Oscilloquartz edgeSync+™

OSA 5422

Compact PTP grandmaster, NTP server, SB/MB-GNSS receiver, multi-interfaces

5G Mobile Telecom Defense Data center Smart grid Transportation Financial Broadcast

Benefits

- **High Accuracy White Rabbit PTP** allowing sub-nanosecond time synchronization achievable through firmware upgrade, no additional hardware required

- **STL Line Card** Supports Low-Earth Orbit Iridium Satellites Time & Location (STL)

- **Ultra-long Holdover** with improved ePRTC algorithm to provide up to 100 days of holdover within 100ns

- **Smooth Holdover Return feature** allow the system to avoid time jumps when reference is restored

- **Multisource ePRTC combiner** Introducing redundancy to ePRTC systems by combining up to five phase and frequency references with user defined or automatic references weights

- **Reference Validator** Provides cross reference validation for ePRTC multi-source combiner. With three or more phase references, validator is able to distinguish and invalidate the faulty source

- **High performance NTP** server supporting up to 500,000 TPS

- **Unique flexibility** can be used as PTP grandmaster clock, APTS, boundary clock and slave clock as well as NTP server and SSU/TSG

- **High-availability** automatic clock selection, self-calibrating delay asymmetry compensation, power supply redundancy and DoS protection

- **Syncjack™ technology** Built-in synchronization accuracy monitoring and assurance functionality

- **Optional Military M-Code** L1 /L2 receiver on dedicated line card

Overview

Reliable and accurate delivery of synchronization is essential to meet the stringent requirements of mission-critical applications in multiple market areas, such as defense, mobile backhaul, power utilities, and broadcasting. Network operators require a robust, scalable solution to provide assured phase, frequency, and time-of-day synchronization. However, achieving this in a cost-effective way presents significant challenges. Our OSA 5422 is a versatile and precise synchronization device designed to meet the stringent frequency and phase synchronization demands of emerging applications like 5G, while also supporting other market needs such as IRIG, BITS, Composite Clock (CC/JCC), and broadcast signals like Tri-Level and Black Burst. Its compact and flexible design, optimized for deployment at the network edge, ensures that reliable and cost-effective synchronization is easily achievable. The OSA 5422, equipped with GNSS receiver, offers unique flexibility by supporting both an IEEE 1588v2 PTP grandmaster clock and an NTP server, including multiple synchronization fan-out options. Additionally, the OSA 5422 supports the STL (Satellite Time and Location) line card as a backup to GPS/GNSS, ensuring ongoing synchronization even in the event of GNSS signal loss. The device is equipped with multilayer jamming and spoofing protection, ensuring reliable performance in challenging environments. The line card with M-Code receiver can further enhance protection, making the OSA 5422 ideal for mission-critical deployments requiring robust timing solutions. One of its standout features is its extended holdover capability, enabled by our ePRTC algorithm and the OSA cesium clock with Optical Pumping technology. Together, they ensure uninterrupted synchronization for up to 100 days with 100ns precision, providing unparalleled stability in the event of GNSS signal loss—critical for high-demand operations.

OSA 5422 now supports White Rabbit PTP for sub-nanosecond synchronization, as a software feature. White Rabbit expand its capabilities for high accuracy precise time distribution.

aPNT+™

Oscilloquartz zero-trust aPNT+™ platform
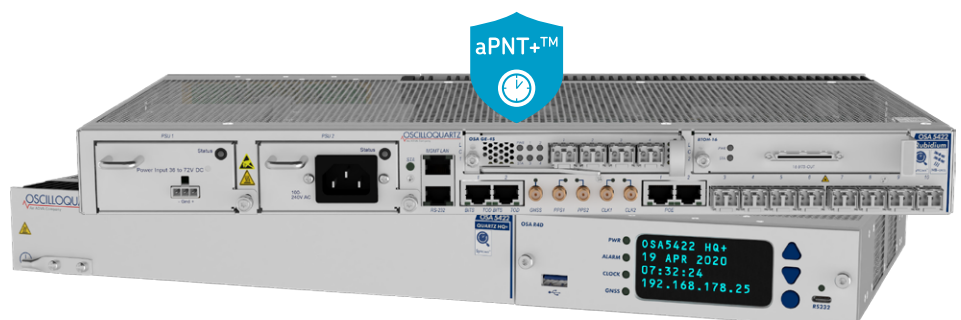
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High-level technical specifications

OSA 5422
- OCXO, high-quality OCXO, high-quality DOCXO and rubidium
- Up to two expansion line cards
- Multiple 1G/10G ports
- Up to 1536 unicast slaves @128pps
- Hot-swappable redundant PSU

Operation modes
- ePRTC, PRTC A and PRTC B
- White Rabbit PTP GM, White Rabbit Boundary Clock. White Rabbit Slave
- PTP GM, BC type D, slave, probe
- NTP server
- SSU – up to 32 x E1/T1 outputs
- GNSS receiver fan-out – up to 32x clock/PPS/PPS+ToD

Built-in GNSS receiver
- Embedded L1 multi- constellation receiver (GPS/GALILEO/BEIDOU/GLONASS)
- Optional multi-band, multi-constellation receiver for enhanced accuracy
- Jamming, spoofing detection

IEEE 1588 2008 PTP profiles
- L2 (Ethernet) and L3 (IP) default profiles
- Telecom profiles
- Enterprise hybrid profile
- Power and utility profiles
- Broadcast profiles

NTP server
- High capacity server
- Hardened NTP responder
- Hardware timestamping
- NTP/PTP/Sync-E/SSU supported simultaneously
- PTP to NTP conversion
- NTP authentication

Expansion cards (Up to 2)
- 16x E1/T1/ 2.048MHz outputs (120/100/ 75ohm)
- 16x PPS outputs (50ohm) 16x clock (10/5/1.544MHz 50ohm)
- 16x PPS+ToD outputs (RJ-45)
- 4x 1GbE/100Mb (SFP)
- 10 x Composite Clock/Japanese Composite Clock
- 10x Time code IRIG
- M Code receiver
- STL receiver
- 4x audio video sync
- 4x 10MHz Low Phase Noise (LPN)

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Applications in your network

Synchronization and time-as-a-service applications with the highest availability

- High Accuracy White Rabbit PTP Grand Master and Boundary Clock
- Timing distribution at the edge of mobile backhaul and fronthaul networks for frequency and phase synchronization
- Cable networks (DOCSIS 3.1) synchronization
- Synchronization delivery within buildings for indoor small cell radio base stations
- Synchronization of legacy network architectures based on NTP, SSU/CC
- Time as a service into data center, financial, health and media networks
- Modernized power utility networks
- Modernized digital broadcasting studios
- Compatible to Optical Timing Channel

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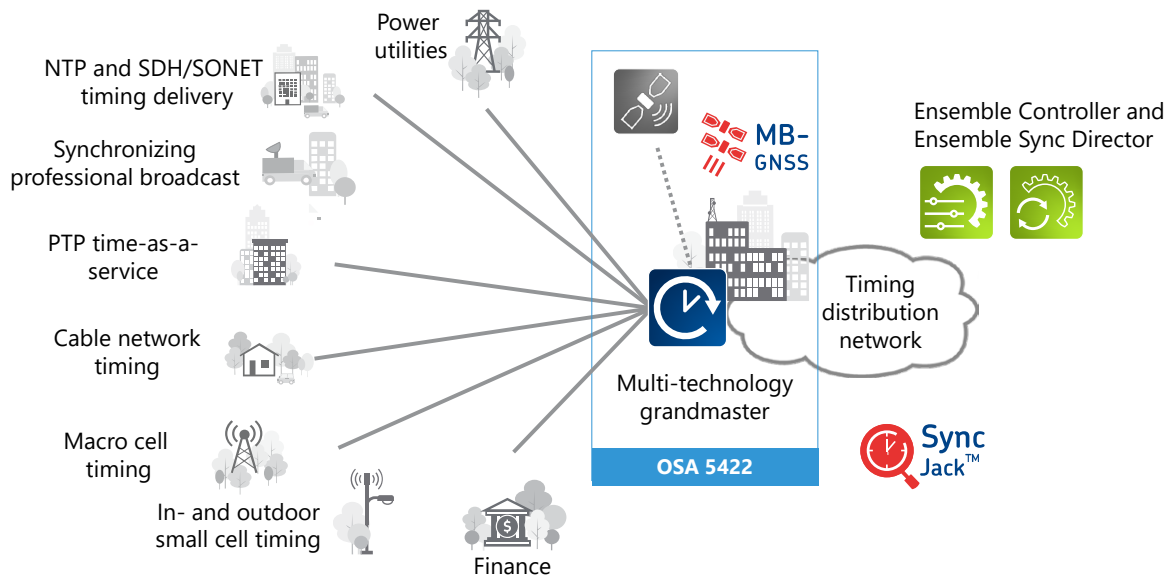
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Product specifications

Product variants

	OSA 5422 quartz	OSA 5422 quartz HQ+	OSA 5422 quartz HQ++	OSA 5422 Rubidium
Clock	OCXO	High-quality OCXO	High-quality DOCXO	Rubidium
Expansion line cards	2	2	2	2
Multi-band GNSS	(*)	Optional	Optional	Optional
Hot-swappable redundant PSU (AC/DC)	2	2	2	2

*Note: please, consult factory

Main applications

- ePRTC , PRTC-A and PRTC-B
- 1588v2 PTP grandmaster clock (up to 1536 PTP unicast clients at 128pps)
- 1588v2 PTP boundary clock (up to 1536 PTP unicast clients at 128pps)
- G.8273.2 boundary clock class D
- 1588v2 APTS clock
- 1588v2 PTP slave clock
- Fan-out of multiple physical synchronization output interfaces
- Synchronization supply unit (SSU)
- NTP server
- Synchronization protocol and physical signal conversion
- Sync probe – Syncjack™ monitoring and assurance

PTP features

- PTP High Accuracy:
  - White Rabbit PTP profile
  - White Rabbit to IEEE PTP translation
- PTP profiles support:
  - ITU-T G.8265.1 frequency delivery profile (IP unicast over IPv4/IPv6)
  - ITU-T G.8275.1 time/phase delivery profile (Full timing support - Ethernet multicast)
  - ITU-T G.8275.2 time/phase delivery profile (APTS)
  - PTP enterprise profile (Mixed multicast and unicast over IPv4/IPv6)
  - IEEE 1588 2008 PTP default profile over IPv4/IPv6 multicast
  - IEEE 1588 2008 PTP default profile over Ethernet multicast (Annex F)
  - PTP power and utility profiles: IEC/IEEE 61850-9-3, IEEE C37.238-2011, IEEE C37.238-2017
  - PTP Broadcast and media profiles: SMPTE ST 2059-2, AES67
    - Up to 300,000 delay requests / delay responses in multicast and hybrid PTP profiles

- 1-step and 2-step clock
- Up to 16 master/BC IP addresses
- Up to 16 VLANs (IEEE 802.1Q customer-tagged) and stacked VLANs
- Support for multiple profiles simultaneously
- Support for PTP IPv4/IPv6 on the same port
- Support PTP (TAI) and arbitrary (ARB) timescales
- Support master and slave on any port simultaneously
- Up to three stacked VLANs per flow (Q-in-Q service provider tagged)
- ICMP/DSCP/TOS
- Configurable static routes and default getaways
- Enhanced PTP GM/BC/Slave statistics, performance monitoring (15min and 24h), threshold crossing alarm (TCA) and SNMP traps
- In-house best-in-class clock recovery algorithms
- DoS protection using hardware access control list (ACL) and traffic rate limiting
- Operates as single or double attached clock in PRP IEC 62439-3 network

NTP features

- Stratum 1 NTP server when locked to GNSS
- NTP v1, v2, v3, v4 and SNTP over IPv4/IPv6
- NTP unicast/multicast/broadcast
- MD5/SHA- 1 symmetric key and autokey authentication
- TIME & DAYTIME protocols
- NTP peering
- NTP selectable timescale (UTC/GNSS/Local)
- Hardware timestamping
- Accuracy within +/-100nsec from UTC
- Up to 16 NTP server IP addresses
- Support PTP and NTP on same Ethernet port
- PTP to NTP translation
- Up to three stacked VLANs per flow (Q-in-Q service provider tagged)

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- Enhanced NTP statistics and client lists
- Up to 8000 transactions per second
- Up to 500.000 transactions per second without authentication
- PTP backup in case of GNSS outage

Synchronization interfaces (onboard)

- Synchronous Ethernet (SyncE) over Ethernet interfaces
- 2x BITS-in and 2x BITS-out (2.048MHz, E1 or T1 (DS1) including SSM)
- 2x PPS in/out
- 2x time-of-day (ToD) + PPS in/out
- 2x CLK 10MHz input (10/2.048MHz) / output (10MHz)
- Antenna input for embedded GNSS receiver

Ethernet ports

- Hardware-based timestamping (PTP & NTP)
- 2x 100/1000BaseT copper ports
- One copper port is PoE driver (802.3af class 2, 6.49W max)
- Up to 8x 1GbE/100Mb FE (SFP) /10GbE (SFP+), user configurable per port
- Additional 4x 1GbE (SFP) using expansion card
- All fiber ports support SM/MM colored/non-colored SFP and copper SFP
- Per-flow hardware-based policing and scheduling
- Configurable link asymmetry delay compensation

Synchronous Ethernet (SyncE)

- Supported by all Ethernet interfaces in fiber and copper modes
- Compliant to ITU-T G.8261/G.8262/G.8262.1/ G.8264
- Ethernet synchronization message channel (ESMC) and enhanced ESMC with enhanced SSM codes
- Sync-E for time holdover during GNSS outage

BITS in/out

- 2x BITS input + output over shielded RJ-48
- User-configurable: E1, T1 (DS1), 2.048MHz
- G.823 / G.824 sync interface compliant
- Synchronization status message (SSM)
- BITS input for time holdover during GNSS outage
- Output squelch option
- EEC/SEC/SSU filtering options

PPS in/out

- 2x PPS input/output (user configurable)
- User configurable input and output delay compensation
- SMA-F connector (50ohm)
- Output squelch option
- PPS configurable width

Time-of-day (ToD+PPS) in/out

- 2x ToD+PPS input/output (user configurable)
- ITU-T G.8271 compliant
- ToD formats − NMEA 0183 ($GPZDA sentence), ITU-T G.8271 and CCSA
- RS422 over shielded RJ-45
- PPS configurable width
- Output squelch option

GNSS receiver

Single-band receiver

- Multi-constellation GNSS L1 72 channels receiver
  - GPS (L1C,) GLONASS (L1OF), GALILEO, BeiDou (B1I), QZSS (L1C/A), SBAS (L1C/A: WAAS, EGNOS, MSAS, GAGAN)
- Three concurrent GNSS constellations

Multi-band GNSS receiver option

- Provide enhanced accuracy for ePRTC and PRTC-B
- Multi -band, Multi-constellation 184-channel GNSS receiver
- GPS (L1C/A L2C), Galileo (E1B/C E5b) ,GLONASS (L1OF, L2OF) , BeiDou (B1I, B2I) , QZSS (L1C/A L2C), SBAS (L1C/A: WAAS, EGNOS, MSAS, GAGAN)
- Four concurrent GNSS constellations
- Jamming and spoofing detection

Common GNSS receiver features

- Skyview and GNSS satellites status
- Configurable SNR, elevation and PDOP masks
- User-configurable antenna cable delay compensation
- Support fixed positioning − single satellite mode
- Advanced spoofing and interference detection and mitigation
- Voltage to antenna +5VDC
- Antenna connector SMA-F (50ohm)

STL receiver

- Provides authenticated timing / location from LEO satellites
- Accuracy within +/-100nsec from UTC (1-sigma) with outdoor antenna
- Position accuracy within 30 meters (1-sigma), after 1 hour survey, with outdoor antenna
- Operates with either outdoor or indoor antenna installations
- Unaffected by high multipath, urban canyon environments
- LEO high-power signal reception (resilient to jamming)
- Authenticated signal (resilient to manipulation)
- Voltage to antenna: 3.3V or 5V user configurable
- Antenna connector SMA-F (50 ohms)

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CLK in/out

- 2x CLK 10MHz input (10/2.048MHz) / output (10MHz) (user configurable)
- SMA-F connector (50ohm)
- Output squelch option

OLED display module

- Optional OLED display (reverse mounting)
- Press buttons
- Status LEDs
- USB type A / serial connectors

Output expansion line cards

- Up to two expansion cards
- Hot insertion/ extraction support
- Overvoltage/ current protection
- Two expansion cards share a single mountable patch panel with 16x RJ-48 / RJ-45 / 16x BNC / 10xIRIG options

IRIG card

- 1x IRIG optical output
  - ST connector – fiber 62/125um
  - Optical: wavelength 820nm multimode RIG-B006/007/004 CF per IEEE1344/IEEE C37.118
- Alarm/pulse relay
  - Connector: WR-TBL 3-pin Serie 382 - 2.50 mm
    - Electrical: Relay contact NC / NO – 50VDC @ 250mA
  - Code Format Selectable function: PPH/PPM/locked/ alarm
- RS422 output
  - RJ11 Connector
  - Electrical: RS-422
  - Code format selectable: DCLS (IRIG-B002/004/006/007) or pulse (PPS/PPM/PPH)
- 1x IRIG input
  - DCLS input (IRIG-B004) time reference to clock and probes AM input (IRIG-B124) time to probes
- 10x IRIG outputs
  - Fanout cable (10x BNC female 50 ohms) or patch panel options
  - CH 1-8: DCLS 5V (IRIG-B002/004/006/007/PPS/ PPM/ PPH) or AM (IRIG-B122/124/126/127)
  - CH 9-10: DCLS 5V or 10V (IRIG-B002/004/006/007/PPS/ PPM/PPH)

- IRIG patch panel
  - CH 1-2: 2xIRIG optical outputs (820nm ST connectors)
  - CH-1-8: 8x IRIG AM/DCLS 5V outputs (BNC-F connector)
  - CH-9-10: 2x IRIG DCLS 5V/10V outputs (BNC-F connector)
  - 1x optical /electrical converter: IRIG optical input (820nm ST connectors) to IRIG DCLS output (BNC-F)

Composite Clock / Japanese Composite Clock

- 10 x CC/JCC outputs
- Nominal peak voltage of "mark" (pulse):
  - 1.0+/-0.1V
  - 3.0 +/- 0.5V

M-Code

- Antenna Input SMA connector
- Serial Management RS232
- Key fill connector

Audio -Video Sync (AVS)

- 4x Audio Video Sync Outputs
  - BNC Connectors (75 Ohm)
  - Black Burst, Tri-Level, LTC, Word Clock
- 1x Audio Video Sync Input (HW Ready)

Assured PNT (aPNT) Solution

- Multiple backups to GNSS including PTP, SyncE , CLK, BITS and local oscillator
- PRTC can automatically select between 3 available input references
- Frequency automatically selected between 3 available input frequency references
- Improved holdover with HQ+/HQ++/rubidium oscillator
- Automatic switchover in case of jamming /spoofing/ interference detection
- Multisource ePRTC combines up to five phase (GNSS/ PTP/PPS+ToD) and frequency (ePRC) references to improve accuracy in locked mode and extended holdover in case of GNSS outage
- Interoperable with OSA 5405 smart antenna
- PTP and GNSS assurance using Sync Director
- M-Code Line card providing enhanced security

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Low phase noise (LPN) card

- Providing 4x Low phase noise outputs
- SMA-F connector (50ohm)
- Amplitude : 13dBm +/- 1
- Harmonics : ≤ -40 dBc
- Spurious : ≤ -70 dBc
- Each output enabled individually
- Squelch option per clock status (per card)

Phase noise	10MHz
@1 Hz	≤ -95 dBc/Hz
@10 Hz	≤ -125 dBc/Hz
@100 Hz	≤ -145 dBc/Hz
@1 kHz	≤ -150 dBc/Hz
@10 kHz	≤ -155 dBc/Hz
@100 kHz	≤ -155 dBc/Hz
@1 MHz	≤ -155 dBc/Hz

ADEV	10MHz
@1s	≤ 3 e-12
@10s	≤ 4.5e-12
@100s	≤ 7.0e-12

Holdover performance

	Clock	Aging / day (after 30 days)	Temperature stability
Quartz	OCXO Stratum 3 / G.812 Type III	$\pm 5 \times 10^{-10}$	$\pm 50 \times 10^{-10}$
Quartz HQ+	High-quality OCXO G.812 Type I	$\pm 2 \times 10^{-10}$ / $\pm 1 \times 10^{-10}$ *	$\pm 2 \times 10^{-10}$
Quartz HQ++	High-quality DOCXO Stratum 2 / G.812 Type II	$\pm 5 \times 10^{-11}$ / $\pm 1 \times 10^{-11}$ *	$\pm 1 \times 10^{-11}$
Rubidium	Rubidium Stratum 2 / G.812 Type II	$\pm 5 \times 10^{-12}$	$\pm 2 \times 10^{-10}$ / $\pm 2 \times 10^{-11}$ **

* Note: Effective daily aging after device has been powered for one month and locked to GPS for three days, for the following three days
** Note: effective temperature stability after compensation

	200nsec	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
Quartz	1 hours	2 hours	4 hours	5 hours	8 hours	14 hours	1 month
Quartz HQ+	4 hours	8 hours	14.5 hours	16.5 hours	1.5 days	2 days	0.5 years
Quartz HQ++	10 hours	17 hours	1.5 days	2.2 days	4.4 days	6.6 days	>1.5 years
Rubidium	1 day	1.8 days	3.5 days	4 days	8 days	12 days	>5 years

Note: The above are typical values (1 sigma confident) assuming controlled temperature environment, after the device has been powered for one month and locked to GPS for 72 hours. Due to the excellent temperature stability of the HQ++, the   HQ++ holdover will outperform the rubidium holdover when significant temperature variations are presented.

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Line cards	16x BITS	16x CLK / PPS	16x PPS+ToD
Capabilities	16x BITS outputs over high density connector (VHDCI) – supporting 2.048MHz, E1 or T1 (DS1). Per output configurable signals type (E1, 2.048MHz)	16x clock 10/5MHz or 1.544MHz outputs over unbalanced 50ohm interface or 16x PPS outputs over unbalanced 50ohm interface	16x PPS+ToD outputs over balanced interface
Number of cards	8	2	2
Power consumption	5W	4W	4W

Line cards	4x 1G	IRIG	LPN
Capabilities	4x 100Mb/1Gb(SFP) Ethernet ports (PTP / NTP / SyncE) SyncE and PTP monitoring and assurance using Syncjack™	1x IRIG isolated input 1x IRIG optical output Alarm/pulse relay RS422 output 10x IRIG outputs	4x 10MHz low phase noise clock outputs unbalanced 50ohm interface
Number of cards	2	2	2
Power consumption	4W	8W	8W

Line card	CCO (10xCC /JCC)	AVS	M-Code	STL
Capabilities	10x composite clock over high density connector – supporting 10 composite clock outputs pairs SW configurable shutdown of output signals	4x Audio/Video sync outputs Black Burst, Tri-Level, LTC, Word Clock	M-Code L1/L2 GPS receiver	Iridium Low-Earth Orbit Satellites Time & Location (STL) receiver
Number of Cards	2	2	2	2
Power consumption	7w	7w	6w	5w

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Sync signal conversion

From / To	SyncE Tx	BITS OUT	CLK OUT (10MHz)	PTP	NTP	PPS OUT	ToD
GPS/GNSS	✓	✓	✓	✓	✓	✓	✓
STL	✓	✓	✓	✓	✓	✓	✓
SyncE Rx	✓	✓	✓	✓	n/a	freq.	n/a
BITS IN	✓	✓	✓	✓	n/a	freq.	n/a
CLK IN	✓	✓	✓	✓	n/a	freq.	n/a
PPS IN	✓	✓	✓	✓	✓	✓	✓
PTP	✓	✓	✓	✓	✓	✓	✓
IRIG	✓	✓	✓	✓	✓	✓	✓

GM / PRTC frequency and time accuracy
- While locked to GNSS
- Phase and time
  - <15nsec RMS from UTC
  - Single band GNSS, PRTC-A: ±100nsec from UTC
  - Multi band GNSS, PRTC-B: ±40nsec from UTC
- Frequency – exceed PRC / G.811 frequency accuracy

GM / ePRTC frequency and time accuracy
- While locked to GNSS and connected to ePRC
- Phase and time – ePRTC / G.8272.1 phase accuracy: ±30nsec from UTC
- Holdover
  - 100nsec over min 30 days (guaranteed) with ePRC+(typical 40 days)
  - 100nsec over min 45 days (guaranteed) with SePRC(typical 55 days)
  - 100ns over 100 days (guaranteed) with sePRC+ (typical 120 days)
- Up to five phase/frequency references to ePRTC multisource combiner
- Cross-reference validator capable of invalidating faulty source when three or more references connected

Syncjack™ monitoring and assurance tools
- Clock accuracy for up to two clock probes – computing TE, TIE and MTIE of physical clocks
  - Calculation of maximum, constant and dynamic TE, TIE and MTIE between physical source and reference signals
  - Programmable source and reference signals including SyncE, BITS, PPS, GNSS, IRIG and CLK
  - MTIE mask and time error threshold alarms based on SNMP traps
  - TE/TIE raw data collection and export to server
  - Daily MTIE and TE performance monitoring reports

- Clock analysis for up to four PTP clock probes – packet TE, TIE and MTIE
  - Calculation of packet maximum, constant and dynamic TE, TIE and MTIE between physical reference signal and timestamps within the PTP packets
  - Support for active and passive probe mode
  - Programmable reference signals including SyncE, BITS, PPS, GNSS, IRIG and CLK
  - MTIE mask and time error threshold alarms based on SNMP traps
  - TE/TIE raw data collection and export to server
  - Daily MTIE and TE performance monitoring reports
- PTP network analysis including PTP network probe
  - Packet delay and packet delay variation performance statistics
  - Delay asymmetry
  - Network usability statistics (FPP based on G.8261.1)
  - Packet loss statistics
  - Programmable reference signals including SyncE, BITS, PPS, GNSS, CLK, CCO, STL, IRIG
  - All probes include enhanced sync assurance statistics, performance monitoring (15min & 24h), including data export, threshold crossing alarm (TCA) and SNMP traps
- User-configurable MTIE masks
- Spoofing meaconing attack detection and Prevention

Low-touch provisioning
- Text-based configuration files
- FTP/SFTP/SCP for configuration file copy
- Remote software upgrade

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Management and security

Local management
- Serial port (RS232 over RJ45) for CLI

Remote management
- Local LAN port (100/1000BaseT over RJ45) using CLI, SNMP and Web GUI interfaces
- Support for IPv4 and IPv6
- Barrier free GUI
- Maintains in-band VLAN and MAC-based management tunnels
- Static routes & configuration of default getaways
- Fully interoperable with Adtran FSP 150 and Adtran FSP 3000 products
- Supported by Sync Director and GNSS assurance

Management protocols
- Telnet, SSH (v1/v2)
- HTTP/HTTPS (TLS 1.2)
- SNMP (v1/v2c/v3)

Secure administration
- Configuration database backup and restore
- System software download via FTP, HTTPS, SFTP or SCP (dual flash banks)
- Remote authentication via RADIUS/TACACS+/LDAP
- SNMPv3 with authentication and encryption
- Access control list (ACL)
- ICMP filtering and rate limiting
- Automatic certificate enrollment with full integration into PKI

IP networking
- DHCP
- ARP cache access control
- RIPv2 and static routes
- IPv6 NDP address resolution
- RIPng for IPv6
- ICMP

SMTP Client
- System send the email to defined recipient in case of alarm

System logging
- Syslog, alarm log, audit log and security log
- Configurable system timing source – local / NTP / PTP / PRTC (GNSS)
- User configurable time zone & daylight saving time

Standards compliance
- ITU-T G.8261, G.8262, G.8262.1, G.8264, G.703, G.704, G.781, G.812
- ITU-T G.8272, G.8273.2
- ITU-T G.8265.1, G.8275.1, G.8275.2
- IEEE 1588v2 (PTP), 802.1Q (VLAN), 802.1ad, 802.1p (Priority)
- IEC60068-2-1
- IEC 60068-2-2, IEC 60068-2-78, IEC 60068-2-6, IEC 60068-2-27, IEC 61810-1
- RFC 2863 (IF-MIB), RFC 2865 (RADIUS), RFC 2819 (RMON)
- RFC 1059 (NTPv1), RFC 1119 (NTPv2), RFC 1305 (NTPv3), RFC 5905 (NTPv4), RFC 4330 (SNTPv4)

Regulatory compliance
- CE compliance   (directive 2011/65/EU)
- RoHS compliance (directive 2011/65/EU)
- LVD compliance (directive 2014/35/EU)
- WEEE compliance (2002/96/EC)
- VCCI compliance
- TEC compliance
- EMC compliance (2014/30/EU)
- NEBS level 3 compliance (GR-1089-CORE/GR-63-CORE)
- IEEE 1613, IEC 61850-3
- Power: ETSI 300 132-2, BTNR2511, ETS 300-019, ETS 300-019-2-[1,2,3], ANSI C84.1-1989
- EN 60255-21-3
- Safety: UL/TUV IEC 62368-1 , 21CFR1040.10, EN 60825
- EMI: EN 55022 2010 Class A, EN 550035,   EN 61000-3-2-2006, EN 61000-3-3 2008, EN 300 386 v1.6.1 2012, FCC 47FR Part 15 , 2014 Class A, ICES-002 2012 Class A

Environmental
- Dimensions: 443mm x 44mm x 250mm /17.44" x 1.73" x 9.84" (W x H x D), ETSI-complaint
- Weight: 4.15 - 5.2Kg
- Operating temperature (ambient):
  - Quartz, Quartz HQ+, Quartz HQ++: AC: -40 to +65ºC (hardened environment)
  - Rubidium: -20 to +65ºC
  - Optional versions for -5 to 55ºC
  - Low phase noise card: -10 to 45ºC
  - Cold restart: -10ºC
- Storage temperature: -40 to +70ºC (GR-63-CORE)
- Humidity: 5 to 100% (with condensation)

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Power supply

- Hot-swappable, modular AC-PSU: 100 to 240VAC (47 to 63Hz) with over-voltage and over-current protection
- Hot-swappable, modular DC-PSU: -48 to -60VDC (tolerate -36 to -72VDC) with over-voltage and over-current protection
- Hot-swappable, high-voltage DC-PSU: 90 to 250VDC with over-voltage and over-current protection
- Power consumption (with OLED display, without LCs or SFPs, two PSUs and Vin=48V):
  - OSA 5422 Quartz: 36W (typical), 40W (max.)
  - OSA 5422 Quartz HQ+: 38W (typical), 44W (max.)
  - OSA 5422 Quartz HQ++: 40W (typical), 48W (max.)
  - OSA 5422 Rubidium: 42W (typical), 50W (max.)

Optional accessories

- Single and multi-band GNSS (GPS/ GLONASS/BEIDOU/ GALILEO/SBAS/QZSS) antenna kits 10 / 20 / 60 / 120 / 150m (32.8ft / 65.6ft / 196.85ft / 393.7ft / 492.1ft), including indoor and outdoor cables, roof antenna, lighting protector and mounting kit
- Anti-jamming/anti-spoofing single band GNSS (GPS/ GLONASS/BEIDOU/ GALILEO/SBAS/QZSS) antenna
- Single and multi-band + STL antenna kits
- STL Indoor antenna kits
- 1:2 / 1:4 / 1:8 GNSS (GPS/ GLONASS/BEIDOU/GALILEO) splitters
- GNSS window antenna
- Cables and adapters accessory kit
- Patch panels for BITS / CLK / PPS / PPS+ToD / IRIG/CC