

## OSA 5410 Series

### PTP grandmaster, GNSS receiver and sync probe

Radio access network (RAN) technology is evolving. Reliable and highly precise delivery of phase, frequency and time-of-day synchronization across mobile backhaul networks has become critical. Real-time synchronization monitoring also plays a key role in detecting sync degradations before services are affected and assuring sync performance.

With our OSA 5410 Series, ensuring cost-effective and reliable synchronization of your base station clocks is no longer a challenge. This family of IEEE 1588v2 Precision Time Protocol (PTP) access grandmaster devices features a built-in GNSS receiver. What's more, it also has the unique capability of monitoring synchronization quality while operating in service; powered by our Syncjack™ technology, the OSA 5410 can perform clock frequency and phase accuracy measurements of both PTP and legacy networks.



### Your benefits

- ✔ **Compact and cost-effective**  
Small form factor design optimized for access network deployment
- ✔ **Syncjack™ technology**  
Built-in technology for in-service synchronization accuracy monitoring, testing and assurance functionality
- ✔ **Unique flexibility**  
Configurable to operate in grandmaster clock, assisted partial timing support (APTS), boundary clock and slave clock mode
- ✔ **Real-time sync monitoring**  
In-service, network-based synchronization monitoring
- ✔ **High-availability design**  
Automatic clock selection, self-calibrating delay asymmetry compensation and power supply redundancy
- ✔ **Operational simplicity**  
Ensemble Controller, including Ensemble Sync Director, for superior management and synchronization monitoring capabilities

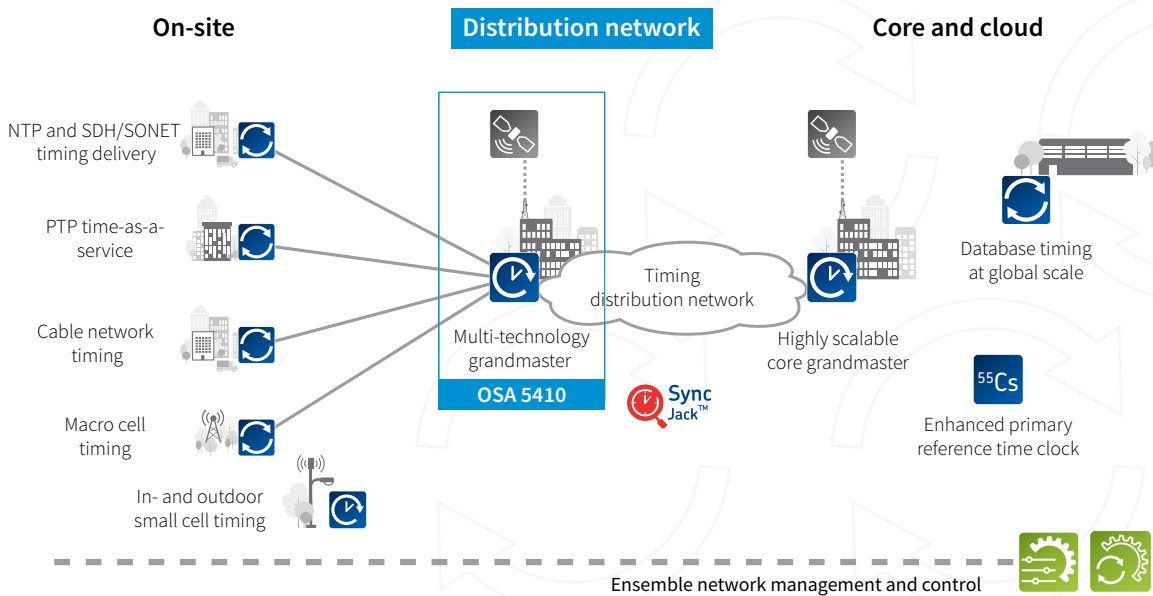
# High-level specifications

<b>OSA 5410</b> <ul style="list-style-type: none"> <li>• High-quality OCXO</li> <li>• Integrated PSU (AC/DC)</li> <li>• 1RU 19" half-width chassis, ETSI compliant</li> <li>• Cost-effective PTP GM, BC, slave and sync probe</li> </ul>	<b>OSA 5411</b> <ul style="list-style-type: none"> <li>• Quartz, high-quality quartz or rubidium</li> <li>• Hot-swappable redundant PSU (AC/DC)</li> <li>• 1RU 19" chassis, ETSI compliant</li> </ul>	<b>Main applications</b> <ul style="list-style-type: none"> <li>• 1588v2 PTP grandmaster, boundary and slave clock, and APTS clock</li> <li>• GNSS receiver and PRTC</li> <li>• Synchronization signal conversion</li> <li>• Sync probe – Syncjack™ monitoring and assurance</li> </ul>
<b>Built-in GNSS receiver</b> <ul style="list-style-type: none"> <li>• Software configurable</li> <li>• GPS/GLONASS/BEIDOU/GALILEO</li> <li>• GPS+GLONASS</li> <li>• GPS+BEIDOU</li> <li>• GPS+GALILEO</li> </ul>	<b>PTP operation modes</b> <ul style="list-style-type: none"> <li>• ITU-T G.8265.1 frequency delivery profile</li> <li>• ITU-T G.8275.1 (full timing support) and ITU-T G.8275.2 profiles (APTS)</li> <li>• PTP enterprise profile</li> <li>• Default profiles over Ethernet and IP multicast</li> </ul>	<b>Syncjack™ technology</b> <ul style="list-style-type: none"> <li>• Frequency and phase accuracy measurements</li> <li>• TE, TIE and MTIE calculation</li> <li>• PTP message transport analysis</li> <li>• PTP network analysis</li> </ul>

## Applications in your network

### Radio access network synchronization and in-service sync probing





- Assured synchronization of LTE-TDD, LTE-Advanced and 5G radio base stations
- PTP slave capable of translating between PTP and Sync-E/BITS/CLK/PPS outputs
- Sync probing – In-service, network-based monitoring, testing and assurance that macro and small cell radio base station clocks are precisely tracking their master
- Time as a service into data center, financial, health and media networks



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Product specifications are subject to change without notice or obligation.

## Product variants

	OSA 5410 Quartz <sup>1</sup>	OSA 5411 Quartz <sup>2</sup>	OSA 5411 Quartz HQ++ <sup>3</sup>	OSA 5411 Rubidium <sup>4</sup>
				
<b>Clock</b>	OCXO	OCXO	High-quality DOCXO	Rubidium
<b>Size</b>	1RU, half-width	1RU 19" chassis	1RU 19" chassis	1RU 19" chassis
<b>PSU</b>	Integrated 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 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

### 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 in/out
- 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

### 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
- 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
- Mini SMB-M connector (50 Ohms)
- 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

### CLK in/out, CLK In

- 1x CLK 10MHz input
- 1x CLK 10MHz input/output (user configurable)
- Mini SMB-M connector (50 Ohms)
- Output squelch option

### GNSS receiver

- Multi-constellation GNSS (GPS, GLONASS, GALILEO and BEIDOU) L1 32 channels receiver
- User configurable antenna cable delay compensation
- Software configurable mode of operation
  - GPS (1575.42 MHz)
  - GLONASS (1601.5 MHz)
  - BEIDOU (1561MHz)
  - Combined GPS + GLONASS
  - Combined GPS + BEIDOU
- Voltage to antenna +5VDC
- Antenna connector SMA-F (50 Ohms)

## Holdover performance

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

\* Note: Effective daily aging for the next following three days after device has been powered for one month and locked to GPS for three days.

	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
<b>Quartz</b>	2 hours	4 hours	5 hours	8 hours	14 hours	1 month
<b>Quartz HQ++</b>	15 hours	1.3 days	2 days	4 days	6 days	>1.5 years
<b>Rubidium</b>	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 541X has been powered for one month and locked to GPS for 72 hours

## Sync signal conversion

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

## GM/PRTC frequency and time accuracy

- While locked to GNSS:
  - Phase & time – G.8272 phase accuracy ( $\pm 100$ nsec from UTC)
  - Frequency – 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
- 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

## PTP networking features

- PTP profiles support:
  - ITU-T G.8265.1 frequency delivery profile (IP unicast)
  - ITU-T G.8275.1 time/phase delivery profile (Full Timing Support - Ethernet multicast)
  - ITU-T G.8275.2 time/phase delivery profile (Assisted Partial Timing Support - IP unicast)
  - PTP Enterprise profile (Mixed Multicast and Unicast over IP)
  - IEEE 1588 2008 PTP default profile over IP multicast
  - IEEE 1588 2008 PTP default profile over Ethernet multicast (Annex F)
- Up to 4 Master/BC IP addresses
- Up to 4 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 gateways
- Enhanced PTP GM/BC/slave statistics, performance monitoring (15min & 24h), threshold crossing alarm (TCA) and SNMP traps

## Low-touch provisioning

- Text-based configuration files
- FTP/SFTP/SCP 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
- Support for IPv4 and IPv6
- 3G/LTE USB interface
- Maintains in-band VLAN and MAC-based management tunnels
- Supported by Ensemble Suite Controller, including Ensemble Sync Director

### 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
- IPv6 NDP address resolution
- RIPng for IPv6

## System logging

- Syslog, alarm log, audit log and security log
- User configurable time zone & day light saving time
- 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, 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)
- 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 compliance

## Power supply

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

## 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<sup>1</sup>
  - 1U 19" compact chassis, 439mm x 44mm x 212mm / 17.3" x 1.75" x 8.4" (W x H x D), ETSI-compliant<sup>2,3,4</sup>
- Weight: 1.834 Kg<sup>1</sup>, 2.98Kg<sup>2</sup>, 3.07Kg<sup>3,4</sup>
- Operating temperature:
  - -40 to +65°C (hardened environment)<sup>1,2,3</sup>
  - -40 to +45°C<sup>4</sup>
- 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, lightning protector and mounting kit
- 1:2/1:4/1:8 GNSS (GPS/GLONASS/BEIDOU/GALILEO ) splitters
- GNSS window antenna
- Cables and adapters Accessory kit

## Product Legend

- <sup>1</sup> OSA 5410
- <sup>2</sup> OSA 5411 Quartz
- <sup>3</sup> OSA 5411 Quartz HQ++
- <sup>4</sup> OSA 5411 Rubidium