Adtran

Data Sheet

OSA 5410XG

Compact high-speed PTP grandmaster, NTP server and probing device

5G Mobile | Telecom | Defense | Data center | Smart grid | Transportation | Financial | Broadcast

Benefits

- **Compact and cost-effective small form factor design optimized for access network deployment**
- **Multiple SFP+ 10G ports**
- **Syncjack™ technology for built-in synchronization accuracy monitoring and assurance functionality**
- **PRTC-A and grandmaster clock functionality for frequency, phase and time-of-day delivery using multiple constellations**
- **High performance NTP server supporting up to 500,000 TPS**
- **Unique flexibility:**
  Can be used as PTP grandmaster clock, APTS, boundary clock and slave clock mode as well as NTP server
- **Jamming/spoofing detection**
- **PTP IEEE 1588 time Transmitter: Supports multiple profiles and upto 1024 clients**
- **Operational simplicity: Ensemble Controller, including Ensemble Sync Director, for superior management and synchronization monitoring capabilities**
- **Hardware ready IRIG-B support and Alarm relay switch**

Overview

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 5410XG 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 5410XG can perform clock frequency and phase accuracy measurements of both PTP and legacy networks.

Oscilloquartz zero-trust multisource aPNT+™ platform

OSA 5410XG

High-level technical specifications

OSA 5410XG

- OCXO
- Multiple 1G/10G ports
- Up to 1024 unicast slaves @128pps
- AC or DC PSU variants

Operation modes

- PRTC A
- PTP GM, BC type D, slave, probe
- NTP server

Built-in GNSS receiver

- Embedded L1 multi- constellation receiver (GPS/ GALILEO/ BEIDOU/GLONASS)
- Jamming and spoofing detection

PTP profiles

- L2 (Ethernet) and L3 (IP) default profiles
- Telecom profiles
- Enterprise hybrid profile
- Power and utility profiles
- Broadcast profiles

NTP server

- High capacity server
- Hardened NTP responder
- Hardware timestamping
- NTP/PTP/SyncE/SSU supported simultaneously
- PTP to NTP conversion
- NTP authentication

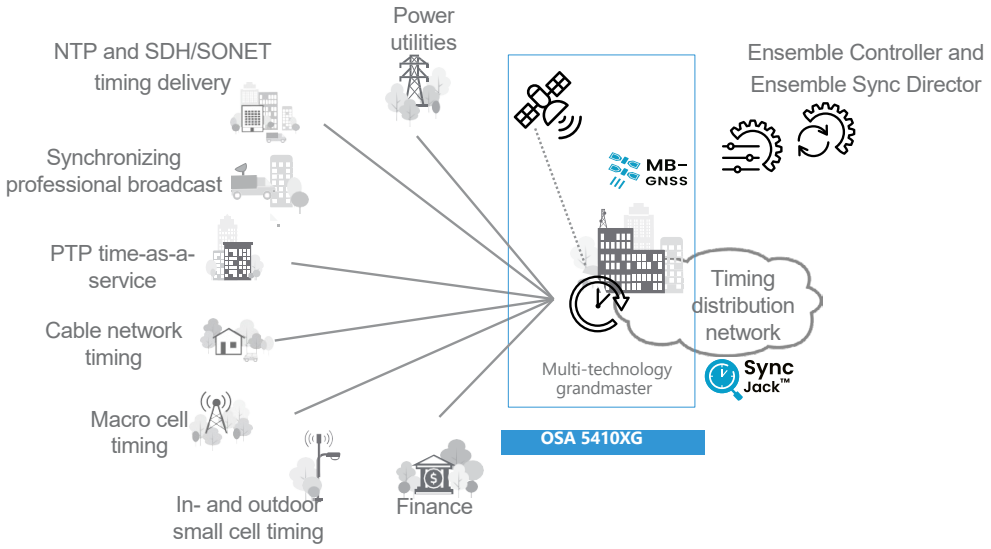
Syncjack™ technology

- Frequency and phase accuracy measurements
- TE, TIE and MTIE calculation
- PTP message transport analysis
- PTP network analysis

Applications in your network

Cost effective grandmaster at aggregation layer

- In-service sync probing
- Assured synchronization of LTE-TDD, LTE-Advanced and 5G radio base stations
- Small cells an private 5G network synchronization
- PTP slave capable of translating between PTP and SyncE/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



Product specifications

Main applications

- PRTC-A
- 1588v2 PTP grandmaster clock (up to 1024 PTP unicast clients at 128pps)
- G.8273.2 boundary clock class D
- 1588v2 APTS clock
- 1588v2 PTP slave clock
- Fan-out of multiple physical synchronization output interfaces
- NTP server
- Synchronization protocol and physical signal conversion
- Sync probe – Syncjack™ monitoring and assurance

PTP 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 (APTS)
- 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)
- PTP power and utility profiles: IEC/IEEE 61850-9-3, IEEE C37.238-2011, IEEE C37.238-2017
- PTP broadcast and media profiles: SMPTE ST 2059-2 AES67
- 1-step and 2-step clock
- Up to 16 master/BC IP addresses
- Up to 16 VLANs (IEEE 802.1Q customer-tagged) and stacked VLANs
- Support for multiple profiles simultaneously
- Support for PTP IPv4/IPv6 on the same port
- 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
- Configurable static routes and default getaways
- 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
- Operates as single or double attached clock in PRP IEC 62439-3 network

NTP features

- Stratum 1 NTP server when locked to GNSS
- NTP v1, v2, v3, v4 and SNTP over IPv4/IPv6
- NTP unicast/multicast/broadcast
- Symmetric key and Autokey authentication
- TIME & DAYTIME protocols
- NTP peering
- NTP selectable timescale (UTC/GNSS/local)
- Hardware timestamping
- Accuracy within +/–100nsec from UTC
- Up to 16 NTP server IP addresses
- Support PTP and NTP on same Ethernet port
- Up to 500.000 transactions per second without authentication
- 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
- PTP backup in case of GNSS outage

Synchronization interfaces

- Synchronous Ethernet (SyncE) over Ethernet interfaces
- 1x BITS-in and 1x BITS-out (2.048MHz, E1 or T1 (DS1) including SSM)
- 3x User Configurable SMA ports (interface: CLK 10/2.048MHz, PPS)
- 2x time-of-day (ToD) + PPS in/out
- Antenna input for embedded GNSS receiver

Ethernet ports

- Hardware-based timestamping (PTP & NTP)
- 2x 100/1000BaseT copper ports
- Up to 4x 1GbE/100Mb FE (SFP)/10GbE (SFP+), user configurable per port
- All fiber ports support SM/MM colored/non-colored SFP and copper SFP
- Per-flow hardware-based policing and scheduling
- Configurable link asymmetry delay compensation

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Synchronous Ethernet (SyncE)

- Supported by all Ethernet interfaces in fiber and copper modes
- Compliant to ITU-T G.8261/G.8262/G.8262.1/G.8264
- Ethernet synchronization message channel (ESMC) and enhanced ESMC with enhanced SSM codes
- SyncE for time holdover during GNSS outage

BITS in/out

- 1x 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
- EEC/SEC/SSU filtering options

PPS in/out

- User configurable input and output delay
- compensation
- SMA-F connector (50ohm)
- Output squelch option
- PPS configurable with

Time-of-day (ToD) in/out

- 2xToD+PPS input/output (user configurable)
- ITU-T G8271 compliant
- ToD formats – NMEA 0183 ($GPZDA sentence), ITU-T G.8271 and CCSA
- RS422 over shielded RJ-45
- PPS configurable width
- Output squelch option

GNSS receiver

- Single-band receiver
- Multi-constellation GNSS L1 72 channels receiver
- GPS (L1C) , GLONASS (L1OF), GALILEO, BeiDou (B1I, QZSS (L1C/A) ,SBAS (L1C/A: WAAS, EGNOS, MSAS, GAGAN)
- Three concurrent GNSS constellations
- Jamming and spoofing detection
- Timing accuracy <15ns RMS to UTC

Common GNSS receiver features

- Skyview and GNSS satellites status
- Configurable SNR, elevation and PDOP masks
- User-configurable antenna cable delay compensation
- Advanced interference detection
- Support fixed positioning – single satellite mode
- Advanced spoofing and interference detection mitigation
- Voltage to antenna +5VDC
- Antenna connector SMA-F (50ohm)

CLK in/out

- SMA-F connector (50ohm)
- Output squelch option

Assured PNT(aPNT) solution

- Multiple backups to GNSS including PTP, SyncE, CLK BITS and local oscillator
- PRTC can automatically select between 3 available input references
- Frequency outputs are automatically selected between 3 available input frequency references
- Automatic switchover in case of jamming/ spoofing/interference detection
- PTP and GNSS assurance using ENC Sync director

Holdover performance

	Clock	Aging / day (after 30 days)	Temperature stability
Quartz	OCXO Stratum 3 / G.812 Type III	$\pm 5 \times 10^{-10}$	$\pm 50 \times 10^{-10}$

	200nsec	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
Quartz	1 hours	2 hours	4 hours	5 hours	8 hours	14 hours	1 month

*Note: The above are typical values (1 sigma confident) assuming controlled temperature environment, after the device has been powered for one month and locked to GPS for 72 hours.

Sync signal conversion

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

GM / PRTC frequency and time accuracy

- While locked to GNSS
- Phase and time
  - <15nsec RMS from UTC
  - PRTC-A: ±100nsec from UTC
- Frequency – exceed 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, PPS, GNSS and CLK
  - MTIE mask and time error threshold alarms based on SNMP traps
  - TE/TIE raw data collection and export to server
  - Daily MTIE and TE performance monitoring reports
- 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, PPS, GNSS and CLK
  - MTIE mask and Time Error threshold alarms based on SNMP traps
  - TE/TIE raw data collection and export to server
  - Daily MTIE and TE performance monitoring reports
  - Clock reference disqualification based on Syncjack™ probe results

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- 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, PPS, GNSS and CLK
  - All probes include enhanced sync assurance statistics, performance monitoring (15min & 24h), including data export, threshold crossing alarm (TCA) and SNMP traps
  - User-configurable MTIE masks

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
- Remote management
  - Local LAN port (100/1000BaseT over RJ45) using CLI, SNMP and Web GUI interfaces
  - Support for IPv4 and IPv6
  - Barrier free GUI
  - Maintains in-band VLAN and MAC-based management tunnels
  - Static routes & configuration of default getaways
  - Fully interoperable with Adtran FSP 150 and Adtran FSP 3000 products
  - Supported by Ensemble Controller, including Ensemble Sync Director and GNSS assurance management protocols
  - Telnet, SSH (v1 / v2)
  - HTTP / HTTPS (TLS 1.2)
  - 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
  - Automatic certificate enrollment with full integration into PKI
- IP networking
  - DHCP
  - ARP cache access control
  - RIPv2 and static routes
  - IPv6 NDP address resolution
  - RIPng for IPv6
  - ICMP

System logging

- Syslog, alarm log, audit log and security log
- Configurable system timing source – local / NTP / PTP / PRTC (GNSS)
- User configurable time zone & daylight saving time

Standards compliance

- ITU-T G.8261, G.8262, G.8262.1, G.8264, G.703, G.704, 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)
- RFC 1059 (NTPv1), RFC 1119 (NTPv2), RFC 1305 (NTPv3), RFC 5905 (NTPv4), RFC 4330 (SNTPv4)

Regulatory compliance

- IEC 62368-1
- UL 62368-1
- CSA 22.2 62368-1
- EN 55032 (emission)
- EN55035 (Immunity)
- FCC part 15, class B
- IEC 61000-3-2, IEC 61000-3-3
- EMC Directive (2004/108/EC)
- ETSI EN 300 386

Power supply

- AC-PSU: 100 to 240VAC (47 to 63Hz) with over-voltage and over-current protection
- DC-PSU: -48 to -60VDC (tolerate -36 to -72VDC) with over-voltage and over-current protection
- Power consumption (without SFPs)
  - Quartz DC: 25W(typical), 26W(max.)
  - Quartz AC: 30W(typical), 31W(max.)

Environmental

- Dimensions: 220mm x 44mm x 220mm(W x H x D), ETSI-complaint
- Weight
  - AC: 1.97Kg
  - DC: 1.98Kg
- Operating temperature (ambient):
  - Quartz: -40 to +65°C (hardened environment)
  - Optional versions for -5 to 55°C
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Humidity: 5 to 100% (with condensation)

Optional accessories

- Single and multi-band GNSS (GPS/ GLONASS/ BEIDOU/GALILEO/SBAS/QZSS)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

Anti-jamming/anti-spoofing signal band

- GNSS(GPS/GLONASS/BEIDOU/GALILEO/SBAS/QZSS) antenna
- 1:2 / 1:4/1.8 GNSS (GPS/ GLONASS/BEIDOU/GALILEO splitters
- GNSS window antenna
- Cables and adapters accessory kit

Updated July 8, 2024