SyncServer® S600

High-Performance, Enhanced Security Network Time Server

Features

- Ultra-high bandwidth NTP time server
- Stratum 1 operation
- Four standard GbE ports, all with patented NTP hardware time stamping
- Two additional 10 GbE ports optional
- Built-in DoS detection and protection
- Security-hardened NTP Reflector with firewall protection
- Web-based management with high-security cipher suite
- NTP monitoring, charting and MRU logging
- Exceptional time accuracy to UTC
- TACACS+, RADIUS, LDAP, x.509, Secure Syslog and more
- Rubidium atomic clock or OCXO oscillator upgrades
- Dual power supply option
- Galileo/GLONASS/BeiDou/SBAS/QZSS option
- PTP multi-port/profile output option
- PTP input option
- DISA/DoDIN Approved Product

Applications

- Synchronizes hundreds of thousands of NTP clients
- Security-hardened for peace-of-mind time service operations
- Multiple GbE NTP ports for easy network configuration and adaptation
- Best-in-class time accuracy for improved log file time stamp precision and usability
- Very reliable and easy-to-use network time appliance for modern networks and business operations

Best in Class

Modern networks require accurate, secure, and reliable time services, as provided by the Microchip SyncServer® S600. The security hardened S600 network time server is purpose-built to deliver exact hardware-based Network Time Protocol (NTP) time stamps. The unparalleled accuracy and security is rounded out with outstanding ease-of-use features for reliable network time services ready to meet user network and business operation needs today and in the future.

High Security and Capacity

The four standard GbE ports, and optional 10 GbE ports, all combined easily handle 10,000 NTP requests per second using hardware time stamping and compensation. All traffic to the S600 CPU is bandwidth limited for protection against denial-of-service (DoS) attacks. NTP monitoring, charting and MRU logging assist in managing the NTP client activity.

For significantly more robust and secure NTP operations, enable the security-hardened NTP Reflector with 100% hardware-based NTP packet processing capable of 360,000 NTP requests per second. The Reflector also works with the CPU-protecting firewall, with bandwidth limiting of all non-NTP traffic. Coupled with the Reflector is DoS detection, notification, and protection against abnormally high network traffic. The NTP Reflector processes all packets at GbE line speed, making it resistant to the level of network traffic that could be delivered in a DoS attack.

Security is an inherent part of the SyncServer S600 architecture. In addition to standard security features related to web interface hardening, NTP operations, and server access, remaining services can be selectively disabled. Advanced authentication services such as TACACS+, RADIUS, LDAP, and x.509 certificates are optionally available.

Timing and Design Reliability

The 72-channel GNSS receiver, coupled with Microchip's patented Active Thermal Compensation Technology, provides best-in class timing accuracy of <15 ns RMS to UTC. Backstop this with a durable hardware design subjected to severe shock and vibration testing, and high-reliability components that extend the operating temperature range to –20 °C to 65 °C. Further, choose the PTP output option to enable multi-port/profile grandmaster operations leveraging the built-in hardware time stamping in all S600 SyncServers. As with all Microchip time servers, upgrading to a high-performance oscillator, such as a Rubidium atomic clock, keeps the S600 accurate in the event of a GNSS service disruption.

Leverage Built-In Hardware

The SyncServer S600 includes additional built-in hardware features enabled through software license keys, such as the security hardened NTP Reflector, IEEE 1588 PTP output and input operations, and Galileo/GLONASS/QZSS/BeiDou support.

The SyncServer S600, the future of time server operations, today.

Four GbE Ports for Performance, Flexibility and Security

The S600 has four dedicated and isolated GbE Ethernet ports, each equipped with NTP hardware time stamping. These are connected to a high-speed microprocessor with microsecond-accurate time stamps to assure high-bandwidth NTP performance. This exceeds the need of servicing 10,000 NTP requests per second with no degradation in time stamp accuracy.

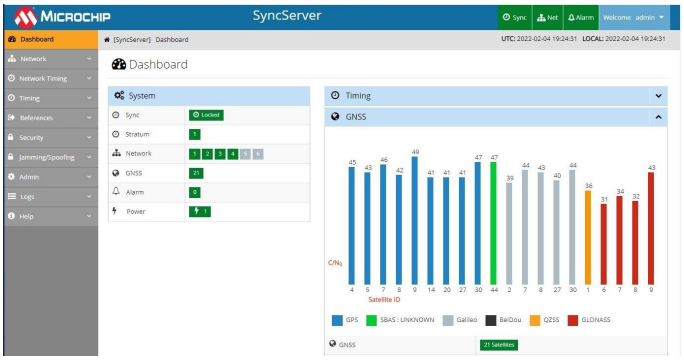
The four GbE ports provide network configuration flexibility and enhanced security. Multiple isolated and synchronized time servers can also be configured. Two 10 GbE SFP+ ports can be added for NTP/PTP operations as well.

Multiple ports provide the flexibility to adapt to different network topologies as networks grow and change. An S600 can be the single time source to synchronize clients on different subnets and physical networks. There is only one time reference, but it can appear as though there are four clocks available because each port is independent.

NTP can be served on all four ports (six if 10 GbE ports are added). The highly secure web-based management interface is only available on port 1, so that administrators may choose to keep that IP address private and secure. Unique access control lists per port can govern server response to client requests for time.

Intuitive, Secure and Easy-to-Use Web Interface

The modern web interface is the primary control interface of the S600. Once the keypad and display bring the unit online, complete status and control functions are easily found on the left navigation menu. A REST API also included.



At-a-glance dashboard presentation combined with logical organization and intuitive controls that make configuring the S600 easy.

Standard Management Access Security

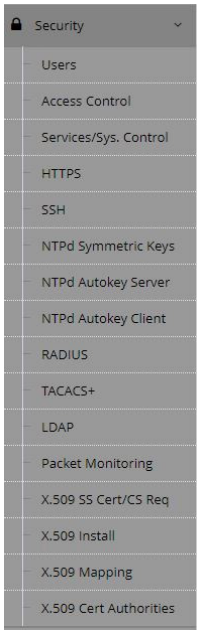
All of the expected network management protocols are standard in the S600. These include mandatory password access, HTTPS/SSL only (using the high-encryption cipher suite), SSH, access control lists, service termination, SNMPv2/v3, and NTP MD5 authentication. All traffic to the S600 CPU is bandwidth-limited for protection against DoS attacks. The local keypad on the server can be password-protected to prevent tampering.

Security-Hardening Option

The SyncServer S600 can be further hardened from both an NTP perspective and an authentication perspective through the Security Protocol License option that includes the security-hardened NTP Reflector.

Operational hardening through the 360,000 NTP packet per second NTP Reflector with 100% hardware-based NTP packet processing also works with a CPU-protecting firewall by bandwidth limiting all non-NTP traffic. The Reflector also monitors packet flow for DoS detection and reporting, yet remains impervious to the level of network traffic as it operates at line speed.

Authentication hardening is available for NTP client/server authentication through the NTP Autokey function or user access authentication through TACACS+, RADIUS, and LDAP. Third party CA-signed X.509 certificates are installable for further hardening of management access and secure syslog operations. For more information about the Security Protocol License option, see the SyncServer Options datasheet.



An entire drop-down menu in the S600 dedicated to security-related protocols.

Unprecedented NTP Accuracy

The Stratum 1 level S600 derives nanosecond-accurate time directly from the atomic clocks aboard the GNSS satellites. By using an integrated, 72-channel GNSS receiver, every visible satellite can be tracked and used to maintain accurate and reliable time. Even in urban canyon environments where direct satellite visibility can be limited, manually inputting the position can be sufficient to acquire accurate time even from a single intermittent satellite.

Ultra-High Performance NTP

The S600 can effortlessly support hundreds of thousands of network clients while maintaining microsecond-caliber NTP time stamp accuracy. NTP request throughput rates can exceed 10,000 requests/second while maintaining NTP time stamp accuracy. NTP monitoring, charting and MRU logging assist in managing the NTP client activity. If the Security Protocol License option is enabled, the NTP Reflector can process over 360,000 NTP requests per second with 15-nanosecond caliber time stamp accuracy with the added benefit of security hardening the network port.

Peering and Holdover

If the GNSS reference signal is lost entirely, the S600 can automatically revert to retrieving time from other user-designated internal or external network time servers. This technology, known as peering, prevents disruption of time services to the network, and the network administrator is notified immediately of the change in time reference status and stratum through SNMP.

A popular adjunct to peering is letting the time server operate in holdover (also called free run or flywheel), where the clock in the time server is allowed to drift if the GNSS signal is lost. The user can specify how far to let the clock drift in terms of estimated time accuracy before reverting to peering. If the optional Rubidium atomic clock is installed, the S600 can flywheel for weeks and still be accurate to less than a millisecond.

Multi-GNSS Constellation Support for Enhanced Reliability

Timing integrity, continuity, and reliability can be improved with the multi-GNSS constallation license that adds support for Galileo, GLONASS, BeiDou, QZSS and SBAS constellations in addition to the standard GPS constellation. With more satellites in view, timing performance can be improved in challenging environments, such as urban canyons. All SyncServer S600's ship with GNSS hardware ready to be enabled with a software license.

Time Cross-Checking for Peace-of-Mind Reliability

The S600 can time cross-check GNSS against at least two other time servers. This protects against an improperly operating GNSS receiver that can subtly corrupt the time. It also serves as a form of spoofing protection.

Multi-Port/Profile IEEE 1588 PTP Grandmaster

Applications demanding very precise time accuracy can require the IEEE 1588 precise time protocol (PTP). The S600 PTP Output License enables multi-port/profile PTP grandmaster operations leveraging the built-in hardware time stamping on each LAN port of the S600.

IEEE 1588 PTP Input License

PTP input is useful for tunneling time to the S600 over the network. PTP input can be the primary time reference or used as a backup reference in the event of GPS signal loss. With GPS, the S600 can automatically calibrate and store observed network path delay asymmetries for PTP input use if the GPS signal is lost.

Oscillator Upgrades Improve Holdover Accuracy and Save Valuable Time

The standard S600 is equipped with a crystal oscillator that keeps the S600 accurate to nanoseconds when tracking GNSS. However, if GNSS connectivity is lost, thereby placing the server in holdover, the oscillator will begin to drift and impact timing accuracy. Upgrading the oscillator improves the holdover accuracy significantly. For example, consider the following drift rates for the standard oscillator compared to the OCXO and Rubidium upgrades.

Oscillator	Holdover Drift (first 24 hours)
Standard	400 microseconds
OCXO	25 microseconds
Rubidium	<1 microsecond

The value of the upgraded oscillator is that if the GNSS signal is lost, the S600 can continue to serve very accurate NTP time. This provides the IT staff plenty of time to correct the problem with no degradation or disruption in network time synchronization accuracy.

Specifications

GNSS Receiver/Antenna

- 72 parallel channel GNSS receiver
- GPS time traceable to UTC (USNO)
- Static and dynamic operational modes
- Acquisition time of 30 seconds (cold start)
- Cable length up to 900 feet (275 m).
- GNSS option adds Galileo/GLONASS/BeiDou/SBAS/QZSS support in addition to GPS

Time Accuracy

- Standard: <15 ns RMS to UTC (USNO), typical
- OCXO: <15 ns RMS to UTC (USNO)
- Rubidium: <15 ns RMS to UTC (USNO)

After one day locked to GPS; evaluated over normal environment (test range <±5 °F) defined in GR-2830..

Oscillator Aging (Monthly)

- Standard: $\pm 1 \times 10^{-7}$
- OCXO: $\pm 5 \times 10^{-9}$
- Rubidium: $\pm 1 \times 10^{-10}$

After one month of continuous operation.

Holdover Accuracy (One Day)

- Standard: 400 µs
- OCXO: 25 µs
- Rubidium: <1 µs

Evaluated over normal environment (test range <±5 °F) defined in GR-2830 after five days locked to GPS.

Frequency Output Accuracy and Stability

- $<1 \times 10^{-12}$ at 1 day locked to GPS

Standard Network Protocols

- NTP v3,4 (RFC 1305/5905/8633), SNTP(RFC4330)
- NTP Symmetric keys: SHA1/256/512, AES128, MD5
- SNMP v2c, v3
- SNMP MIB II, Custom MIB, system status via SNMP
- DHCP/DHCPv6
- HTTPS/SSL* (TLS 1.2/1.3)
- SMTP forwarding
- SSHv2
- Telnet
- IPv4/IPv6
- Syslog: 1 to 8 servers (RFC 3164/5424)
- Key management protocols can be individually disabled
- Port 1: Management and Time protocols
- Port 2, 3, and 4 (optional 5 and 6): Time protocols only

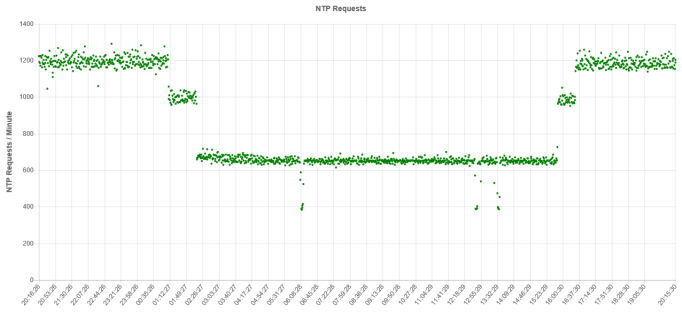
Optional Network Protocols

- Autokey (RFC5906)
- PTP
- TACACS+
- LDAPv3
- RADIUS
- X.509 certificates for HTTPS and secure syslog

NTP Server Performance

- 10,000 NTP requests per second while maintaining accuracy associated with reference time source.**
- Stratum 1 through GNSS: overall server time stamp accuracy of 5 µs to UTC with 1-sigma variation of 15 µs (typical). All NTP time stamps are hardware-based or have real-time hardware compensation for internal asymmetric delays. The accuracy is inclusive of all NTP packet delays in and out of the server, as measured at the network interface. NTP serves the UTC timescale by definition, but the user can choose to serve GPS timescale instead. The user can also select the UTC leap second smearing/slewing behavior. The SyncServer easily supports millions of NTP clients.
- NTP Activity Charting and MRU Logging: A rolling 24 hour chart displays overall NTPd requests/minute activity. An NTPd Most Recently Used (MRU) list provides details on the most recent 1024 NTP client IP addresses. Data is sortable and exportable. Selection of an individual IP address charts the NTP request totals in 30 minute increments over the past 24 hours. These tools are useful to verify an NTP client is reaching the SyncServer and to identify NTP clients that may be requesting the time more frequently than desired.
- NTP Reflector option: 360,000 NTP requests per second (Client request is Mode 3). NTP packets are time stamped 100% in hardware with prevailing clock accuracy. All non-NTP packets are provided to the CPU on a bandwidth-limited basis. The NTP Reflector is included as part of the Security Protocol License option.

NTP Activity Chart



Rolling 24 hour NTPd activity chart to accompany Most Recently Used (MRU) list with individual NTPd client activity details and chart.

*SSL_High_Encryption Cypher suite or the SSL_High_And_Medium_Encryption Cypher suite.
**<5% NTPd packet drop at 10,000 NTPd requests per second. See SyncServer BlueSky option data sheet for performance specifications if BlueSky validator is enabled (optional)

Mechanical/Environmental

Specification	Details
Size	1.73" × 17.24" × 15.88" (4.4 cm × 43.8 cm × 40.3 cm) 1U rack mount, including BNCs
AC Power	90 VAC–264 VAC 50 Hz–60 Hz 50W Optional second power supply
Optional Dual-DC Power	20 VDC to 75 VDC 50W
Operating Temperature	Non-Rb: –20°C to 65°C Rb: –5°C to 55°C
Storage Temperature	–40°C to 85°C IEC 60068-2-1Ab (low-temp soak), IEC 60068-2-2Bb (hi-temp soak), IEC 60068-2-14Nb (change of temp), IEC 60068-2-78Cb (humidity storage), IEC 60068-2-30Db (humidity condensation)
Operational Humidity	≤95%, non-condensing, IEC 60068-2-78Cb, IEC 60068-2-30Db
Certifications	FCC Part 15, Class A, CISPR 32, Class A, UL 62368-1, CSA 22.2 62368-1, EN/IEC 62368-1 2nd ed., VCCI, RoHS 5/6
Server weight	12.5 lbs (5.7 kgs)
Shipping Package	16.3 lbs (7.4 kgs)

Shock and Vibration

Specification	Details
Operational	ETSI EN-300 019-2-3 Mil-Std-810H
Storage	IEC 60068-2-6 Fc (sinusoidal vibration) Mil-Std-810H, figure 514.6C-3
Seismic	EN300 019-2-3 NEBS GR-63-CORE
Transportation	
Bounce	IEC 60068-2-27Ea (shock 18 g)
Vibration	IEC 60068-2-64Fh (random vibration)
Package Drop	IEC 60068-2-31 Ec

Front Panel

Specification	Details
Display	Sharp, high-resolution, 160 × 32 vacuum-fluorescent
Keypad	0–9 numeric, up, down, left, right, ENTER, CLR, TIME, STATUS, MENU, keypad lockout.
LEDs (tri-color: green/red/orange)	
Sync	Time reference status
Network	Network connection status
Alarm	Fault condition

DISA APPROVED Approved Product for DoD Networks

Note: The SyncServer S600 is on the DISA/DoDIN Approved Products List

Rear Panel

Specification	Details
Network	Four RJ-45 100/1000BASE-T Ethernet, speed/duplex: Auto, 100/1000 full
Serial Data/ Timing	NMEA-0183; ZDA/GGA/GSV/RMC messages; NENA 04-002 messages; DB9-F RS-232 user selectable rate to 115.2 kbps
1 PPS Out	BNC, rising edge on-time, TTL into 50Ω
GNSS	BNC L1/B1, 1575/1602/1561 MHz
Console	DB9-F RS-232
Alarm Relay	SPST, maximum 300 mA and 32V
Power	IEC 60320 C14 connector, optional second power supply/connector, hitless switching
Optional DC Power	Mating connector is Molex HCS-125 series

Product Includes

SyncServer S600, locking power cord, and rack mount ears. Two-year hardware warranty. Current manual and MIB are available online at www.microchip.com. MIB and REST API can also be downloaded from the SyncServer.

SyncServer S600 Rear Panel

Ordering Information

SynServer Part Numbers	Power Supply	Oscillator	LAN Ports	
			1 GbE	10 GbE
090-15200-601	Single AC	Standard	4	
090-15200-602	Single AC	OCXO	4	
090-15200-603	Single AC	Rubidium	4	
090-15200-604	Dual AC	Standard	4	
090-15200-605	Dual AC	OCXO	4	
090-15200-606	Dual AC	Rubidium	4	
090-15200-607	Dual AC	Standard	4	2
090-15200-608	Dual AC	OCXO	4	2
090-15200-609	Dual AC	Rubidium	4	2

Custom configure your build-to-order SyncServer S600 using the online SyncServer Configurator tool at www.microchip.com. Configurations can be submitted as requests for quotes.

Note: The SyncServer S600 is TAA Compliant

Hardware Options

10 GbE LAN Ports

Two additional 10 GbE SFP+ ports equipped with hardware time stamping that supports NTP, PTP, and NTP Reflector operations.

Rubidium Atomic Oscillator Upgrade

Improves stability, accuracy, and holdover accuracy. Holdover accuracy is <1 µs for the first 24 hours and <3 µs after the first three days.

OCXO Oscillator Upgrade

Improves holdover accuracy to 25 µs for the first day.

Dual AC Power Supplies

The dual-corded, dual-AC power supply option provides load sharing and active power management system with hitless failover.

Dual DC Power Supplies

The dual-corded, dual-DC power supply option provides load sharing and active power management system with hitless failover.

Antenna Accessories

Antenna cables and accessories enable versatile solutions to meet most installation requirements.

Note: For complete information, see the Options datasheet (DS00002920).

Software Options

Security Protocol License with Security-Hardened NTP Reflector

Security-hardened NTP Reflector and authentication hardening with NTP Autokey, TACACS+, RADIUS, LDAP, and CA-signed X.509 certificates.

PTP Output/Grandmaster (Simultaneous Multi-Port/Profile)

Single license enables multi-port, multi-profile IEEE 1588 PTP Grandmaster operations leveraging the built-in hardware time stamping in all SyncServers.

PTP Input

PTP as a timing input for tunneling time through PTP or as a backup time reference in the event of the loss of the GNSS signal.

Multi-GNSS Constellation

Track GPS/SBAS, Galileo, QZSS, GLONASS, and/or BeiDou constellations for improved integrity and satellite visibility in an urban canyons.

BlueSky GPS Jamming and Spoofing Detection, Protection, Analysis

Detect GPS jamming and spoofing related anomalies in real-time to protect essential time and frequency outputs.

Synchronization Software

Comprehensive MS Windows-based network time synchronization software with monitoring and auditing functions.

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