OSCILLOQUARTZ
An ADVA Optical Networking Company

OSA 5420 Series

PTP grandmaster, NTP server, GNSS receiver

Driven by the continuing evolution of radio access networks to support higher data rates, increased coverage and better spectrum utilization, cost-effective delivery of assured phase, frequency and time-of-day synchronization at the edge of mobile backhaul networks has become a challenge.

Are you struggling with high packet delay variation and delay asymmetries across your mobile backhaul network? Do you have difficulties in meeting frequency and phase synchronization accuracies required by LTE-TDD and LTE-Advanced technology? Our OSA 5420 Series can help. This family of IEEE 1588v2 Precision Time Protocol (PTP) grandmaster devices optimized for deployment at the network edge ensures that cost-effective and accurate synchronization is no longer a challenge. What's more, with its NTP server and GNSS receiver capability including multiple synchronization fan-out options, our OSA 5420 Series is also ideal for deployment in legacy synchronization architectures.

Your benefits

- ### Leading edge GNSS receiver
  Enables PRTC/PRC and grandmaster clock functionality for frequency, phase and time-of-day delivery using multiple constellations

- ### Unique flexibility
  Configurable to operate in PTP grandmaster clock, assisted partial timing support (APTS), boundary clock and slave clock mode as well as NTP server and SSU / TSG

- ### Extended holdover performance
  High-end quartz and rubidium oscillator options

- ### High-availability design
  Automatic clock selection, self-calibrating delay asymmetry compensation, power supply redundancy and DoS protection

- ### Syncjack™ technology
  Built-in synchronization accuracy monitoring, testing and assurance functionality

- ### Operational smplicity
  FSP Network and Sync Manager platform for superior management and sync monitoring capabilities

High-level specifications

OSA 5420 Series

- High-quality OCXO, DOCXO and rubidium
- Up to two expansion line cards
- Up to 1024 unicast slaves @128pps
- Hot-swappable redundant PSU

Operation modes

- PTP GM, BC, slave, probe
- NTP server
- SSU – up to 32 x E1 / T1 outputs
- GNSS receiver fan-out – up to 32 x clock / PPS / PPS+ToD

Built-in GNSS receiver

- GPS/GLONASS/BEIDOU/ GALILEO
- GPS+GLONASS
- GPS+BEIDOU
- GPS+GALILEO

IEEE 1588 2008 PTP profiles

- Default profiles over Ethernet and IP multicast
- Telecom profiles G.8265.1, G.8275.1 and G.8275.2
- Enterprise hybrid profile

NTP server

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

Output cards

- 16x E1 / T1 / 2.048MHz (120 / 100 / 75ohm)
- 16 x PPS (50ohm)
  16 x clock (10MHz 50ohm)
- 16 x PPS+ToD (RJ-45)
- 4 x 1GbE (Fiber)

Applications in your network

Radio access network synchronization and time-as-a-service applications

- Timing distribution at the edge of mobile backhaul networks for frequency and phase synchronization with the highest availability
- Synchronization delivery within buildings for indoor small cell radio base stations
- Precise synchronization of legacy network architectures based on NTP and SSU
- Time as a service into data center, financial, health and media networks
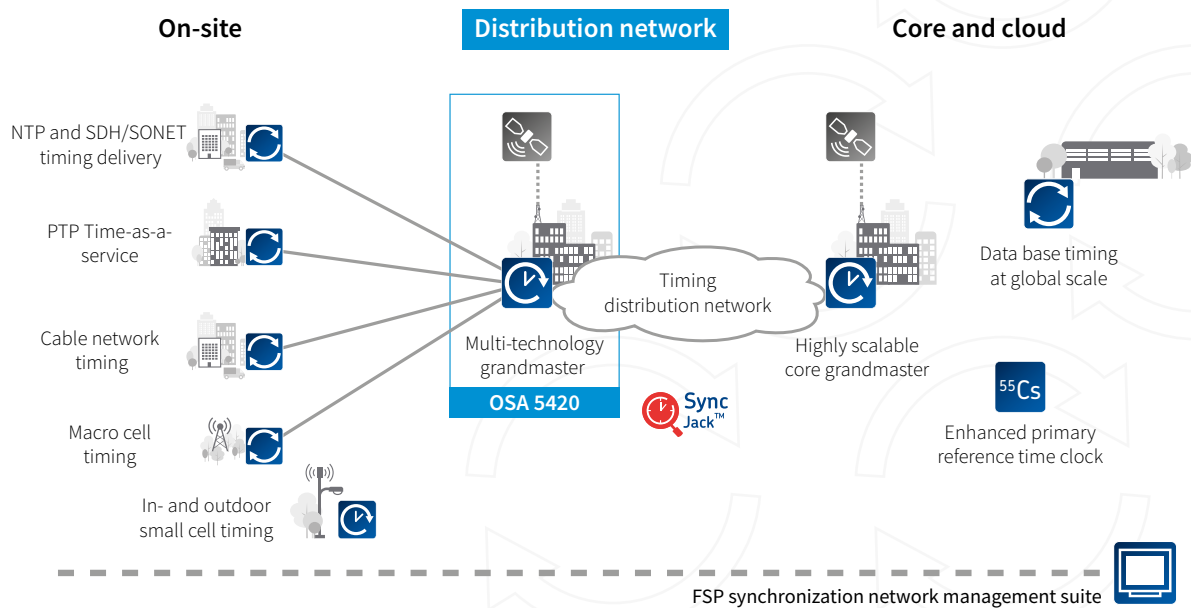
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Product variants

	OSA 5420 quartz HQ	OSA 5420 quartz HQ+	OSA 5421 quartz HQ++	OSA 5421 rubidium
Clock	High-quality OCXO	DOCXO	DOCXO	Rubidium
Expansion line cards	2	2	1	1
PSU	Hot-swappable redundant PSU (AC/DC)	Hot-swappable redundant PSU (AC/DC)	Hot-swappable redundant PSU (AC/DC)	Hot-swappable redundant PSU (AC/DC)

Main applications

- 1588v2 PTP grandmaster clock (up to 1024 PTP clients at 128pps)
- 1588v2 PTP boundary clock (up to 1024 PTP clients at 128pps)
- 1588v2 APTS clock
- 1588v2 PTP slave clock
- GNSS receiver and PRC/PRTC including 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 networking features

- 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)
  - Designed to support 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)
- 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 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
- Static routes configuration of 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

NTP features

- Stratum 1 NTP server when locked to GNSS
- NTP v1, v2, v3, v4
- Hardware timestamping
- 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)
- Enhanced NTP statistics and client lists
- Up to 8000 transactions per second (when configured as NTP server without PTP/Syncjack)
- PTP backup in case of GNSS outage

Synchronization interfaces (onboard)

- Synchronous Ethernet over FE/GbE interfaces
- 1 x BITS-in and 1 x BITS-out (2.048MHz, E1 or T1 (DS1) including SSM)
- 1 x 1PPS in/out and 1 x 1PPS in
- 1 x time-of-day (ToD) + 1PPS in/out
- 1 x CLK 10MHz in/out and 1 x CLK 10MHz in
- Antenna input for embedded GNSS receiver

4 x Ethernet ports

- Hardware-based timestamping (PTP & NTP)
- Two combo 100/1000BaseT or 100/1000BaseX (SFP) ports
- Two additional 100/1000BaseX (SFP) ports
- All ports support SM/MM colored/non-colored SFP and copper SFP
- Per-flow hardware-based policing and scheduling
- Configurable link asymmetry delay compensation

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Synchronous Ethernet (SyncE)

- Supported by all Ethernet interfaces in fiber and copper modes
- Compliant to the relevant sections of ITU-T G.8261/ G.8262/G.8264
- Ethernet synchronization message channel (ESMC)
- Sync-E for time holdover during GNSS outage and in accordance with PTP

BITS

- 1 x BITS input over shielded RJ-48
- 1 x BITS 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 frequency input or output (Sync-E Tx, 10M out)
- BITS input for time holdover during GNSS outage
- Output squelch option
- SSU filtering option

1PPS in / out, 1PPS in

- 1 x 1PPS input
- 1 x 1PPS input/output (user configurable)
- User configurable input and output delay compensation
- SMA-F connector (50ohm)
- Output squelch option

Time-of-day (ToD) output

- G.8271 compliant
- ToD format – NMEA 0183 ($GPZDA sentence) and CCSA
- RS422 over shielded RJ-45
- Output squelch option

GNSS receiver

- Multi-constellation GNSS L1 32 channels receiver
- Hardware-ready for SBAS, QZSS
- Skyview and GNSS satellites status
- Configurable SNR, elevation and PDOP masks
- User-configurable antenna cable delay compensation
- Support fix positioning – single satellite mode
- Software configurable mode of operation
    - GPS (1575.42MHz)
    - GLONASS (1601.5MHz)
    - BEIDOU (1561MHz)
    - GALILEO (1575.42 MHz)
    - Combined GPS + GLONASS
    - Combined GPS + BEIDOU
    - Combined GPS + GALILEO
- Voltage to antenna +5VDC
- Antenna connector SMA-F (50ohm)

Output expansion line cards

- OSA 5420 – Up to two expansion cards
- OSA 5421 – One expansion card
- Hot insertion / extraction support
- Overvoltage / current protection
- Two expansion cards share a single mountable patch panel with 16xRJ-48 / RJ-45 and 16xBNC connector options

CLK in/out, CLK in

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

	16 x BITS	16 x CLK / PPS	16 x PPS+ToD	4 x 1G
Capabilities	16xBITS outputs over high density connector (VHDCI) – supporting 2.048MHz, E1 or T1 (DS1). SW configurable of output signals type & line impedance per group of 8 (E1, 2.048MHz)	16xclock 10MHz outputs over unbalanced 50ohm interface or 16xPPS outputs over unbalanced 50ohm interface	16xPPS+ToD outputs over balanced interface	4x100 / 1000 Ethernet ports (PTP / NTP / Sync-E) Sync-E and PTP monitoring and assurance using Syncjack™

Product specifications are subject to change without notice or obligation.

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Holdover performance

	Clock	Aging / day (after 30 days)	Temperature stability
OSA 5420 Quartz	High-quality OCXO	$\pm\,5 \times 10^{-10}$	$\pm\,50 \times 10^{-10}$
OSA 5420 Quartz HQ+	DOCXO	$\pm\,2 \times 10^{-10} / \pm\,1 \times 10^{-10}$ *	$\pm\,2 \times 10^{-10}$
OSA 5421 Quartz HQ++	DOCXO	$\pm\,5 \times 10^{-11} / \pm\,1 \times 10^{-11}$ *	$\pm\,1 \times 10^{-11}$
OSA 5421 Rubidium	Rubidium	$\pm\,5 \times 10^{-12}$	$\pm\,2 \times 10^{-10}$

Note: Effective daily aging after OSA 542X has been powered for one month and locked to GPS for 3 days, for the following 3 days.

	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
OSA 5420 Quartz	2 hours	4 hours	5 hours	8 hours	14 hours	1 month
OSA 5420 Quartz HQ+	8 hours	13 hours	15 hours	1.2 days	1.7 days	0.5 years
OSA 5421 Quartz HQ++	15 hours	1.3 days	2 days	4 days	6 days	>1.5 years
OSA 5421 Rubidium	15 hours	1.3 days	2 days	4 days	6 days	>5 years

Note: The above are approximated values assuming constant temperature, no initial phase and frequency error, after OSA 542X has been powered for one month and locked to GPS for 72 hours.

Sync signal conversion

From / To	SyncE Tx	BITS OUT	CLK OUT (10MHz)	PTP	NTP	1PPS OUT	ToD
GPS/GNSS	✓	✓	✓	✓	✓	✓	✓
SyncE Rx	✓	✓	✓	✓	n/a	freq	n/a
BITS IN	✓	✓	✓	✓	n/a	freq	n/a
CLK IN (10MHz)	✓	✓	✓	✓	n/a	freq	n/a
PPS IN	✓	✓	✓	✓	✓	✓	✓
PTP	✓	✓	✓	✓	✓	✓	✓

GM / PRTC frequency and time accuracy
- While locked to GNSS:
- Phase and time – PRTC / G.8272 phase accuracy (±100nsec from UTC)
- Frequency – PRC / G.811 frequency accuracy

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, 1PPS, GNSS and 10MHz
  - 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, 1PPS, GNSS and 10MHz
  - 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, 1PPS, GNSS and 10MHz
- All probes include enhanced sync assurance statistics, performance monitoring (15min & 24h), including data export, threshold crossing alarm (TCA) and SNMP traps

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 (10/100BaseT 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 ADVA FSP 150 and ADVA FSP 3000 products
- Supported by FSP Sync Network Manager

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

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

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

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.8264, G.703, 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)
- RFC 2863 (IF-MIB), RFC 2865 (RADIUS), RFC 2819 (RMON)
- RFC 1119 (NTPv2), RFC 1305 (NTPv3), RFC 5905 (NTPv4)

Regulatory compliance
- CE compliance
- RoHS compliance
- Power: ETSI 300 132-2, BTNR2511, ETS 300-019, ETS 300-019-2-[1,2,3], ANSI C84.1-1989
- Safety: EN 60950-1, 21CFR1040.10, EN 60825
- EMI: EN 55022 2010 Class A, 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

Power supply
- Hot-swappable, modular AC-PSU: 110 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
- Power consumption (without LC or SFP; Vin=48V):
  - OSA 5420 Quartz: 20W (typical), 22W (max)
  - OSA 5421 Quartz HQ+: 25W (typical), 35W (max)
  - OSA 5421 Quartz HQ++: 25W (typical), 35W (max)
  - OSA 5421 Rubidium: 28W (typical), 41W (max)

Environmental
- Dimensions: 443mm x 44mm x 219mm /17.44" x 1.73" x 8.62" (W x H x D), ETSI-complaint
- Weight: 3.2Kg
- Operating temperature (ambient):
  - Quartz, Quartz HQ+, Quartz HQ++: AC: -40 to +50°C / DC: -40 to +65°C (hardened environment)
  - Rubidium: -40 to +45°C
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Humidity: 5 to 100% (with condensation)

Optional accessories
- GNSS (GPS / GLONASS/BEIDOU/GALILEO) 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
- 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

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