

## OSA 5401

### SFP-based PTP grandmaster, boundary and slave clock

Supporting higher data rates and increasing coverage challenges mobile network operators to pursue new avenues in radio access network synchronization. Air interface evolution and public small cells demand ultra-compact and cost-effective synchronization solutions for deployment deep in the radio access network.

Are you facing the challenge of synchronizing small cell base stations deployed in your radio access network? Do you have difficulties with synchronizing legacy 2G and 3G equipment when migrating your backhaul network from SONET/SDH to packet-based infrastructure? Our OSA 5401 SyncPlug™ small-form factor pluggable (SFP) can help to enable 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) and Synchronous Ethernet functionality. With our OSA 5401 SyncPlug™ SFP, supporting modern LTE-TDD, LTE-Advanced as well as 5G-NR radio access network technology is no longer challenge.



### Your benefits

- ✔ **Syncjack™ technology**  
Highly accurate timing delivery and assurance with smallest footprint on the market
- ✔ **Fully-featured freq. and phase enabler**  
Built-in GNSS receiver enabling PRTC and IEEE 1588v2 grandmaster (GM), boundary (BC) and slave clock (SC) functionality
- ✔ **Compatible**  
Compliant with SFP multi-source agreement (MSA) – no need for additional space and power
- ✔ **Increased system design flexibility**  
Enables decoupling of network element development from GNSS receiver implementation
- ✔ **Extended holdover performance**  
Multiple fallback options to high-end Stratum 3E oscillator, SyncE and PTP in the event of GNSS outage
- ✔ **Customizable**  
OEM product customization option for vendor branding

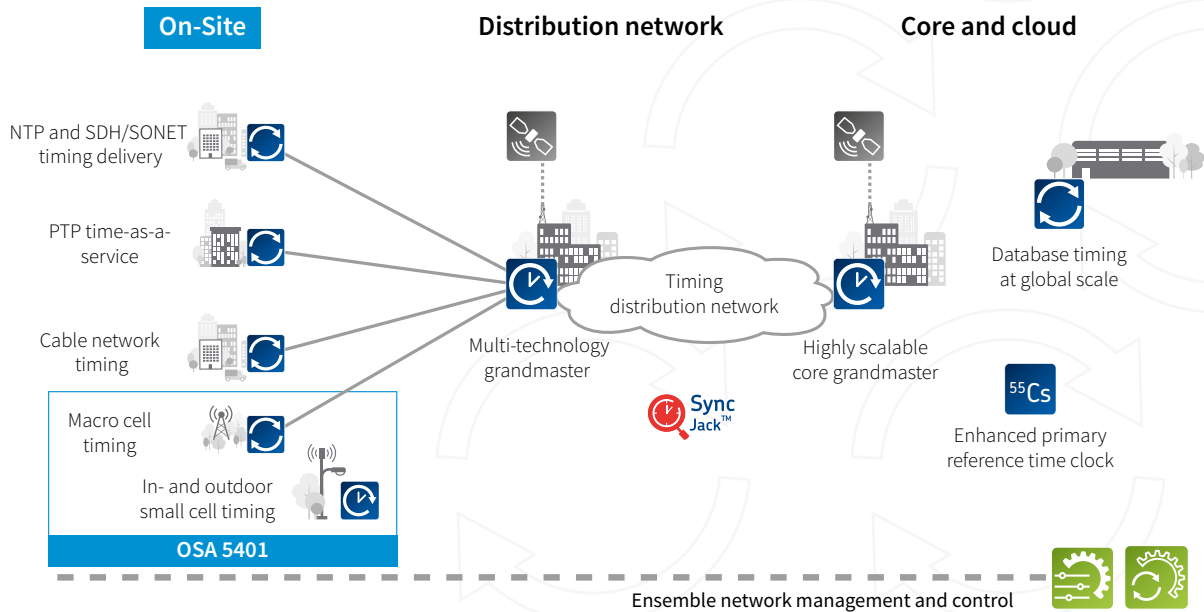
# High-level specifications

<h3>OSA 5401 SyncPlug™</h3> <ul style="list-style-type: none"> <li>• Small form-factor pluggable SFP</li> <li>• Integrated GM, BC, SC and GNSS receiver</li> <li>• Robust design</li> <li>• Add-on plugs into hosting device</li> </ul>	<h3>SFP form factor</h3> <ul style="list-style-type: none"> <li>• Power consumption &lt;1.5W</li> <li>• Extended operating temperature range</li> <li>• MSA compliant</li> <li>• Zero footprint</li> </ul>	<h3>PTP functionalities</h3> <ul style="list-style-type: none"> <li>• Configurable as GM, BC, slave clock and APTS</li> <li>• GM supported profiles:             <ul style="list-style-type: none"> <li>– IEEE 1588 2008 L3/L2,</li> <li>– ITU-T 8265.1 / 8275.1 / 8275.2</li> </ul> </li> <li>• PTP over L2 and over IPv4/IPv6 supported simultaneously</li> </ul>
<h3>Timing accuracy</h3> <ul style="list-style-type: none"> <li>• +/-100nsec from UTC</li> <li>• G.8272/G.8273.1 compliant PRTC</li> <li>• G.811 compliant PRC</li> <li>• G.8262/G.8264 Sync-E</li> </ul>	<h3>Management</h3> <ul style="list-style-type: none"> <li>• In-band management over IPv4 and IPv6</li> <li>• Remote and secured CLI-Telnet and SSH</li> <li>• Separate management and PTP IP address</li> <li>• Ensemble management and control</li> </ul>	<h3>Built-in GNSS receiver</h3> <ul style="list-style-type: none"> <li>• 72-channel multi-GNSS</li> <li>• Enhanced timing features</li> <li>• Dual-frequency GNSS</li> <li>• GPS, GLONASS, BeiDou</li> </ul>

# Applications in your network

## Ultra-compact and cost-effective synchronization

- Radio access network synchronization including 3G, 4G, 5G femtocells and small cells as well as macro cells
- Cable networks (DOCSIS 3.1) and PON synchronization
- GNSS receiver upgrade for small cells
- Time-as-a-service into data center, financial, health and media networks
- 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



For more information please visit us at [www.advaoptical.com](http://www.advaoptical.com)  
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Product specifications are subject to change without notice or obligation.

## 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

## PTP master modes of operation

- 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)
- IEEE1588v2 default PTP profiles over L3 (Annex D and E) and L2 (Annex F)
- PTP enterprise profile (mixed IP multicast and unicast)
- Designed to support power and broadcast profiles (HW ready)
- Grandmaster simultaneous support for multiple profiles

## PTP Slave modes of operation

- 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)
- IEEE1588v2 default PTP profiles over L3 (Annex D) and L2 (Annex F)
- PTP enterprise profile (Mixed IP multicast and unicast)
- Designed to support power and broadcast profiles (HW ready)

## 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 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

## Ethernet interface

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

## 1PPS/CLK out

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

## 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)
- Sync-E input for time holdover during GNSS outage

## GNSS receiver

- 72-channel multi-GNSS engine
- Concurrent GNSS (dual frequency)
- Supports single satellite timing modes
  - Survey fixed location
  - Configurable fixed location
- Supports navigation mode
- Configurable satellites SNR and elevation masks
- GPS/QZSS L1 C/A and GLONASS L10F, BeiDou B1
- Supported modes: GPS/GLONASS/BeiDou/GPS+GLONASS/GPS+ BeiDou
- HW ready to support
  - SBAS L1 C/A: WAAS, EGNOS, MSAS
- User configurable antenna cable delay compensation
- Voltage to antenna +3.3VDC
- Antenna connector SMA-F (50 ohms)

## Internal oscillator

- OCXO Stratum 3E (20-55°C,  $\Delta T = \pm 20^\circ\text{C}$ )

## Frequency accuracy

- G.811 compliant PRC while locked to GNSS

## Time and phase accuracy

- G.8272/G.8273.1 compliant PRTC ( $\pm 100\text{nsec}$  from UTC,  $\text{MTIE} < 100\text{nsec}$ ) 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  $< \text{UTC} \pm 1\mu\text{sec}$  for 24 hrs
  - Traceable to G.8272 PRTC: TimeError  $< \text{UTC} \pm 1\mu\text{sec}$  for 72 hrs

## 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

## 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
- Multi-level user access
- Access control list (ACL)
- SNMP v2 / v3 including authentication and encryption
- Alarms, inventory and traps reporting to NMS
- Managed by ADVA Ensemble Controller / Ensemble Sync Director

## 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)
- 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):  $\pm 15$  kV /  $\pm 8$  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  $\mu$ s)
- 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 <1.5W (T >20°C)

## Optional accessories

- 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
- Patch window antenna
- 1:2/1:4/1:8 GNSS splitters
- RP-MMCX to BNC adapter cable