OSCILLOQUARTZ
An ADVA Optical Networking Company

OSA 5420 Series

Advanced PTP Grandmaster & GNSS Receiver

Product Overview

Our OSA 5420 series is a family of cost-effective, mid-scale synchronization distribution and assurance devices that bring the power of Syncjack™ to any network. The OSA 5420 series offers unique flexibility by supporting delivery and assurance of synchronization, utilizing Synchronous Ethernet and IEEE 1588v2 Precision Time Protocol (PTP). Thanks to the built-in Global Navigation Satellite System (GNSS) receiver and Grandmaster (GM) Clock capability, it can be used as a timing source for frequency, phase and time-of-day delivery, as well as a measurement reference for Syncjack™ tools.

The OSA 5420 series supports Assisted Partial Timing Support (APTS) for the most stringent timing applications. An internal high-quality OCXO or the rubidium oscillator option enable extended holdover capabilities.

Applications

The family members of the OSA 5420 series can be utilized in a variety of network synchronization applications, including IEEE 1588v2 Grandmaster, Boundary Clock, Slave Clock and APTS. The built-in GNSS receiver and Primary Reference Time Clock (PRTC) capability, together with the redundant power supply option, make it ideal for reliable synchronization delivery.

No longer must archaic legacy solutions providing limited visibility on timing accuracy be maintained. Instead, timing can be easily distributed and assured throughout a network over existing packet infrastructure. In addition to packet-based timing, our OSA 5420 series also scales for bulk delivery of legacy frequency synchronization signals, as well as next generation phase and frequency synchronization signals. Expansion slots for BITS and coming soon 1PPS/TOD/CLK fan-out modules make it ideal for physical timing distribution applications at the edge of the network.

Our OSA 5420 series is designed to deliver the accurate phase and frequency information required by next-generation network technologies including LTE-A, LTE-TDD, enterprise networks and financial data centers. The latest ITU-T PTP telecom profiles for frequency and time/phase delivery are supported, as well as the latest PTP Enterprise profile.

The OSA 5420 series gives mobile and wireline network operators a valuable new approach to timing distribution.

Syncjack™ Monitoring and Assurance Tools

Syncjack™ is a comprehensive technology for timing distribution, monitoring and timing service assurance. Syncjack™ Clock Accuracy measures the frequency and phase accuracy of physical clock signals relative to a synchronization reference signal. Syncjack™ continuously performs clock analysis, including frequency and phase accuracy of the PTP packet domain. The network probe and analysis function of the OSA 5420 series complements the clock analysis functions. Syncjack™ continuously performs PTP network analysis, as well as monitoring and testing the PTP communication path.

All functions are supported by our FSP Sync Manager, an advanced management platform for timing distribution and assurance.

Features & Benefits

- Built-in GNSS receiver enables PRTC/PRC and Grandmaster Clock functionalities
- Brings precise IEEE 1588v2 PTP frequency and phase synchronization to radio access networks
- Syncjack™ technology for timing distribution, monitoring and testing
- Extended holdover performance including high-end quartz and rubidium oscillator options
- Configurable to operate in Grandmaster, APTS, Boundary and Slave Clock modes
- Scalable fan-out of multiple physical synchronization output interfaces
- High-availability design including APTS clock selection, automatic asymmetric delay compensation and power supply redundancy

Technical Information

Main Applications
- 1588v2 PTP Grandmaster Clock (up to 512 PTP clients)
- 1588v2 PTP Boundary Clock (up to 512 PTP clients)
- 1588v2 APTS Clock (Assisted Partial Timing Support Clock)
- 1588v2 PTP Slave Clock
- GNSS receiver and PRC/PRTC including fan-out of multiple physical synchronization output interfaces
- Synchronization protocol and physical signal conversion
- Sync Probe – Syncjack™ monitoring and assurance

PTP Modes of Operation
- Fully compatible with ITU-T G.8265.1 frequency delivery profile
- Fully compatible with ITU-T G.8275.1 time/phase delivery profile (Full Timing Support)
- Designed to support ITU-T G.8275.2 time/phase delivery profile (Assisted Partial Timing Support)
- Fully compatible with PTP Enterprise profile
- Fully compatible with IEEE 1588 2008 PTP default profile over Ethernet multicast

Synchronization Interfaces
- Synchronous Ethernet over FE/GbE interfaces
- 1 x BITS-in and 1 x BITS-out (2.048MHz, E1 or T1)
- 1 x 1PPS in/out and 1 x 1PPS in
- 1 x Time-of-Day (ToD) + 1PPS
- 1 x CLK 10MHz in/out and 1 x CLK 10MHz in
- Antenna input for embedded GNSS receiver

4 x Ethernet Ports
- Two combo 100/1000BaseT or 100/1000BaseX (SFP) ports
- Two additional 100/1000BaseX (SFP) ports

Synchronous Ethernet (SyncE)
- Support on 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 (onboard)
- 1 x BITS input over shielded RJ-48
- 1 x BITS output over shielded RJ-48
- User-configurable: E1, T1, 2.048MHz (including line impedance)
- 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 and in accordance with PTP
- Output squelch option

Expansion Cards
- OSA 5420[1] – Up to two expansion cards
- OSA 5421[2,3] – One expansion card
- Each expansion card supports:
  - Up to 16 BITS outputs over high density connector (VHDCI), supporting 2.048MHz, E1 or T1
  - SW configurable of output signals type per group of 8 (E1, 2.048MHz)
- Hot insertion/extraction support
- Overvoltage/current protection
- Two expansion cards share a single mountable patch panel with 16xRJ-48 and 16xBNC connectors

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 (50 Ohms)
- Output squelch option

Time-of-Day (ToD) Output
- G.8271 compliant
- ToD format - NMEA 0183 ($GPZDA sentence)
- RS422 over shielded RJ-45
- Output squelch option

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

GNSS Receiver
- Multi-constellation GNSS (GPS and GLONASS) L1 32 channels receiver
- Hardware-ready for Galileo, Beidou, SBAS, QZSS
- User configurable antenna cable delay compensation
- Software configurable mode of operation
  - GPS (1575.42 MHz)
  - GLONASS (1601.5 MHz)
  - Combined GPS + GLONASS
- Voltage to antenna +5VDC
- Antenna connector SMA-F (50 Ohms)

Holdover Performance

	Aging/Day (after 30 days)	Temperature Stability
Quartz (OSA 5420)[1]	± 5e-10	± 50e-10
Quartz HQ++ (OSA 5421)[2]	± 5e-11	± 1e-11
Rubidium (OSA 5421)[3]	± 5e-12	± 2e-10

	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
Quartz[1]	2 hours	4 hours	5 hours	8 hours	14 hours	1 month
Quartz HQ++[2]	15 hours	1.3 days	2 days	4 days	6 days	>1 year
Rubidium[3]	15 hours	1.3 days	2 days	4 days	6 days	>1 year

Note: The above are approximated values assuming constant temperature, no initial phase and frequency error, after OSA 542X was powered for one month and locked to GPS for 24 hours.

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

Sync Signal Conversion

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

Syncjack™ Monitoring and Assurance Tools
- Clock Accuracy for up to 2 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
- Clock Analysis for up to 4 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


[1] OSA 5420 Quartz


[2] OSA 5421 Quartz HQ++


[3] OSA 5421 Rubidium

Technical Information

- 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
  - Enhanced sync assurance statistics, performance monitoring (15min & 24h), including data export, threshold crossing alarm (TCA) and SNMP traps

PTP Networking Features

- PTP profiles support:
  - Telecom Frequency profile ITU-T G.8265.1 – IPv4 unicast
  - Telecom Phase & Time profile ITU-T G.8275.1 – Ethernet multicast
  - Enterprise profile – IP Hybrid Multicast/Unicast
  - Default profile IEEE 1588 2008 – Ethernet Multicast
- Up to 4 Master/BC IP addresses
- Up to 4 VLANs (IEEE 802.1Q customer-tagged) and stacked VLANs
- Up to 3 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 & 24h), threshold crossing alarm (TCA) and SNMP traps
- In-house best in class clock recovery algorithms

Low-Touch Provisioning

- Text-based configuration files
- TFTP for configuration file copy
- Remote software upgrade

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
- USB interface
- Maintains in-band VLAN and MAC-based management tunnels
- Fully interoperable with FSP 150CM, FSP 150EG-X and FSP 150CC 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)

IP routing

- DHCP, RIPv2 and static routes, ARP cache access control

System logging

- Syslog, alarm log, audit log and security log
- Configurable system timing source – Local/NTP/PTP/PRTC (GNSS)

Standards Compliance

- ITU-T G.8261, G.8262, G.8264, G.703, G.781
- ITU-T G.8272
- ITU-T G.8265.1, G.8275.1
- IEEE 1588v2 (PTP), 802.1Q (VLAN), 802.1ad, 802.1p (Priority)
- RFC 2863 (IF-MIB), RFC 2865 (RADIUS), RFC 2819 (RMON)

Regulatory 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
- ROHS 6 compliance

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 -72VDC or +24 to +30VDC with over-voltage and over-current protection
- Power consumption:
  - 15W (typical), 17W (max)[1]
  - 24W (typical), 32W (max)[2]
  - 32W (typical), 37W (max)[3]

Environmental

- Dimensions: 443mm x 44mm x 219mm /17.44" x 1.73" x 8.62" (W x H x D), ETSI-compliant
- Weight:
  - 3.15Kg[1]
  - 3.20Kg[2,3]
- Operating temperature (ambient):
  - -40 to +65°C (hardened environment)[1,2]
  - -40 to +45°C[3]
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Humidity: 5 to 95% (non-condensing)

Syncjack™