

Reliable and accurate delivery of frequency, phase and time synchronization from the core to the network edge is essential to meet the stringent requirements of LTE TDD and LTE Advanced technologies. However, the challenges go beyond accuracy. As well as strict precision, network operators need a robust, scalable and cost-effective solution that can work over packet-based networks as well as legacy infrastructure.

With our OSA 5430 and OSA 5440 series, a family of carrier-grade IEEE 1588v2 Precision Time Protocol (PTP) grandmaster devices optimized for deployment at the network core, cost-effective and accurate synchronization distribution and assurance is no longer a challenge. What's more, with its NTP server and GNSS receiver capabilities including multiple legacy and next generation synchronization fan-out options, our OSA 5430 and OSA 5440 series are 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

✓ High-Speed Connectivity

First telecom grandmaster supporting PTP, NTP and SyncE over 10G as well as 1G interfaces with hardware time stamping

✓ Unique Flexibility

Modular and scalable design, 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

✓ Syncjack™ Technology

Built-in synchronization accuracy monitoring, testing and assurance functionality

✓ Operational Simplicity

FSP Network and Sync Manager platform for superior management and sync monitoring


High-Level Specifications

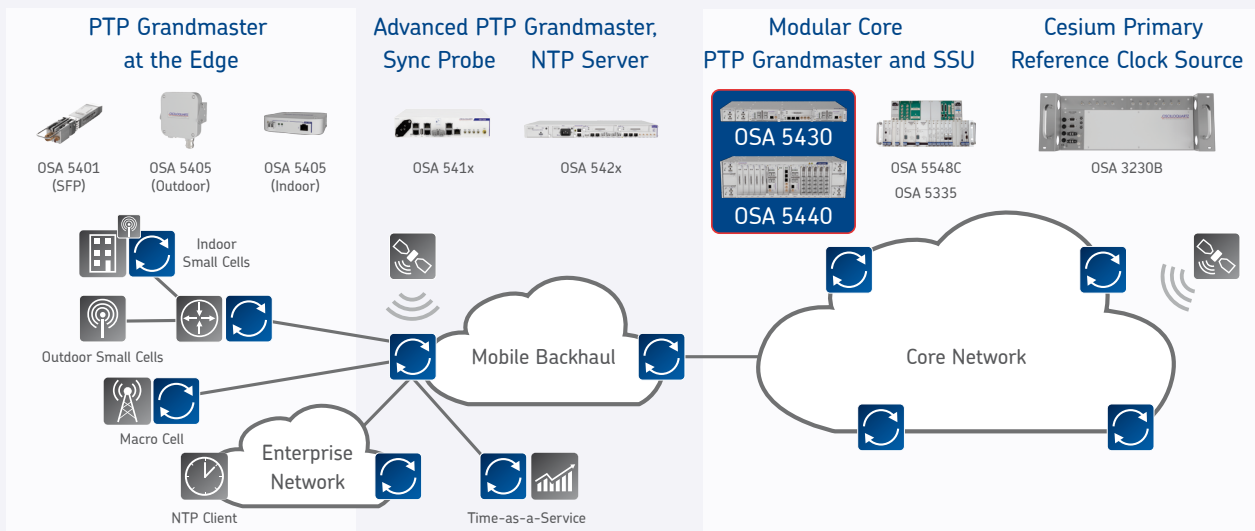
System Overview <ul style="list-style-type: none"> • High-quality OCXO, DOCXO and rubidium • Up to 4x10GbE / 44x1GbE • Up to 1024 unicast slaves • Hot-swappable redundant clock, GNSS and PSU 	Operation Modes <ul style="list-style-type: none"> • IEEE 1588 PTP grandmaster • IEEE 1588 PTP boundary clock (BC), slave and probe • NTP server • PRC/SSU (Sync-E and BITS) 	Built-in GNSS Receiver <ul style="list-style-type: none"> • GPS/GLONASS/BEIDOU/GALILEO • GPS+GLONASS • GPS+BEIDOU • GPS+GALILEO
IEEE 1588 2008 PTP Profiles <ul style="list-style-type: none"> • Default profiles over Ethernet and IP multicast • Telecom profiles G.8265.1, G.8275.1 and G.8275.2 • Enterprise hybrid profile • HW-based packet processing 	NTP Server <ul style="list-style-type: none"> • High-capacity Stratum 1 server • HW timestamping • NTP/PTP/Sync-E/SSU supported simultaneously • PTP to NTP conversion 	Expansion Cards (optional) <ul style="list-style-type: none"> • Up to 10x line cards • Line cards: <ul style="list-style-type: none"> • 16x E1/T1/2.048MHz (120/100/75ohm) • 4x 1GbE (PTP/NTP/Sync-E)

Applications in Your Network

Timing distribution from the network core

- Radio access network synchronization including 3G, 4G, 4.5G LTE/LTE-A, femtocells and small cells
- Precise synchronization of legacy network architectures based on NTP and SSU
- Cable networks (DOCSIS 3.1) and PON synchronization


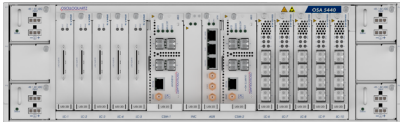
FSP Network and Sync Manager 



For more information please visit us at www.oscilloquartz.com
Data Sheet, version 10/2017

OSCILLOQUARTZ
An ADVA Optical Networking Company

Product Variants

		
Size (WxHxD)	1RU 443mm x 44.1mm x 216mm / 17.44" x 1.73" x 8.50"	3RU 443mm x 132.5mm x 216mm / 17.44" x 5.21" x 8.50"
Clock	Quartz (OCXO) Quartz HQ+ (high-quality DOCXO) Quartz HQ++ (enhanced high-quality DOCXO) Rubidium	Quartz (OCXO) Quartz HQ+ (high-quality DOCXO) Quartz HQ++ (enhanced high-quality DOCXO) Rubidium
Expansion Line Cards	Up to 1	Up to 10
PTP/NTP/Sync-E ports	Up to 8	Up to 44
BITS output ports	Up to 16	Up to 160
PSU	Hot-swappable redundant DC PSU (up to 2)	Hot-swappable redundant DC PSU (up to 4)

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 PTP slave input (as backup to GNSS)
- GNSS receiver and PRC/PRTC including fan-out of multiple physical synchronization output interfaces
- Synchronization supply unit (SSU)
- NTP server
- 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)
 - ITU-T G.8275.2 time/phase delivery profile (assisted partial timing support - IPv4/IPv6)
 - 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 (IPv4 and IPv6 supported simultaneously)
- Up to 16 EVCs (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 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 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

Hardware Modules

- Modules:
 - CSM: Clock synchronization module.
 - AUX: Auxiliary I/O module

- PSU: Power supply unit
- Expansion line cards (optional):
 - GE-4S-P: 4x1G Ethernet card
 - BTOH-P-16: 16xBITS outputs card
- Same modules for OSA 5430 and OSA 5440
- Number of modules supported per product:

	OSA 5430	OSA 5440
CSM	1(*)	1(*)
AUX	1	1
PSU	1-2	1-4
Line Cards	0-1	0-10

(*) HW ready for dual CSM. The OSA 5430 and OSA 5440 devices are designed to provide full redundancy for management, GNSS receiver, and Oscillator and Ethernet ports

Clock Synchronization Module (CSM)

CSM Oscillator Options

- Quartz (OCXO)
- Quartz HQ+ (high Quality DOCXO)
- Quartz HQ++ (enhanced high quality DOCXO)
- Rubidium

4x Ethernet Ports

- Hardware-based timestamping (PTP and NTP)
- Four 1Gbit/s (SFP) / 10Gbit/s (SFP+) ports
- All ports support SM/MM colored/non-colored/dual/singel fiber SFP / SFP+ and copper SFP
- Per-flow hardware-based policing and scheduling
- Configurable link asymmetry delay compensation

Synchronous Ethernet (SyncE)

- 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

GNSS Receiver

- Dual antenna inputs for embedded GNSS receivers (on each CSM)
- Multi-constellation GNSS (GPS/GLONASS/BEIDOU/ GALILEO) L1 32-channel 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)

Auxiliary Card (AUX)

Synchronization Interfaces

- 1x BITS in/out
- 1x 1PPS in/out
- 1x Time-of-day (ToD) + 1PPS in/out
- 2x CLK 10MHz in/out

BITS

- 1 x BITS input and 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 time holdover during GNSS outage
- Output squelch option
- SSU filtering option

1PPS In/Out

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

ToD + PPS In/Out



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

CLK In/Out

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

Output Expansion Line Cards

- Same cards for OSA 5430 and OSA 5440
- Line cards:
 - GE-4S-P: 4x1G Ethernet card
 - BTOH-P-16: 16xBITS card
- OSA 5430 – One expansion card
- OSA 5440 – Up to ten expansion cards
- Hot insertion/extraction support
- Overvoltage/current protection
- Two expansion cards share a single mountable patch panel with 16xRJ-48/RJ-45 and 16xBNC connectors

	BTOH-P-16 (16xBITS)	GE-4S-P (4x1G)
		
Capabilities	16xBITS outputs over high density connector (VHDCI) – supporting 2.048MHz, E1 or T1 (DS1), SW configurable of output signals type and line impedance per group of 8 ports (E1, 2.048MHz)	4x1Gbit/s fiber Ethernet ports (PTP/NTP/Sync-E) Sync-E and PTP monitoring and assurance using Syncjack™

Holdover Performance

	Clock	Aging/Day (after 30 days)	Temperature Stability
Quartz CSM	High-quality OCXO	± 5e-10	± 50e-10
Quartz HQ+ CSM	DOCXO	± 3e-10/± 1e-10*	± 2e-10
Quartz HQ++ CSM	DOCXO	± 5e-11	± 1e-11
Rubidium CSM	Rubidium	± 5e-12	± 2e-10

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

	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
Quartz CSM	2 hours	4 hours	5 hours	8 hours	14 hours	1 month
Quartz HQ+ CSM	8 hours	13 hours	15 hours	1.2 days	1.7 days	0.5 years
Quartz HQ++ CSM	15 hours	1.3 days	2 days	4 days	6 days	>1.5 years
Rubidium CSM	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 device has been powered for one month and locked to GPS for 24 hours.

Sync Signal Conversion

From/To	SyncE Tx	BITS OUT	CLK OUT (10MHz)	PTP	NTP	1PPS OUT	ToD
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
- 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
- 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

Low-Touch Provisioning

- Text-based configuration files
- FTP/SFTP/SCP for configuration file copy
- Remote software upgrade

Management and Security

Local Management

- Serial port (RS232 over RJ45) for CLI (on CSM)

Remote Management

- Local LAN port (100/1000BaseT over RJ45) using CLI, SNMP and Web GUI interfaces (on AUX)
- Support for IPv4 and IPv6 (dual stack)
- Maintains in-band VLAN-based management tunnels
- Static routes & configuration of default gateways
- Fully interoperable with ADVA FSP 150 and ADVA FSP 3000 products
- Supported by FSP Network and Sync Manager

Management Protocols

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

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

- ICMP
- DHCP v4/v6
- ARP cache access control
- IPv4 RIPv2 and static routes
- IPv6 NDP address resolution and static routes
- 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 and daylight saving time (DST)

Standards Compliance

- ITU-T G.8261, G.8262, G.8264, G.703, G.781, G.812, G.811
- 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), 802.3ae (10G)
- RFC 2863 (IF-MIB), RFC 2865 (RADIUS), RFC 2819 (RMON), RFC 2460 (IPv6)
- RFC 1119 (NTPv2), RFC 1305 (NTPv3), RFC 5905 (NTPv4)

Regulatory Compliance

- CE compliance
- ROHS 6 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 DC-PSU: -48 / -60VDC (tolerate -36 to -72VDC) with over-voltage and over-current protection

Environmental

- Dimensions (W x H x D):
 - OSA 5430: 443mm x 44.1mm x 216mm / 17.44" x 1.73" x 8.50"
 - OSA 5440: 443mm x 132.5mm x 216mm / 17.44" x 5.21" x 8.50"
- Weight (depending on the configuration):
 - OSA 5430: 3.6Kg to 5.5Kg
 - OSA 5440: 8.5Kg to 14.5Kg
- Operating temperature (ambient):
 - Quartz, Quartz HQ+, Quartz HQ++: -40 to +50°C
 - Rubidium: -40 to +45°C
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Humidity: 5 to 95% (non-condensing)
- Operational altitude: -450m to 5000m

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 line cards