OSCILLOQUARTZ
A division of Adtran

Data sheet

ruggedSync™ Series OSA 5510

Assured timing for mission-critical harsh environments

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

Benefits

- **Ruggedized construction**
  Compliant with MIL-STD-810H thermal, shock, vibration and environment conditions
- **EMI/EMC certification**
  Compliant with MIL-STD-461G standards
- **Rugged chassis design**
  VITA 75.22 (RSFF) and IP65-rated aluminum enclosure with IP6K9K circular push-pull locking connectors
- **Advanced holdover**
  Powered by high-performance oscillators for sustained precision timing during GNSS outages
- **Multi-input sync options:**
  Seamlessly switches between GNSS, SyncE, 1PPS, ToD, or time-code inputs for maximum resiliency
- **Dual GNSS design**
  Supports multi receiver options, including GNSS, M-Code, Galileo PRS and Iridium STL HW variants
- **Multi-constellation GNSS**
  Supports GPS, Galileo, BeiDou, and NavIC with built-in anti-jamming and anti-spoofing protection, including Galileo OSNMA support
- **High-performance PTP grandmaster clock:**
  Delivers nano-second-level accuracy using IEEE 1588v2 Precision Time Protocol
- **Syncjack™ technology**
  Provides built-in synchronization accuracy monitoring and assurance functionality
- **Protocol security**
  Includes hardened NTP server and Network Time Security (NTS)

Overview

Mission-critical timing you can trust

As defense and tactical communications evolve, precision synchronization is no longer just a technical requirement. It's a strategic asset. Whether coordinating unmanned systems, synchronizing radar and sensor data, or enabling resilient battlefield networks, timing accuracy, reliability, and security are now vital to modern military operations.

Oscilloquartz's OSA 5510 is a fully ruggedized grandmaster clock engineered for military, aerospace, and high-assurance mission environments. Designed to perform in the harshest conditions, it delivers dependable operation under extreme temperatures, shock, vibration, dust and humidity. Its robust EMC protection ensures reliable performance in electromagnetically challenging environments such as naval vessels, aircraft, and armored vehicles.

Compact, and field-deployable, the OSA 5510 is ideal for tactical missions, seamlessly integrating into command vehicles and pop-up data centers. It can also be optionally equipped with dual GNSS receivers, supporting advanced capabilities such as multi-GNSS, M-Code, Galileo PRS, or low-Earth orbit (LEO) Iridium STL for enhanced robustness, anti-jamming, and assured positioning and timing, even in GNSS-contested environments.

By supporting a zero-trust architecture, the OSA 5510 aligns with next-generation defense IT standards through end-to-end encryption, role-based access control, and comprehensive audit logging. With unmatched synchronization precision and operational resilience, it provides defense forces with a secure and trusted timing backbone, ready for even the most unpredictable, GNSS-denied, or infrastructure-limited mission scenarios.

ruggedSync™ Series OSA 5510

High-level technical specifications

OSA 5510 front panel connectors

- 2x 100/1000 BASE-T Ethernet ports
- Optional SFP/SFP+ 1G/10G fiber optic ethernet port
- 4x low phase noise CLK outputs
- Multi I/O and USB management port
- Optional M-Code key loader and ZEROIZE
- 2x GNSS antenna input
- Normal and standby DC power inputs

Oscillators

- OCXO HQ+
- Rubidium

Note: other oscillator options available per demand

Operation modes

- GNSS master clock
- PTP GM, BC, SC, probe
- NTP server

Built-in multiband GNSS receiver

- Embedded L1/L2 or L1/L5 multi- constellation receiver (GPS/ GALILEO/ BEIDOU / NavIC)
- Jamming and spoofing detection
- Galileo OSNMA support

Multiple receiver option

- Up to 3 receivers in parallel
- MB-GNSS
- Optional M-Code, PRS, STL

I/O timing signals:

- HaveQuick/STANAG
- PPS/CLK
- ToD (NMEA 0183)
- IRIG-B DCLS/ RS485 (AM options available per demand)
- 10MHz low phase noise CLK output

PTP profiles

- L2 (Ethernet) and L3 (IP) default profiles
- Telecom profiles
- Power profiles
- Enterprise profiles

Synchronous Ethernet (SyncE)

- Supported on ingress and egress
- G.811 compliant SyncE primary reference clock (PRC) when locked to GNSS
- Ethernet synchronization message channel (ESMC)
- SyncE input for time holdover during GNSS outage

NTP server

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

Syncjack™ probing and measurements

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

Designed for mission-critical defense applications

In-service synchronization assurance across a wide range of operational scenarios

- Battlefield communications and tactical networks
- Radar, sonar and signal intelligence systems
- Timing backbone for UAV and autonomous platforms
- Joint operations requiring synchronized command infrastructure
- Airbone platforms and maritime defense systems
- In-service sync probing

ruggedSync™ Series OSA 5510

Product specifications

Main applications

- GNSS primary reference clock (PRC)
- 1588-2019 PTP grandmaster clock (up to 1024 PTP unicast clients at 128pps)
- 1588v2 PTP slave and boundary clock
- Fan-out of multiple physical synchronization output interfaces: IRIG, STANAG/HaveQuick, PPS, CLK & ToD TTL or RS 485
- NTP server
- Synchronization protocol and physical signal conversion
- Sync probe – Syncjack™ monitoring and assurance
- Fast wakeup (<5 seconds) from standby power mode once main power is restored

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)
- IEEE 1588 2008 PTP default profile over IPv4/IPv6 multicast
- IEEE 1588 2008 PTP default profile over Ethernet multicast (annex F)
- 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 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
- Operates as a 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
- NTS – Network Time Security RFC 8915
- 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 8,000 transactions per second with authentication
- PTP backup in case of GNSS outage

Synchronization interfaces

- Synchronous Ethernet (SyncE) over Ethernet interfaces
- 4x low phase noise CLK output SMA ports
- Multi I/O port supporting up to 17 different I/O signals (IRIG, PPS, CLK, ToD, STANAG/HQ & USB)
- 2x antenna inputs for embedded GNSS receivers

Ethernet ports

- Hardware-based timestamping (PTP & NTP)
- 2x 100/1000BASE-T copper ports
- 1G/10G SFP/SFP+ port
- Per-flow hardware-based policing and scheduling
- Configurable link asymmetry delay compensation

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

10 MHz low phase noise CLK:

- 4x SMA-F connector (50ohm)

Phase noise	10MHz
@1 Hz	≤ -95 dBc/Hz
@10 Hz	≤ -125 dBc/Hz
@100 Hz	≤ -145 dBc/Hz
@1 kHz	≤ -150 dBc/Hz
@10 kHz	≤ -155 dBc/Hz
@100 kHz	≤ -155 dBc/Hz
@1 MHz	≤ -155 dBc/Hz

ruggedSync™ Series OSA 5510

Multipurpose I/O port
- Up to 17 I/O 5V/10V single-ended, RS485 and RS232

PPS in/out
- User configurable input and output delay compensation
- Output squelch option
- PPS width adjustable

IRIG
- Code format selectable: DCLS/RS485 (IRIG-B002/004/006/007)

STANAG/ HaveQuick
- STANAG 4246 HQ I/HQ II, 4430 XHQ/XHQ ED1, 4372 HQ IIA (Saturn) and ICD-GPS-060

ASCII time-of-day (ToD) in/out
- NMEA 0183
- ToD – NMEA 0183 ($GPZDA sentence)
- Location – NMEA 0183 ($GPGGA) sentence

CLK
- 5/10 MHz sine wave
- Output squelch option

GNSS receiver
- Multi-band L1/L2 or L1/L5 receiver (L1/L2/L5 options available per demand).
- Multi-constellation,144 channels GNSS receiver
- GPS (L1C/A, L2C, L5), GALILEO (E1B/C, E5b, E5a), QZSS (L1C/A, L2C, L5), BeiDou (B1I, B1C, B2I, B2A), GLONASS (L1OF, L2OF), SBAS (L1C/A: WAAS, EGNOS, MSAS, GAGAN), NavIC (SPS-L5)
- Four 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
- Automatic antenna cable delay compensation (User-configurable).
- Advanced spoofing and interference detection and mitigation
- Support fixed positioning – single satellite mode
- Voltage to antenna +5VDC or +3.3VDC (User-configurable)
- Antenna connector SMA-F (50ohm)

Assured PNT(aPNT) solution
- Multiple backups to GNSS including alternate receivers, PTP, SyncE, CLK and local oscillator
- 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 MNC Sync Director

Holdover performance

	Clock	Aging / day (after 30 days)	Temperature stability
Quartz HQ+	High-quality OCXO G.812 Type I	$\pm 2x10^{-10}$ / $\pm 1x10^{-10}$ *	$\pm 2x10^{-10}$
Rubidium	Rubidium Stratum 2/G.812 Type II	$\pm 5x10^{-12}$ *	$\pm 5x10^{-10}$

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

	200nsec	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
Quartz HQ+	4 hours	8 hours	14.5 hours	16.5 hours	1.5 days	2 days	0.5 years
Rubidium	1 day	1.8 days	3.5 days	4 days	8 days	12 days	> 5 years

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

ruggedSync™ Series OSA 5510

Frequency and time accuracy

- While locked to GNSS
- Phase and time
  - <15nsec RMS from UTC
  - PRTC-B: ±40nsec 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, 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, 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
- 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, 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
  - USB port for CLI
- Remote management
  - In-band management on Ethernet ports using SSH/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 gateways
  - Supported by Ensemble Controller, including Mosiac Sync Director and GNSS assurance management protocols
  - Telnet, SSH (v1 / v2)
  - HTTP / HTTPS (TLS 1.3)
  - 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

ruggedSync™ Series OSA 5510

System logging

- Syslog, alarm log, audit log and security log
- Configurable system timing source – local / NTP / PTP / PRTC (GNSS) / TOD
- 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

- MIL-STD-810H
  - 501.7, 502.7, 503.7, 507.6, 506.6, 509.7
  - Vibration: MIL-STD-810H Method 514.8 (2.24g rms, 10 to 500 Hz)
  - Shock: MIL-STD-810H Method 516.8 (20g@11ms)
- MIL-STD-461G(EMI/EMC)
  - CE102 (Conducted Emissions, Power Leads, 10KHz to 10MHz)
  - CS101 (Conducted Susceptibility, Power Leads, 30Hz to 150KHz)
  - CS114 (Conducted Susceptibility, Bulk Cable Injection, 10KHz to 200MHz)
  - CS115 (Conducted Susceptibility, bulk Cable injection, Impulse excitation)
  - CS116 (Conducted Susceptibility, Damped Sinusoidal Transients, Cables and Power Leads, 10 KHz to 100 MHz)
  - RE102 (Radiated Emissions, Electric Field, 2 MHz to 18 GHz)
  - RS103 (Radiated Susceptibility, Electric Field, 2 MHz to 18 GHz)
  - CS118 (Personnel borne electrostatic discharge; contact discharge ±8kV, air discharge ±15kV)
- CE/UL
- Design to meet MIL-STD 1275E & MIL-STD 704F

Physical properties

- VITA 75.0, 6VU, rugged small form factor.
- Dimensions (W x H x D): 147.3mm x 63mm x 127.5mm,
- Weight: 1.2Kg

Environmental

- VITA 75.22, cooled via cold plate conduction.
- Operating temperature mounting plate temperature:
  - Quartz HQ+: -40 to +71°C
  - Rubidium: -30 to +65°C
- Storage temperature
  - -45 to +85°C
- Humidity: 5 to 100% (with condensation)

Power supply

- Support main and standby 10-36VDC (28V typical), input voltages
- Typical power consumption:
  - Main: 30W
  - Standby: 1W

Optional accessories

- GNSS ruggedized multiband L1+L2+L5+L6 antenna (GPS+GLONASS+GALILEO+BeiDou+QZSS), 40dB, high out of band rejection, with TNC-f connector (without cable) delivered with L-Bracket mounting
- Evaluation kit cables (Power, Multi I/O, Ethernet)
- External 28VDC power supply

Updated June 15, 2026