

GridTime™ 3000 GNSS Time Server

Substation-Hardened and License-Enabled GNSS Time Server



Features

- Multi-band multi-constellation GNSS network Time Server
- Software-configurable license model
- Isolated single- or dual-power supply options
- Swappable high- and low-voltage power supplies
- Independently isolated outputs
- Hardware-based assurance boot process
- IRIG-B, DCF-77 and programmable pulse support
- AM IRIG-B
- T1/E1/J1
- Serial time string protocol support
- IEEE® 1588 v2 Precision Time Protocol (PTP)
- Network Time Protocol (NTP) v1, v2, v3, v4 server support
- Simple Network Time Protocol (SNTP) client support
- Simple Network Management Protocol (SNMP) v1 v2c and v3
- Internal logging
- Configurable notification system via Syslog and SNMP
- Ethernet and USB-C® administration ports

Applications

- Synchronization of station, bay and process-level equipment
- Time synchronization for digital substation with process bus
- Industrial automation and Supervisory Control and Data Acquisition (SCADA)

Flexibility

There are major changes to substation design philosophies underway, and utilities are looking toward the future for what the substation architecture will look like in years to come. To fill the needs of a changing environment, the GridTime™ 3000 GNSS Time Server has flexible licensing options that allow utilities to only enable the features they need, when they need them.

Electrical Protected

It is critical that all devices continue to operate when power surges are present in a substation network. All ports on the GridTime 3000 GNSS Time Server are electrically isolated up to 2.5 kV to ensure continued operation if an unexpected surge or transient occurs.

Resilience

Although issues within any type of network are bound to happen, the ability to ride out and recover from these issues is important.

Resilient timing is critical in any modern substation. The GridTime 3000 GNSS Time Server consists of multiple safeguards to ensure it can withstand unpredictable and adverse conditions. Mitigation techniques include malicious software checking, hardened components, advanced holdover options and compliance to IEC 61850-3 environmental standards.

Redundancy

The GridTime 3000 GNSS Time Server offers redundant power supplies, multiple timing oscillators, firmware upgrade, downgrade verification and Parallel Redundancy Protocol (PRP) support to keep a network up and running.

Security

Cyber security threats are on the rise, and network administrators around the world are working to protect their networks and the companies that own these networks. The transition to digital interfacing and networking has required many power utilities to protect themselves and their customers from malicious attacks. The GridTime 3000 GNSS Time Server uses secure boot and industry-standard access control to ensure only those with adequate permission can access, configure and control the system.

Port Density

As networks evolve and grow, the number of connections needed will also continue to grow. We have outfitted the GridTime 3000 GNSS Time Server with the largest number of ports of any substation clock on the market.

Industry-Standard Protocols

The power industry uses several standardized timing protocols. The GridTime 3000 GNSS Time Server has the flexibility to support all relevant timing needs from a single platform.

Key protocols supported include:

- Precision Time Protocol (PTP)
- Network Time Protocol (NTP)
- IRIG-B (B004–B007, B124–B127)
- Serial time strings
- T1/E1/J1
- Programmable pulses (PPS, PPM, PPH)
- DCF-77

High-Speed Ethernet Interfacing

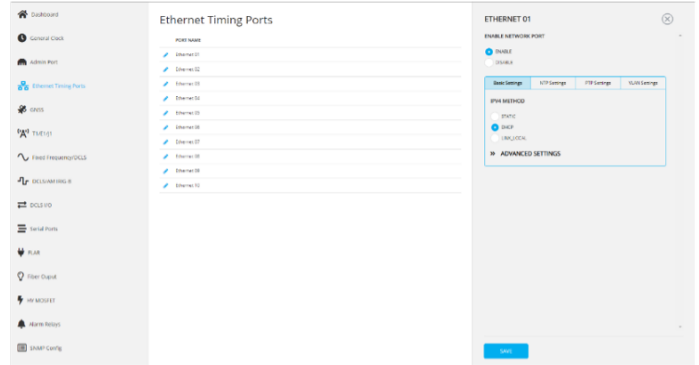
The GridTime 3000 GNSS Time Server has 10 dedicated 1 Gb Ethernet ports, each equipped with NTP and PTP capabilities. These ports are connected to a dedicated microprocessor (MPU) to ensure precise and accurate time stamping of packets.

The GridTime 3000 GNSS Time Server also supports two optional SFP+ Ethernet interfaces for up to 10 Gbps.

Clock Management Tool (CMT)

The GridTime 3000 GNSS Time Server uses a modern web interface for configuration and management of the device. The CMT is an HTTPS web-based interface that is hosted on internal system memory.

You can connect to the CMT by using the administration Ethernet or USB-C port and navigating to the IP address on the display using any modern browser.



Time Accuracy Output Suppression

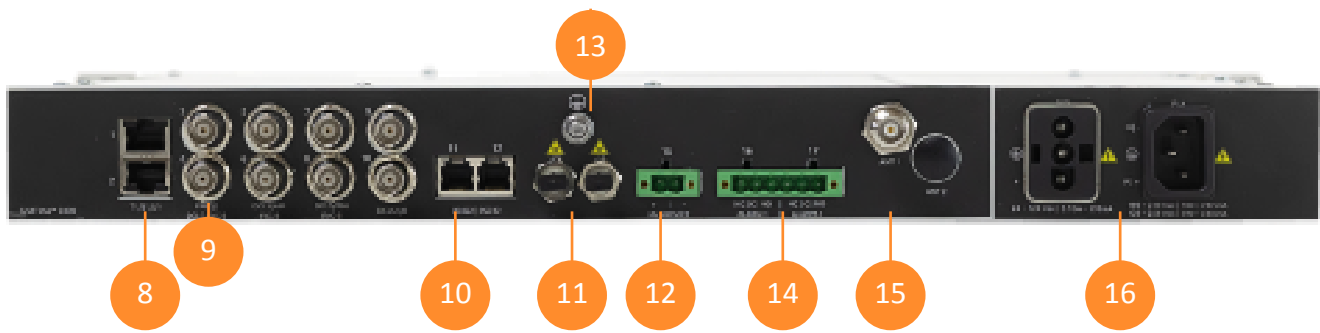
Within the substation, it is critical that the time provided to end devices can be trusted to be the most accurate it can be. We have included time accuracy output suppression in the GridTime 3000 GNSS Time Server. If the clock deviates past your configured threshold, it will suppress the output, preventing the device from outputting an incorrect time and triggering a false trip.

Inputs and Outputs

Front Panel

1. A backlit LED/LCD display, showing key status information in an easy-to-read manner
2. Sync and alarm status LEDs
3. Buttons for scrolling through display panel options
4. USB and Gb Ethernet administration ports
5. Two 1 Gb copper Ethernet port options
6. Six fixed 1 Gb Ethernet SFP ports (copper or fiber options)
7. Two 1 Gb Ethernet or 10 Gb Ethernet SFP+ ports (fiber-only options)





Rear Panel

8. Two RJ-48 E1/T1/J1 framed telecom ports
9. Eight BNC ports:
 - Two TTL* or frequency 1.544, 2.048, 10 MHz, sine or square
 - Four TTL* or AM IRIG-B output only
 - Two TTL* or IRIG-B output/input
10. Two RJ-12 serial ports
11. Two ST optical ports
12. Two 3-pin alarm relays
13. One ground lug
14. One 2-pin High-Voltage (HV) Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET) port
15. Two TNC antenna connectors
16. Two power supply slots**

*DCLS IRIG-B (B00x, B22x,) user-defined pulses, or DCF77

**High (120–250 V_{DC}, 100–240 V_{AC}) and low (40–110 V_{DC}) voltage options available

Clock Accuracy to UTC

| | |
|-----------------------|----------|
| TTL/fiber | < 100 ns |
| AM IRIG-B | < 60 μs |
| 1 PPS | <100 ns |
| PTP time stamp | < 100 ns |
| NTP time stamp | < 50 μs |

Specifications

GNSS Receiver

- 184 parallel-channel GNSS receiver
- Acquisition time
 - Cold start: 26s
 - Hot start: 2s
- Cable delay compensation configuration
- Available constellations
 - GPS L1/L2C
 - GLONASS L1/L2
 - Galileo E1/E5b
 - BeiDou B1I/B2I
 - QZSS L1/L2C

LCD Display and LEDs

- 192 × 32-pixel LCD display
 - Sync status, clock information, satellite acquisition status, alarm information
- Two LEDs indicating sync and alarm status

Network Protocols (General)

- Dynamic Host Configuration Protocol (DHCP) auto-configuration with fallback to Address Resolution Protocol (ARP)-tested link-local address
- Virtual LAN (VLAN) packet tagging
- Auto-MDIX
- Auto-negotiation
- HTTPS/SSL
- IPv4

Network Time Protocol (NTP)

- Stratum 1 NTP and SNTP Time Server
- Multicast and broadcast server capability
- Optional MD5 authentication
- Supports NTP v1, v2, v3 and v4
- 7500 requests per second

Precision Time Protocol (PTP)

- One- or two-step operation
- End-to-end, peer-to-peer or manual delay calculations
- Layer 2 (Ethernet) or Layer 3 (UDP) transport
- Server and client-only mode
- Default profile support
- Power profile support (C37.238-2011, C37.238-2017)
- Telecom profile support (G8265.1, G8275.1)
- Power utility profile (IEC 61850-9-3)
- C37.238 Type, Length, Value (TLV) supported
- Alternate time offset TLV supported with automatic or manual offset
- C37.238 SNMP Management Information Base (MIB) supported

Parallel Redundancy Protocol (PRP)

- IEC 62439-3 (2016)
- Supports up to five PRP pairs
- Supports:
 - IEEE 1588v2 default profiles
 - PTP power profiles
 - IEEE C37.238-2017
 - IEC 61850-9-3

Simple Network Management Protocol (SNMP) and Syslog

- v1, v2c and v3 support can be independently enabled
- Configurable v1, v2c community names and security groups
- Fully configurable via SNMP
- v3 User-based Security Module (USM) support
- USM authentication methods: MD5, SHA
- USM privacy methods: DES, AES
- USM MIB support
- SNMP trap generation v1, v2c and v3
- SNMP v3 traps can be authenticated and privatized via USM
- Syslog (RFC-3164 and 5424) support

T1/E1/J1

- Framed format options
- AMI and B8ZF encoding
- Synchronization Status Messages (SSM) available

Fixed Frequencies

- Configurable sine or square wave
- 1.544 MHz, 2.048 MHz or 10 MHz frequencies

IRIG-B

- DCLS IRIG-B (B00x) with configurable C37.118.1 and AFNOR S87-500 extensions
- AM IRIG-B (B12x)
- Modified Manchester (B22x)

Programmable Pulse

- User-defined pulse duration, offset and interval
- 1 PPS, 1 PPM, 1 PPH, 1 PPD

IRIG-B Input

- DCLS IRIG-B input
- Event recording

DCF-77

- DCF-77 time code
- 1 kHz square wave

Serial String

- NMEA-0183 ZDA
- NMEA-0183 RMC
- IRIG J-17
- String A-H (Eight protocols for plug-and-play compatibility with a wide range of equipment)

Port Isolation

- Outputs to base unit: 2.5 kV
- Power supply to I/O: 3.5 kV

Configurable Alarm Relay

- Two normally open/normally closed (NO/NC) alarm relays
- Low satellite alarm
- Holdover alarm
- Out-of-sync alarm
- Power alarm
- Antenna fault alarm
- GNSS no fix alarm
- Excessive time error alarm
- High current alarm
- Multiple login attempts alarm
- No IRIG input alarm
- Over/under temperature alarm

Mechanical/Environmental

| Specification | Details |
|------------------------------------|---|
| Size | (W) 483 mm × (D) 330 mm × (H) 45 mm |
| AC/DC Power Input (IEC 320) | 100–240 V _{AC} – 50 Hz only 120–250 V _{DC} |
| DC Power Input (3 Pin) | 40–110 V _{DC} |
| Power Drain | 60W |
| Operating Temperature | –10–55°C |
| Storage Temperature | –10–85°C |
| Operational Humidity | ≤ 95%, non-condensing |
| Certifications | CE, FCC, CSA, RCM EN: 55 032:2015 IEC 61850-3:2015 NERC CIP 007 IEEE® 1613:2009 |
| Weight | 3.76 kg |
| Ingress Protection | IP40 |

Front Panel

| Specification | Details |
|-----------------------|--|
| Display | 192 × 32-pixel LCD display |
| Buttons | Three navigation buttons |
| LEDs | One green sync LED One red alarm LED |
| Admin Ethernet | One RJ45 for CMT and SNMP |
| Admin USB | One USB-C® for CMT interface |
| Network | Two RJ45 timing ports Six SFP timing ports Two SFP+ timing ports |

Back Panel

| Specification | Details |
|---------------------------------|---|
| T1/E1/J1 | Two RJ48 Pulse amplitude: 2.4V–3.6V |
| Fixed Frequency Output | Two switchable BNC 10 MHz, 1.544 MHz and 2.048 MHz Sine or square 0–5 V _{DC} 150 mA |
| TTL Output | Eight switchable BNC IRIG-B (B00x) Programmable pulse DCF-77 0–5 V _{DC} 150 mA |
| AM IRIG-B | Four switchable BNC AM IRIG-B (B12x) ± 8 V _{DC} |
| IRIG-B Input | Two switchable BNC 0–5 V _{DC} 150 mA |
| Serial Time String | Two RJ12 serial outputs One RS232 One RS422 |
| Fiber Pulse | Two ST fiber pulse outputs Multimode 62.5/125 μm, λ 820 nm |
| High-Voltage Pulse | HV MOSFET IRIG-B (B00x) Programmable pulse DCF-77 Up to 250 V _{DC} |
| Alarm Relays | Two NO/NC alarm relays Up to 250 V _{DC} |
| GNSS Input | One TNC antenna connection Multi-band GNSS receiver 5V |
| Power | AC/DC (IEC 320) or DC (3-pin) AC/DC (IEC 320) 100–240 V _{AC} – 50 Hz only 120–250 V _{DC} DC (3-pin) 40–110 V _{DC} |
| Optional Secondary Power | AC/DC (IEC 320) or DC (3-pin) AC/DC (IEC 320) 100–240 V _{AC} – 50 Hz Only 120–250 V _{DC} DC (3-pin) 40–110 V _{DC} |