

Net.Time intends to solve any synchronization requirements of the industry so among its options are 4 Ports, Display, and a wide variety of signals including PTP, NTP, SyncE, EH90, ToD, IRIG-B, PPS, MHz, DCF77 as well as alarms.

Datasheet

Updated on 12/2/24
DS-Net-Time-v1.211.fm

Net.Time - Flexible Time Server

CONFIDENTIAL

1. Oscillator

1.1 Performance (Locked)

Table 1. RMS phase error

Reference	TCXO	OCXO-MQ	OCXO-HQ	Rubidium
GNSS (single-band)	± 50ns	± 20ns	± 20ns	± 15 ns
GNSS (multi-band)	± 40ns	± 5 ns	± 5 ns	± 5 ns

Table 2. Locking time

	TCXO	OCXO-MQ	OCXO-HQ	Rubidium
Locking time	< 3 min	< 5 min	< 30 min	< 4 hours

1.2 Performance (Hold-over)

Table 3. Holdover oscillator performance ($\pm 1^\circ\text{C}$)

	TCXO	OCXO-MQ	OCXO-HQ	Rubidium
Phase within ± 100 ns	-	-	-	10 hours
Phase within ± 250 ns	-	1 hour	4 hours	-
Phase within ± 500 ns	-	-	-	24 hours
Phase within ± 1.0 μs	-	-	-	48 hours
Phase within ± 10.0 μs	-	24 hours	36 hours	-
Phase within ± 2.0 ms	24 hours	-	-	-

1.3 Performance (Free-run)

Table 4. Free-run frequency offset on shipment

Reference	TCXO	OCXO-MQ	OCXO-HQ	Rubidium
1-day observation time	$\pm 2.0 \cdot 10^{-7}$	$\pm 5.0 \cdot 10^{-8}$	$\pm 2.0 \cdot 10^{-9}$	$\pm 5.0 \cdot 10^{-11}$

1.4 Oscillators Aging

Table 5. Oscillator aging

	TCXO	OCXO-MQ	OCXO-HQ	Rubidium
Daily	$2.0 \cdot 10^{-8}$	$5.0 \cdot 10^{-10}$	$1.0 \cdot 10^{-10}$	$2.5 \cdot 10^{-11}$
Monthly	-	-	-	$1.0 \cdot 10^{-10}$
Yearly	$5.0 \cdot 10^{-7}$	$5.0 \cdot 10^{-8}$	$1.0 \cdot 10^{-8}$	$1.5 \cdot 10^{-9}$

2. Ports

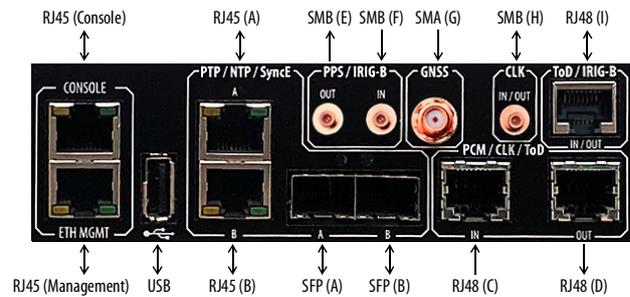


Figure 1. Mainframe ports

Control

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

Table 6. Signals and interfaces

	GNSS	PTP	NTP	SyncE	ToD	IRIGB	PPS	T1/E1	MHz
RJ45 (A, J)		out	out	out					
SFP (A, J)		out	out	out					
RJ45 (B, K)		in/out	in/out	in/out					
SFP (B, K)		in/out	in/out	in/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		in/out
RJ48 (I)					in/out	in/out		out	out

Timing

- 2 x SFP
- 2 x RJ-45
- 4 x SFP (with RIC-156)
- 4 x RJ-45 (with RIC-156)
- 1 x SMA: unbalanced 50 Ω
- 3 x SMB: unbalanced 50 Ω
- 3 x RJ-48: balanced (RS-422) 100 Ω

3. Ethernet

- RJ-45 / SFP work in combo mode, only one of each pair is active
- Main board ports

- 2 x RJ-45: 10BASE-T, 100BASE-TX, 1000BASE-T
- 2 x SFP: 100BASE-FX, 1000BASE-LX, 1000BASE-ZX, 1000BASE-BX

Additional ports in RIC-156

- 2 x RJ-45: 10BASE-T, 100BASE-TX, 1000BASE-T
- 2 x SFP: 100BASE-FX, 1000BASE-LX, 1000BASE-ZX, 1000BASE-BX

4. Clock functions

- ITU-T G.8272 PRTC-B compliant
- Hierarchical clock reference input configuration
- Automatic Reference Platformover 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
- 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
- Sensitivity: -166 dBm (tracking), -148 dBm (cold start)
- Single or multiple constellation selection
- Anti-jamming technology

Bands

- GPS L1
- GLONASS L10F
- Galileo E1B/C
- BeiDou B1

5.2 Multi-band Receiver

- 184-channel receiver
- Sensitivity: -167 dBm (tracking), -148 dBm (cold start)
- Single or multiple constellation selection
- Anti-jamming and anti-spoofing technology

Bands

- GPS L1C/A, L2C, L5
- GLONASS L10F
- Galileo E1B/C, E5b, E5a
- BeiDou B1l, B1C, B2a
- NavIC L5

6. Clock Reference Inputs

- PTP over RJ-45 and SFP
- Synchronous Ethernet over RJ-48 and SFP
- 1.544 / 2.048 / 5.0 / 10.0 MHz and 1.544 / 2.048 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
- Synchronous Ethernet over RJ-48 and SFP
- 1.544 / 2.048 / 5.0 / 10.0 MHz and 1.544 / 2.048 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)
- 1.544 / 2.048 / 5.0 / 10.0 Mb/s 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 / ITU-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):

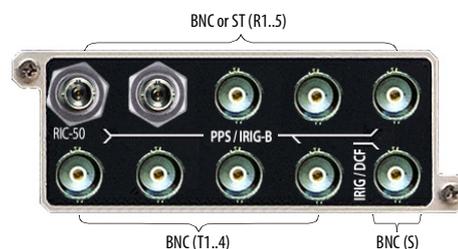


Figure 2. RIC-50 connector layout

- 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 7. 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

RIC-50E module adds a 5-pin Terminal Block providing two Electro-mechanic relay outputs for Alarms

8.2 RIC-52 Module

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

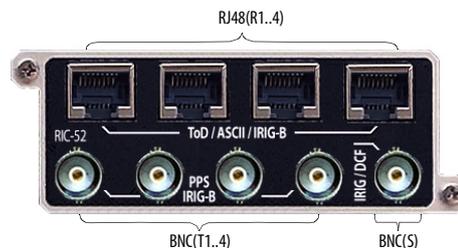


Figure 3. RIC-52 connector layout

- RJ48(R1..4): EH90, IRIG-B00X, ToD (NMEA, G.8271), ASCII (NMEA, Meinerberg)
- BNC (T1..4): IRIG-B00X, PPS, 1.5 / 2.0 / 5 / 10 MHz
- BNC (S): IRIG-B1XX, DCF77

Table 8. RIC-52 ports and interfaces

	EH90	ToD	IRIGB	PPS	ASCII	DCF77	Alarm	MHz
RJ48 (R1..4)	out	out	out		out			
BNC (S)			out			out		
BNC (T1..5)			out	out				out

RIC-52E module adds a 5-pin Terminal Block providing two Electro-mechanic relay outputs for Alarms

8.3 RIC-54 Module

Provides 5 x BNC (up) and a 16-pin terminal block (down) ports:

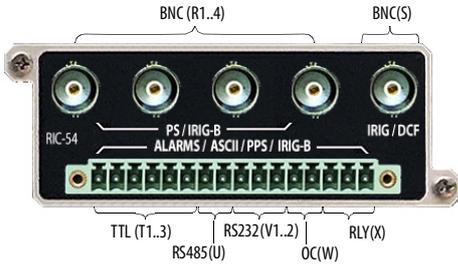


Figure 4. RIC-54 connector layout

- 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 9. RIC-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:

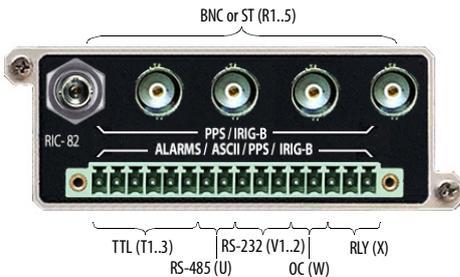


Figure 5. RIC-82 connector layout

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

Table 10. 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			

Table 10. RIC-82 ports and interfaces

	ToD	IRIGB	PPS	ASCII	DCF77	Alarm	MHz
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:

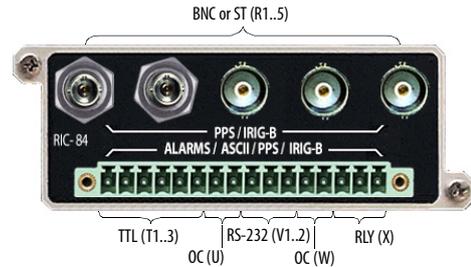


Figure 6. RIC-84 connector layout

- 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)

Table 11. 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. RIC-156 Module

Provides 2 x RJ45, 2 x SFP, 4 x RJ48, 5 x SMA and a 5-pin terminal block ports:

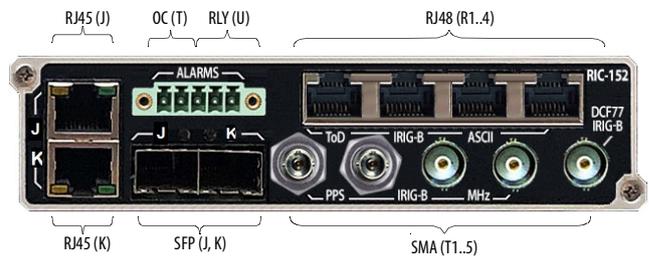


Figure 7. RIC-156 connector layout

- 2 x RJ-45: 10BASE-T, 100BASE-TX, 1000BASE-T
- 2 x SFP: 100BASE-FX, 1000BASE-LX, 1000BASE-ZX, 1000BASE-BX
- RJ48 (R1..4): IRIG-B00X, ToD (NMEA, G.8271), ASCII (NMEA, Meinberg), 1 / 1.544 / 2 / 2.048 / 5 / 10 MHz Square Wave and T1 / E1
- SMA (T1..5): IRIG-B00X, PPS, 1 / 2 / 5 / 10 MHz Sine Wave
- OC (T): PPS, Alarm (Electronic -MOSFET driver- relay)

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

Table 12. RIC-156 ports and interfaces

	ToD	IRIGB	PPS	ASCII	DCF77	Alarm	MHz
RJ48 (R1..4)	out	out		out			out
SMA (T1..5)		out	out				out
OC (T)						out	
RLY (U)						out	

10. 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)
- ITU-T G.8265.1 (Telecom frequency profile)
- ITU-T G.8275.1 (Telecom phase and time profile)
- ITU-T G.8275.2 (PTS / APTS profile)

11. NTP Function

- Up to 500.000 transactions / sec. per two ports in server mode
- NTP protocol versions: NTPv3 (RFC 1305), NTPv4 (RFC 5905)
- SNTP protocol versions: SNTPv3 (RFC 1769)
- MD5 authenticated NTP transactions

11.1 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. 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 / BX
- Generation, decoding, forwarding of ESMC

13. PRP Function

- 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 1588-2008 / IEC 61588: 2009 defined in IEC 62439-3 Annex A connected with grandmaster clock operation

14. 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
- TACACS+ and RADIUS Authentication
- TFTP and SFTP

15. 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

15.1 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

16. Platform

16.1 Management

- 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 through SNMPv2c and SNMPv3

16.2 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)

16.3 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)

16.4 LEDs

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

16.5 USB

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

16.6 Environmental

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

16.7 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

17. Certifications

17.1 Summary

- Communications devices installed in 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)

17.2 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

17.3 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

17.4 Reliability

- Cold storage: IEC 60068-2-1, -40°C, 16 hours
- Cold operation: IEC 60068-2-1, -40°C, 16 hours
- Dry heat storage: IEC 60068-2-2, +85°C, 16 hours
- Dry heat operation: IEC 60068-2-2, +70°C, 16 hours
- Change of temperature: IEC 60068-2-14, -10 ~ + 65°C, 5 cycles
- Damp heat cyclic test: IEC 60068-2-30, +25~+40°C, 55~93%RH, 6 cycles
- Damp heat steady state: IEC 60068-2-78, +40°C, 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)

17.5 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

18. Ordering Information

Table 13. Base configuration

Code	Description
NT.GM.ACDC	Net.Time NTP Server / Grandmaster Clock. Includes dual 10 / 100 Mb/s electrical Ethernet port and dual 100 Mb/s optical Ethernet supplying synchronization through the Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769). Internal timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. 1PPS, 1PP2S and time-of-day 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.GM.AC	Net.Time NTP Server / Grandmaster Clock. Includes dual 10 / 100 Mb/s electrical Ethernet port and dual 100 Mb/s optical Ethernet supplying synchronization through the Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769). Internal timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. 1PPS, 1PP2S and time-of-day 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 100 – 240 V, 50 – 60 Hz (IEC 60320 C13/C14) power supply unit (PSU-AC).
NT.GM.DCL	Net.Time NTP Server / Grandmaster Clock. Includes dual 10 / 100 Mb/s electrical Ethernet port and dual 100 Mb/s optical Ethernet supplying synchronization through the Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769). Internal timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. 1PPS, 1PP2S and time-of-day 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).
NT.GM.DCH	Net.Time NTP Server / Grandmaster Clock. Includes dual 10 / 100 Mb/s electrical Ethernet port and dual 100 Mb/s optical Ethernet supplying synchronization through the Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769). Internal timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. 1PPS, 1PP2S and time-of-day 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 43 – 160 V (2-pin 5.1 mm) power supply unit (PSU-DCH).

Table 14. Optional features

Code	Description
NT.PTR.D	PTP IEEE 1588-2008 Annex J (Default Profiles) up to 64 slave clocks.
NT.PTR.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.PTR.U	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.
NT.1GE	1 Gb/s Ethernet interfaces over electrical and optical ports.
NT.SE	Synchronous Ethernet frequency outputs. ESMC generation as specified in ITU-T G.8261, G.8262 and G.8264.
NT.BC	Adds PTP profile translation functionality. Adds support for PTP to NTP protocol translation.
NT.PRP	Parallel Redundancy Protocol following IEC 62439-3 for simultaneous transmission of information over two redundant Ethernet ports with zero seconds fail-over recovery time.
NT.FREQ	Provides support for 2048 kHz, 2048 kb/s, 1544 kHz, 1544 kb/s, 10 MHz and 5 MHz clock reference inputs and outputs.
NT.IRIG	Inter Range Instrumentation Group type B (IRIG-B) time codes input and output over balanced or unbalanced interface.
NT.GM.USR128	Increases number of client unicast clocks per port from 64 to 128.
NT.GM.USR256	Increases number of client unicast clocks per port from 64 to 256.

Table 15. Hardware options

Code	Description
NT.FHM.LCD	Adds LCD screen and control keyboard.
NT.FHM.TCXO	TCXO internal timing source.
NT.FHM.OCXO-MQ	OCXO-MQ internal timing source
NT.FHM.OCXO-HQ	OCXO-HQ internal timing source
NT.FHM.RB	Atomic (Rubidium) internal timing source.
NT.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.PSU.AC	Adds an additional AC 100 – 240 V, 50 – 60 Hz (IEC 60320 C13/C14) power supply unit.
NT.PSU.ACDC	Adds an additional AC/DC 85 – 264 VAC / 100 – 370 VDC (2-pin 5.1 mm) power supply unit.
NT.PSU.DCL	Adds an additional low voltage DC 18 – 75 V (2-pin 5.1 mm) power supply unit.
NT.PSU.DCH	Adds an additional high voltage DC 43 – 160 V (2-pin 5.1 mm) power supply unit.
NT.RIC.50.X/E	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. RIC-50E provides a 5-pin Terminal Block for Alarms.
NT.RIC.52/E	Provides additional clock reference outputs. Includes EH90, 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. RIC-52E provides a 5-pin Terminal Block for Alarms.
NT.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.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.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.
NT.RIC.156.X	Adds dual 10 / 100 Mb/s electrical Ethernet port and dual 100 / 1000 Mb/s optical Ethernet supplying synchronization through the Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769). Provides additional clock reference outputs. Includes ToD, ASCII, IRIG-B00X and square wave frequency references in 4 x RS-232 ports (RJ48 connector). Includes PPS, IRIG-B00X and sine wave frequency references in 5 x SMA factory configurable ports. Includes 1 x open collector and 1 x electro-mechanic relay outputs.

Table 16. Accessories

Code	Description
NT.ANT	GNSS antenna kit for fixed installation up to 50 m. Includes antenna, surge arrester, 3 m TNC-SMA patch cable and accessories. Cable not included.
NT.ANTC	GNSS antenna 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 and accessories. 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.

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