to 200 m. Includes antenna, surge arrester, in-line amplifier 25 dB gain and accessories.
NT.ANT.MB	GNSS kit. Compatible with L1 and L5 frequency bands. GNSS antenna kit for fixed installation up to 50 m. Includes antenna, surge arrester and accessories.
NT.ANTC.MB	GNSS kit. Compatible with L1 and L5 frequency bands. GNSS antenna kit for fixed installation up to 200 m. Includes antenna, surge arrester, in-line amplifier 25 dB gain and accessories.

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