OSCILLOQUARTZ
A division of Adtran

Oscilloquartz accessSync™

Data sheet

OSA 5401XG SyncPlug™

SFP-based PTP grandmaster, NTP server, boundary/slave clock, GNSS receiver

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

Benefits

- **Syncjack™ technology**
  Highly accurate timing delivery and assurance with the smallest footprint on the market
- **Sophisticated, feature -rich synchronization**
  Built-in, cost-efficient multi-band GNSS receiver enabling PRTC-B and IEEE 1588v2 grandmaster (GM), boundary clock (BC), slave clock (SC) and NTP server functionality
- **Compatible**
  Compliant with 1G/10G SFP+ multi-source agreement (MSA) – no need for additional space or power
- **Advanced jamming and spoofing detection**
  Provides advanced detection on both device and network management system (NMS) levels
- **Extended holdover performance**
  Multiple fallback options – high-stability OCXO, SyncE and PTP – can be used in the event of GNSS outage
- **Customizable**
  Offers OEM product customization for vendor branding

Overview

From 4G and 5G mobile networks to power utilities, financial infrastructure, modern broadcast services and defense systems, mission-critical applications demand ultra-compact, cost-effective synchronization solutions that can be deployed deep in the network with minimal footprint and power consumption. Our OSA 5401XG SyncPlug™ meets this need by enabling precise synchronization in the most space-restrictive environments. Now there's a simple way to upgrade legacy systems with IEEE 1588v2 Precision Time Protocol (PTP).

The OSA 5401XG SyncPlug™ is a small-form-factor pluggable (SFP) device – a powerful and versatile time server with a built-in multi-GNSS receiver and the most compact design on the market. It enables accurate phase and frequency synchronization using PTP, SyncE and NTP at the network edge, with zero added footprint. Its small form factor and rich feature set support a versatile range of deployment options for enhanced synchronization network performance.

Oscilloquartz multisource aPNT+™ platform

OSA 5401XG SyncPlug™

High-level technical specifications

OSA 5401XG SyncPlug™

- Small form-factor pluggable SFP with GNSS receiver
- Integrated GM, BC, SC
- Integrated NTP server
- Robust design
- Add-on plugs into hosting device

SFP form factor

- Typical power consumption less than 1.5W
- Extended operating temperature range
- SFP+ MSA compliant
- Zero footprint
- 1G/10G support (10G is separately licensed)

PTP functionalities

- Configurable as GM, BC, slave clock and APTS
- GM supported profiles
  - IEEE 1588 2008 L3/L2,
  - ITU-T 8265.1 / 8275.1 / 8275.2
  - Power, broadcast
  - APTS
- PTP over L2 and over IPv4/IPv6 supported simultaneously

Timing accuracy

- +/-40nsec from UTC
- G.8272 / G.8273.1 compliant PRTC
- G.811 compliant PRC
- G.8262 / G.8264 SyncE

Management

- In-band management over IPv4 and IPv6
- Remote and secured CLI (Telnet and SSH)
- Separate management and PTP IP addresses
- Mosaic management and control

Built-in GNSS receiver

- Single and multi-band L1 and L5 receiver support (multi-band is separately licensed)
- Enhanced timing features
- Advanced jamming and spoofing detection
- GPS, GLONASS, BeiDou, Galileo, NavIC/IRNSS

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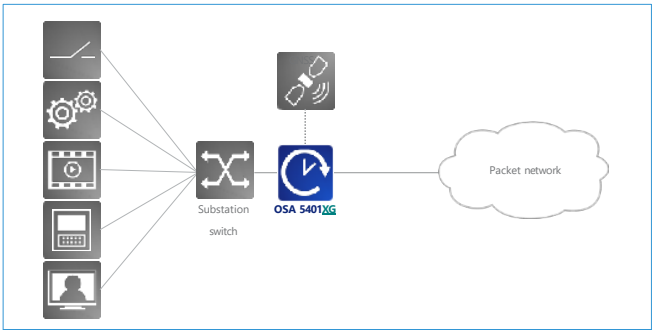
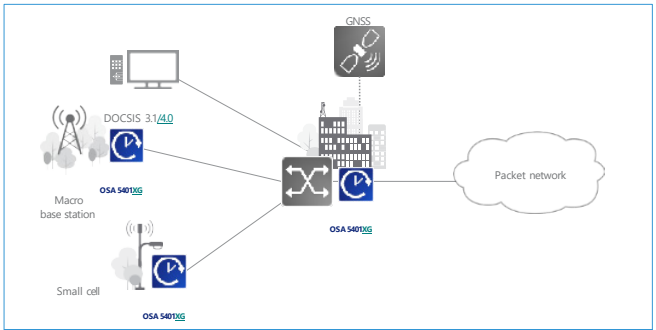
Applications in your network

Ultra-compact and cost-effective synchronization

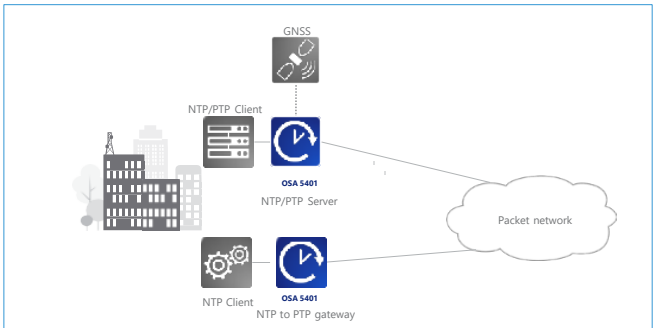
- Radio access network synchronization including 3G, 4G, 5G (femtocells, and small cells and macro cells)
- GNSS receiver upgrade for small cells
- Cable networks (DOCSIS 3.1/4.0) and xPON synchronization
- Modernized power utility and media broadcast networks
- Time-sensitive network and audio video bridging
- Time-as-a-service into data center, financial, health and media networks
- Defense systems that require precise time and frequency delivery.
- Upgrade of aggregation switches for delivering precise frequency and phase sync via PTP and SyncE
- PTP boundary and slave clock enabler to existing network elements such as switches and microwaves links



Synchronization in power utilities (IEC 61850)



Synchronization of radio access networks and DOCSIS 3.1/4.0



Synchronization in finance and enterprises

OSA 5401XG SyncPlug™

Product specifications

Main applications

- 1588v2 PTP grandmaster, boundary and slave clocks
- PTP to Sync-E and Sync-E to PTP conversion
- GNSS receiver operating as PRTC and PRC
- NTP server

PTP master modes of operation

- PTP Telecom profiles:
  - ITU-T G.8265.1 & Telecom2008 frequency delivery profiles
  - ITU-T G.8275.2 time/phase delivery profile
  - ITU-T G.8275.1 time/phase delivery profile (full timing support) also used for DOCSIS 3.1
- PTP enterprise profile (mixed IP multicast and unicast)
- PTP power and utility profiles
  - IEC/IEEE 61850-9-3
  - IEEE C37.238-2011
  - IEEE C37.238-2017
- PTP broadcast profiles:
  - SMPTE ST 2059-2
  - AES67 Media Profile
- PTP AVB/TSN profile:
  - IEEE 802.1AS
- IEEE1588v2 default PTP profiles over L3 (Annex D
- and E) and L2 (Annex F)
- Grandmaster simultaneous support for multiple
- profiles

PTP slave modes of operation

- PTP power and utilities profiles:
  - IEC/IEEE 61850-9-3
  - IEEE C37.238-2011
  - IEEE C37.238-2017
- PTP telecom profiles
  - ITU-T G.8265.1 & Telecom2008 frequency delivery profiles
  - ITU-T G.8275.2 time/phase delivery profile (APTS & partial timing support with BMCA and automatic asymmetry compensation to two remote masters)
  - ITU-T G.8275.1 time/phase delivery profile (full timing support)
- IEEE1588v2 default PTP profiles over L3 (Annex D) and L2 (Annex F)
- PTP enterprise profile (mixed IP multicast and unicast)

PTP features

- Up to 64 unicast slaves at 128pps
- Full-featured IEEE 1588-2008 PTP grandmaster, boundary and slave clocks
- Assisted partial timing support (APTS) – PTP input to backup GNSS outage over network with partial/ no timing support
- 1-step and 2-step clock
- Dedicated or common IP PTP interface
- VLAN (IEEE 802.1Q) or untagged
- Sync-E input to PTP output (frequency) conversion
- Conversion between PTP profiles
- Maintain PTP slaves list
- Fixed asymmetry compensation
- Hardware-based DoS protection

Ethernet interface

- 1GbE/10GbE SFP+ (MSA compliant)

Programmable I/O

- RP-MMCX (50 Ohms):
  - 1PPS/ CLK (10MHz/2.048MHz) I/O
  - IRIG-B DCLS output only

Synchronous Ethernet (Sync-E)

- Compliant to the relevant sections of ITU-T G.8261 /G.8262 / G.8264
- Supported on ingress and egress
- G.811 compliant Sync-E primary reference clock (PRC) when locked to GNSS
- Ethernet synchronization message channel (ESMC
- SyncE input for time holdover during GNSS outage

NTP server

- Smallest NTP server formfactor
- Security-hardened NTP server with Hardware-based responder
- Stratum 1 NTP server when locked to GNSS
- NTP v1, v2, v3, v4 and SNTP over IPv4 /IPv6
- Time & daytime protocols
- Hardware-based timestamping
- Within +/–100nsec from UTC
- Hardware-based DoS protection using NTP responder
- Up to 500,000 transactions per second
- Support PTP and NTP on same port
- PTP to NTP translation
- PTP backup in case of GNSS outage
- Stationary or moving platforms

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GNSS receiver

- Provide high accuracy for PRTC-B applications
- Accuracy within +/-40nsec from UTC
- Multi-band (L1+L5) , multi-constellation GNSS receiver
- Supports satellite timing modes
  - Survey fixed location
  - Configurable fixed location
  - Navigation mode
- Configurable satellites SNR and elevation masks
- Advanced spoofing and jamming detection on device level
- AI-based spoofing and jamming detection based on Mosaic Controller featuring NMS GNSS assurance
- GPS/QZSS L1 C/A and GLONASS L10F, BeiDou B1 , Galileo E1, SBAS (QZSS ,WAAS, EGNOS, MSAS), IRNSS/NAVIC
- Up to four concurrent GNSS constellations
- User-configurable antenna cable delay compensation
- Voltage to antenna:+3.3 VDC
- Antenna connector SMA-F (50 ohms)

Internal oscillator

- Frequency stability over temperature: +/-10ppb
- Frequency slope ΔF/ΔT: +/-0.5 ppb/°C
- Long-term stability (aging)
  - +/-1ppb/day
  - +/-2.5ppm/20 years

Frequency accuracy

- G.811 compliant PRC while locked to GNSS

Time and phase accuracy

- G.8272 / G.8273.1 compliant PRTC (±100nsec from UTC, MTIE<100nsec) while locked to GNSS
- During GNSS outage: time holdover using a G.811 PRC / G.8272 PRTC Sync-E input
- Traceable to G.811 PRC: TimeError < UTC +/-1µsec for 24hrs
- Traceable to G.8272 PRTC: TimeError < UTC +/- 1µsec for 72hrs

Indications

- GNSS operation and general fault indication status LED

Syncjack™ monitoring and assurance tools

- Clock accuracy for up to two clock probes – computing TE and TIE of physical clocks
- Calculation TE/TIE between physical source and reference signals
- Programmable source and reference signals including SyncE, GNSS, PTP recovered clock.
- TE/TIE raw data collection and export to server
- Clock analysis for up to two PTP clock probes – packet TE/TIE
- Calculation of packet TE/TIE between physical reference signal and timestamps within the PTP packets
- Programmable reference signals including SyncE and GNSS
- TE/TIE raw data collection and export to server
- Integrated with Mosaic Controller Sync Director

Management and security

- In-band management (over PTP / Sync-E port)
- Remote CLI – Telnet & SSH (Secure Shell)
- Separate MGMT IP & PTP address
- VLAN and untagged
- System software download via TFTP & SCP (secure copy)
- Enable to disable each of the protocol via CLI
- Alarm log
- Syslog
- Remote authentication via RADIUS
- Remote, secured backup and restore
- Remote, secured SW upgrade
- Low touch provisioning using configuration file
- Multi-level user access
- Access control list (ACL)
- Full management using SNMP v2 / v3 including authentication and encryption
- LLDP
- Alarms, inventory and traps reporting to NMS
- Managed by Adtran Mosaic Controller and Mosaic Sync Director, including GNSS assurance toolkit

OSA 5401XG SyncPlug™

Regulatory and standards compliance

- ITU-T G.8261, G.8262, G.8264
- ITU-T G.8272, G.811
- ITU-T G.8265.1, G.8275.1. G.8275.2
- IEEE 1588v2 (PTP)
- RFC 1059 (NTPv1), RFC 1119 (NTPv2), RFC 1305 (NTPv3), RFC 5905 (NTPv4), RFC 4330 (SNTPv4)
- RFC868 (Time), RFC867(Daytime)
- ETSI EN 300 386 V1.6.1
- EN 55024
- EN 55022 Class-B
- AS/NZS CISPR 22
- FCC CFR 47 Part 15 Subpart B
- ANSI C63.4 Class-B
- IEC/EN 61000-3-2
- IEC/EN 61000-3-3
- IEC/EN 61000-4-2 (ESD): ±15 kV / ±8 kV (air/contact)
- IEC/EN 61000-4-3 (RI)
- IEC/EN 61000-4-4 (EFT): 1 kV / 50 A (5/50 ns)
- IEC/EN 61000-4-5 (Surge): 4KV (10/700 µs)
- IEC/EN 61000-4-6 (CI)
- EN 60950-1:+A11, +A12, +2 (SAFETY)
- RoHS compliance

Environmental

- Operating temperature: -40 to +80°C / -104 to 176°F
- Storage temperature: -40°C to +85°C / -104 to 185°F
- Humidity: 5 to 95% (non-condensing)

Power consumption

- Max power consumption <2.5W (T >20°C)

Optional accessories

- GNSS (GPS/GLONASS/BeiDou/IRNSS) 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 splitters
- RP-MMCX to BNC adapter cable

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