Product Overview

Our OSA 5410 Series is a family of compact and cost-effective synchronization distribution and assurance devices that brings the power of Syncjack™ to any access network. The OSA 5410 Series offers unique flexibility by supporting delivery and assurance of synchronization utilizing Synchronous Ethernet and IEEE 1588v2 Precision Time Protocol (PTP). Thanks to its 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.

Our OSA 5410 Series supports Assisted Partial Timing Support (APTS) for the most stringent timing applications. An internal high-quality oven-controlled crystal oscillator (OCXO) or a rubidium oscillator option enable extended holdover capabilities.

Applications

The family members of our OSA 5410 Series can be utilized in a variety of network synchronization applications, including IEEE 1588v2 Access Grandmaster, Boundary and Slave Clock, APTS Clock, GNSS receiver and Primary Reference Time Clock (PRTC), synchronization signal conversion and sync probe applications.

Our OSA 5410 Series is designed to deliver the accurate phase and frequency required by next-generation network technologies such as LTE-A, LTE-TDD and enterprise networks. Timing can be easily distributed and assured throughout a network over existing packet infrastructure.

Timing performance is continuously monitored while in service, and alarms are triggered if needed. A valuable new approach for timing distribution is made available to mobile network operators: the ability to efficiently distribute timing from the network edge and assure that base station clocks precisely track their master.

Syncjack™ Monitoring and Assurance Tools

Our OSA 5410 Series supports all Syncjack™ functions and 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. Syncjack™ continuously performs Clock Analysis, including frequency and phase accuracy of the PTP packet domain. Syncjack™ also performs PTP network analysis, as well as monitoring and testing the PTP communication path.

Our OSA 5410 Series uses Syncjack™ tools to measure frequency and phase accuracy of a physical clock source or a remote slave clock based on TE, TIE and MTIE. It performs PTP clock analysis by calculating TE, TIE and MTIE from timestamps embedded in PTP messages. The network probe function complements the clock measurement through network analysis of the PTP message transport.

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

Features & Benefits

- Cost effective and small form factor design suitable for access network

- Built-in GNSS receiver enable PRTC/PRC & 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

- High-availability design

Technical Information

Main Applications
- 1588v2 PTP Grandmaster Clock (up to 64 PTP clients)
- 1588v2 PTP Boundary Clock (up to 64 PTP clients)
- 1588v2 APTS Clock (Assisted Partial Timing Support Clock)
- 1588v2 PTP Slave Clock
- GNSS Receiver and PRTC
- Synchronization 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)
- Enterprise profile – IP Hybrid Multicast/Unicast
- Default profile IEEE 1588 2008 – Ethernet Multicast

Synchronization Interfaces
- Synchronous Ethernet ITU-T G.8261/G.8262/G.8264
- 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

Ethernet Interfaces
- Two combo 10/100/1000BaseT or 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)
- SyncE for time holdover during GNSS outage and in congruent with PTP

BITS
- 1 x BITS input over shielded RJ-48
- 1 x BITS output over shielded RJ-48
- User-configurable: E1, T1, 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 and in congruent with PTP
- Output squelch option

1PPS in/out, 1PPS in
- 1 x 1PPS input
- 1 x 1PPS input/output (user-configurable)
- User-configurable input and output delay compensation
- Mini SMB-M 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)
- Mini SMB-M connector (50 Ohms)
- Output squelch option

GNSS Receiver
- Multi-constellation GNSS (GPS and GLONASS) L1 32 channels receiver
- Hardware-ready for Galileo
- 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 5410)	± 5e-10	± 50e-10
Quartz HQ++ (OSA 5411)	± 5e-11	± 1e-11
Rubidium (OSA 5411)	± 5e-12	± 2e-10

	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
Quartz	2 hours	4 hours	5 hours	8 hours	14 hours	1 month
Quartz HQ++	15 hours	1.3 days	2 days	4 days	6 days	>1 year
Rubidium	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 541X 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

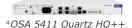| From/To	SyncE Tx	BITS OUT	CLK OUT (10MHz)	PTP	1PPS OUT	ToD
GPS/GNSS	✓	✓	✓	✓	✓	✓
SyncE Rx	✓	✓	✓	✓	freq	n/a
BITS IN	✓	✓	✓	✓	freq	n/a
CLK IN (10MHz)	✓	✓	✓	✓	freq	n/a
PTP	✓	✓	✓	✓	✓	✓

Syncjack™ Monitoring and Assurance Tools
- Clock Accuracy for up to 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
- 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
- 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), threshold crossing alarm (TCA) and SNMP traps

Technical Information

PTP Networking Features
- PTP over IPv4 (G.8265.1) and over Ethernet (G.8275.1), Hybrid mode (Enterprise profile)
- One/Two Way, One/Two Step
- Up to four Master/BC IP addresses
- Up to four VLANs (IEEE 802.1Q customer-tagged) and stacked VLANs
- 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 & 24h), threshold crossing alarm (TCA) and SNMP traps

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

Management and Security

Local management
- Serial connector (RS232 over RJ45) using CLI

Remote management
- Local LAN port (10/100BaseT over RJ45) using CLI, SNMP and Web GUI interfaces
- 3G/LTE USB interface
- Maintains in-band VLAN and MAC-based management tunnels
- 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)

Regulatory and 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)
- 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
- Integrated PSU[1]: 110/240 VAC, -48 to -72VDC or +24 to +30VDC
- Hot swappable, modular AC-PSU[2,3]: 110 to 240VAC (47 to 63Hz) with over-voltage and over-current protection
- Hot swappable, modular DC-PSU[2,3,4]: -48 to -72VDC or +24 to +30VDC with over-voltage and over-current protection
- Power consumption:
  - 13W (typical), 19.5W (max)[1,2]
  - 22W (typical), 27W (max)[4]
  - 25W (typical), 30W (max)[3]

Environmental
- Dimensions:
  - 1U ½ 19" compact chassis, 220mm x 44mm x 212mm / 8.7" x 1.75" x 8.4" (W x H x D), ETSI-compliant[1]
  - 1U 19" compact chassis, 439mm x 44mm x 212mm / 17.3" x 1.75" x 8.4" (W x H x D), ETSI-compliant[2,3,4]
- Weight: 1.834Kg[1], 2.98Kg[2], 3.07Kg[3]
- Operating temperature:
  - -40 to +65°C (hardened environment)[1,2,4]
  - -40 to +45°C[3]
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Humidity: 5 to 95% (non-condensing)