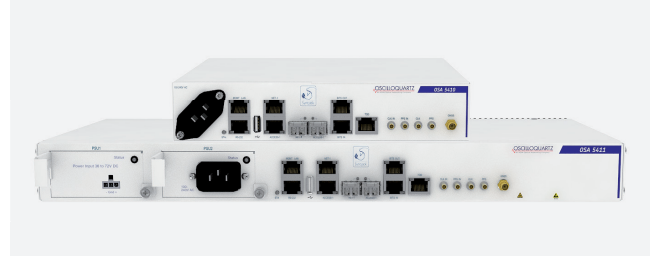## Product Overview

The OSA 5410 Series is a family of compact and cost-effective synchronization distribution and assurance devices that bring the power of Syncjack™ to any network. Following a toolbox approach, the family members of the OSA 5410 Series can be utilized in a variety of network synchronization applications including IEEE 1588v2 Access Grandmaster, Boundary and Slave Clock, GNSS receiver and Primary Reference Time Clock (PRTC), synchronization signal conversion and sync probe applications. 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. Timing performance is continuously monitored while in service, and alarmed 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 are precisely tracking their master.

synchronization reference is unavailable. Syncjack™ also continuously performs PTP Network Analysis, including monitoring and testing of the PTP communication path.

Syncjack™ Monitoring and Assurance Tools

The 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 of the OSA complements clock measurement by network analysis of the PTP message transport. All functions are supported by ADVA Optical Networking's FSP Sync Manager, an advanced management platform for timing distribution and assurance.

Product Details

The OSA 5410 Series offers unique flexibility by supporting delivery and assurance of synchronization, utilizing Synchronous Ethernet and IEEE 1588v2 Precision Time Protocol (PTP). It has a built-in GNSS receiver and Grandmaster Clock capability that 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 5410 Series is designed to support Assisted Partial Timing Support (APTS) for the most stringent timing applications. An internal high-quality OCXO oscillator and the Rubidium clock option enables extended holdover to support remote site, head-end and feeder applications.

Syncjack™ Functions

The OSA 5410 Series supports all Syncjack™ functions and tools. Syncjack™ is a comprehensive technology for timing distribution, monitoring and timing service assurance. It includes three main functionalities: Clock Accuracy, Clock Analysis and PTP Network Analysis. Syncjack™ Clock Accuracy measures the frequency and phase accuracy of clocks relative to a synchronization reference, which can be internal, external, recovered or originating from a GNSS signal. Syncjack™ continuously performs Clock Analysis, including frequency and phase accuracy of the PTP packet domain, even when a

Features & Benefits

- Syncjack™ technology for timing distribution, monitoring and testing

- Brings precise IEEE 1588v2 PTP frequency and phase synchronization to radio access networks

- Built-in GNSS receiver and Grandmaster Clock functionality

- Extended holdover performance by Rubidium clock option

- Configurable to operate in Slave, Boundary and Grandmaster Clock mode

- Precise clock accuracy measurement and enhanced statistics

- 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 64 PTP clients)
- 1588v2 PTP Boundary Clock (up to 64 PTP clients)
- 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)

Synchronization Interfaces
- Synchronous Ethernet ITU-T G.8261/G.8262/G.8264
- 1 x BITS-in and 1 x BITS-out
- 1 x PPS in/out and 1 x PPS in
- 1 x Time-of-Day (ToD)
- 1 x CLK in/out and 1 x CLK in
- Antenna in for embedded GNSS receiver

Ethernet Interface Capacity
- 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 frequency input and output (i.e. BITS out, 10M out, GM)
- SyncE for time holdover during GNSS outage and in congruent with PTP

BITS
- 1 x BITS input over shielded RJ-45
- 1 x BITS output over shielded RJ-45
- 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

PPS in/out, PPS in
- 1 x PPS input
- 1 x PPS 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
- 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
- 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
- OCXO
- Rubidium [2]

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 10M
  - MTIE mask and Time Error threshold alarms based on SNMP traps
- 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 10M
  - 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 10M
  - 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)
- Up to 4 Master/BC IP's
- 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

Low-Touch Provisioning
- DHCP/BOOTP auto-configuration
- 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
- 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)

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)
- ANSI C84.1-1989
- ETSI 300 132-2, BTNR2511, ETS 300-019, ETS 300-019-2-[1,2,3], ETS 300-753
- Safety IEC/UL/EN 60950, 21CFR1040.10, EN 60825, EN 50371, EN 300-386, EN 50160, IEC 60320/C14
- EMI EN 300-386, GR-1089-CORE, ETS 300-132, FCC Part 15, Class A, Industry Canada

Power Supply
- Integrated PSU[1]: 110/240 VAC, -48 to -72VDC or +24 to +30VDC
- Hot swappable, modular AC-PSU[2]: 110 to 240VAC (47 to 63Hz) with over-voltage and over-current protection
- Hot swappable, modular DC-PSU[2]: -48 to -72VDC or +24 to +30VDC with over-voltage and over-current protection
- Power consumption:
  – OCXO: 25W (typical), 27W (max)
  – Rubidium[2]: 31W (typical), 40W (max)

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]
- Operating temperature:
  – OCXO: -40 to +65°C (hardened environment)
  – Rubidium[2]: -20 to +55°C
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Humidity: 5 to 95% (B1 non-condensing)