

OSA 5401 SyncPlug™

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



Benefits

- z **Syncjack™ technology**
Highly accurate timing delivery and assurance with smallest footprint on the market
- z **Fully-featured freq. and phase enabler**
Built-in GNSS receiver enabling PRTC and IEEE 1588v2 grandmaster (GM), boundary (BC), slave clock (SC) and NTP server functionality
- z **Compatible**
Compliant with SFP multi-source agreement (MSA) – no need for additional space and power
- z **Advanced jamming and spoofing detection**
Advanced jamming and spoofing detection on device and NMS levels
- z **Extended holdover performance**
Multiple fallback options - high-stability OCXO, SyncE and PTP can be used in the event of GNSS outage
- z **Customizable**
OEM product customization option for vendor branding

Overview

From 4G and 5G mobile networks, through power utilities to modern broadcast services, mission-critical applications demand ultra-compact and cost-effective synchronization solutions for deployment deep in the network with minimal footprint and power consumption. Our OSA 5401 SyncPlug™ enables 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 5401 SyncPlug™ small-form factor pluggable (SFP) is a powerful and versatile time server with a built-in GNSS receiver and the smallest footprint and most compact design on the market. It enables accurate phase and frequency synchronization using PTP, Sync-E and NTP at the network edge with zero-adding footprint. Its small form factor and rich feature set enable a versatile range of deployment options for enhanced synchronization network performance.



Oscilloquartz multisource aPNT+™ platform

OSA 5401 SyncPlug™

High-level technical specifications

OSA 5401 SyncPlug™

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

SFP form factor

- z Powerconsumption < 1.5W
- z Extended operating temperature range
- z MSA compliant
- z Zero footprint

PTP functionalities

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

Timing accuracy

- z +/-100nsecfrom UTC
- z G.8272 / G.8273.1 compliant PRTC
- z G.811 compliant PRC
- z G.8262 / G.8264 Sync-E

Management

- z In-band management over IPv4 and IPv6
- z Remote and secured CLI-Telnet and SSH
- z Separate management and PTP IP address
- z Ensemble mgmt. and control

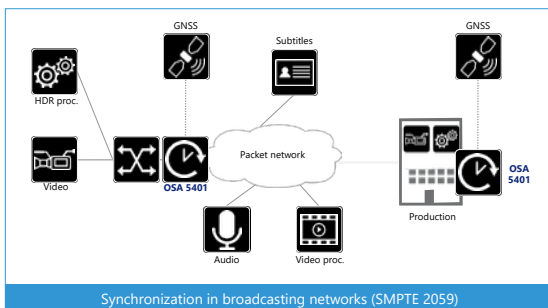
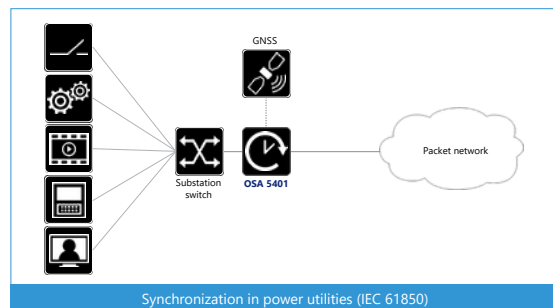
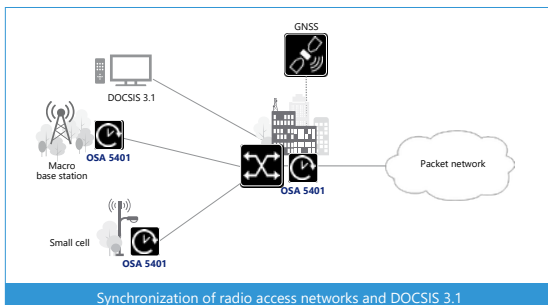
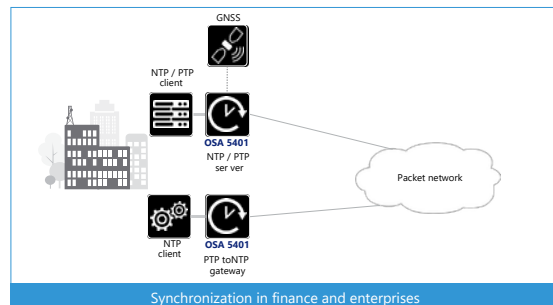
Built-in GNSS receiver

- z 72-channel multi-GNSS
- z Enhanced timing features
- z Advanced jamming and spoofing detection
- z Dual-frequency GNSS
- z GPS, GLONASS, BeiDou

Applications in your network

ultra-compact and cost-effective synchronization

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



OSA 5401 SyNCPlug™

Product specifications

Main applications

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

PTP master modes of operation

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

PTP slave modes of operation

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

PTP features

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

Ethernet interface

- z SFP or combo SFP/SFP+ 1000Base-X (MSA compliant)

1PPS/CIK out

- z User configurable output: 1PPS/10MHz/2.048MHz
- z RP-MMCX connector (50ohms)

Synchronous Ethernet (Sync-E)

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

NTP Server

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

GNSS receiver

- z Provide high accuracy for PRTC-A applications
- z Accuracy within ± 100 nsec from UTC
- z Independent 72-channel multi-constellation
- z Supports single satellite timing modes
- z Survey fixed location
- z Configurable fixed location
- z Navigation mode
- z Configurable satellites SNR and elevation masks
- z Advanced spoofing and jamming detection on device level
- z AI based spoofing and jamming detection based on Ensemble Controller featuring NMS GNSS assurance
- z GPS/QZSS L1 C/A and GLONASS L1OF, BeiDou B1, Galileo E1, SBAS (QZSS, WAAS, EGNOS, MSAS)
- z Up to three concurrent GNSS constellations
- z User-configurable antenna cable delay compensation
- z Voltage to antenna: ± 3.3 VDC
- z Antenna connector SMA-F (50 ohms)

Internal oscillator

- z Frequency stability over temperature: ± 10 ppb
- z Frequency slope $\Delta F/\Delta T$: ± 0.5 ppb/°C
- z Long term stability (aging):
 - z ± 1 ppb/day
 - z ± 2.5 ppm/20 years

Frequency accuracy

- z G.811 compliant PRC while locked to GNSS

Time and phase accuracy

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

Indications

- z GNSS operation and general fault indication status LED

SyncJack™ monitoring and assurance tools

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

Management and security

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

OSA 5401 SyNCPlug™

Regulatory and standards compliance

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

Environmental

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

Power consumption

- z Max power consumption <1.5W (T >20°C)

Optional accessories

- z GNSS (GPS/GLONASS/BeiDou) 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
- z Patch window antenna
- z 1:2/1:4/1:8 GNSS splitters
- z RP-MMCX to BNC adapter cable



Contact US

WAVETEL

PARIS | RENNES | LARMOR-PLAGE | LANNION

sales@wavetel.fr • www.wavetel.fr • +33(0)2 99 14 69 65



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