GridTime™ 3000 GNSS Time Server

Substation-Hardened 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, DCF77 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
- IEEE 802.1Q Virtual LAN (VLAN)
- Event logging and GNSS commissioning
- Configurable notification system via Syslog and SNMP
- Ethernet and USB-C® administration ports
- RADIUS and LDAP support
- Configuration file upload and download
- TLS certificate upload

Applications

- Synchronization of station and bay-level equipment
- Time synchronization for digital substation with sampled values
- 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 offers multiple safeguards to enable it to withstand unpredictable and adverse conditions. Mitigation techniques include malicious software checking, advanced holdover options, anti-jamming and spoofing detection algorithms, hardened components, advanced holdover options and compliance to IEC 61850-3:2013 environmental standards.

Redundancy

The GridTime 3000 GNSS Time Server offers redundant power supplies, optional additional 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 connections possible.

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)
- Parallel Redundancy Protocol (PRP)
- IRIG-B (B004–B007, B124–B127)
- Serial time strings
- T1/E1/J1
- Programmable pulses (e.g., PPS, PPM, PPH)
- DCF77

High-Speed Ethernet Interfacing

The GridTime 3000 GNSS Time Server has 10 dedicated 1 Gb Ethernet ports, each equipped with simultaneous NTP and PTP capabilities. The GridTime 3000 GNSS Time Server also supports the option to upgrade two of the SFP Ethernet interfaces to 10 Gb.

GNSS Commissioning Log

The GridTime 3000 enables users to execute a GNSS commissioning log, which serves to verify the proper installation of a device and its antenna. This log offers detailed information on each satellite, encompassing its utilization for timing purposes, visibility status, positional data and signal strength. These comprehensive diagnostics ensure that upon setup, the antenna receives adequate GNSS reception for optimal performance.

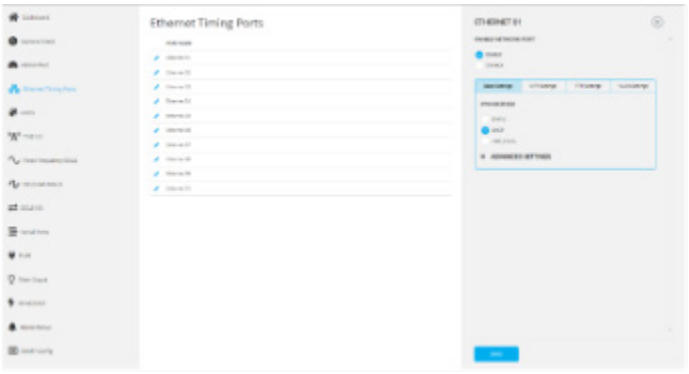
System Event Logs

The GridTime 3000 features an advanced system logging capability that meticulously records all system activities, providing a detailed audit trail complete with precise timestamps. This enhances security measures and supports diagnostic procedures. The robust logging functionality ensures compliance with regulatory standards and facilitates efficient system monitoring and error traceability by accurately documenting and maintaining a record of every system event.

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 Quality-Based 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 quality-based output suppression in the GridTime 3000 GNSS Time Server. If the clock deviates past the configured threshold, it will suppress the output, preventing the device from outputting inaccurate time and triggering a false trip.

Inputs and Outputs

Front Panel

1. A backlit LED/LCD display for easy-to read key status information
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 timing port options
6. Six fixed 1 Gb Ethernet SFP timing ports (copper or fiber options)
7. Two 1 Gb Ethernet or 10 Gb Ethernet SFP+ ports

(fiber-only or Direct Attach Copper (DAC) 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 wave outputs

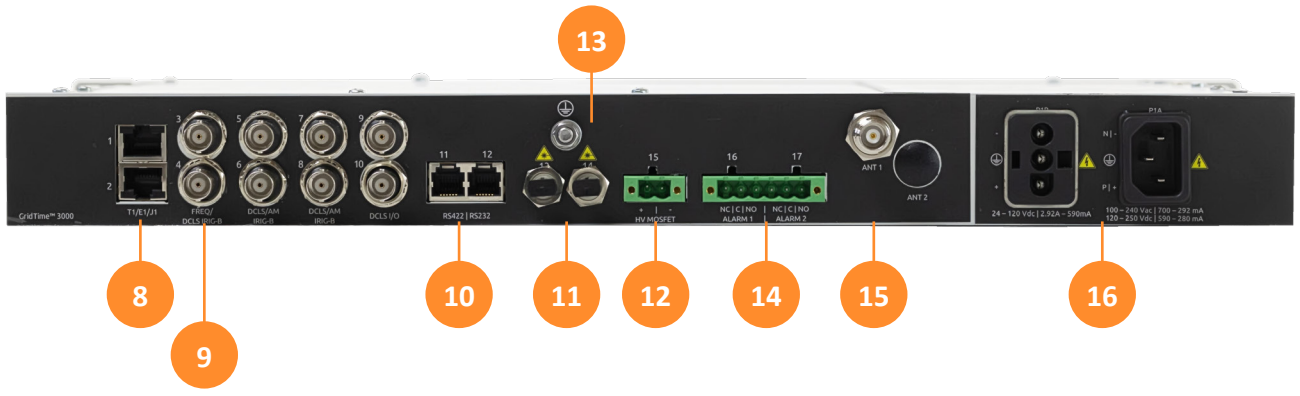
Four TTL* or AM IRIG-B output only

Two TTL* or IRIG-B output/input

10. Two RJ-12 serial ports
11. Two ST optical/fiber ports
12. One 2-pin High-Voltage (HV) MOSFET port
13. One ground lug
14. Two 3-pin alarm relays
15. One TNC antenna connector
16. Two power supply slots**

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

**High (120–250 VDC,100–240 VAC) and low (24–120 VDC) voltage options available



Output Accuracy to UTC (When Synchronized to GNSS)

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 (including firmware version and administration IP address 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/TLS
- IPv4
- RADIUS
- LDAP

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

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 (IP/UDP) transport
- timeTransmitter and timeReceiver-only mode
- Default profile support (IEEE 1588v2-2008)
- Power profile support (IEEE C37.238-2011, IEEE C37.238-2017)
- Telecom profile support (ITU-T G.8265.1, ITU-T G.8275.1)
- Power utility profile (IEC 61850-9-3:2016)
- IEEE C37.238-2011 and IEEE C37.238-2017 Type, Length, Value (TLV) supported
- Alternate time offset TLV supported with automatic or manual offset
- IEEE C37.238-2011 SNMP Management Information Base (MIB) supported
- User-configurable offsetScaledLogVariance value

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 62439-3:2016

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
- SNMPv3 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
- Authenticate and privatize SNMPv3 traps using USM.
- Syslog (RFC-3164 and 5424) support

T1/E1/J1

- Framed format options
- AMI, HDB3 and B8ZS 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 C37.118.1-2011 and AFNOR S87-500 extensions
- AM IRIG-B (B12x*)
- Modified Manchester (B22x*)

*Where “x” is 4, 5, 6 or 7

Programmable Pulse

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

IRIG-B Input

- DCLS IRIG-B input (requires C37.118.1-2011 Extension)

DCF77

- DCF77 timecode

Serial String

- NMEA-0183 ZDA
- NMEA-0183 RMC
- IRIG J-1x
- 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 supply alarms
- Antenna fault alarm
- GNSS no fix alarm

Mechanical/Environmental

Specification	Details
Size	(W) 483 mm × (D) 330 mm × (H) 44 mm
AC/DC Power Input (IEC 320)	100–240 VAC 120–250 VDC
Power Input (3 Pin)	24–120 VDC
Power Drain	60W
Operating Temperature	−10–55°C
Storage Temperature	−10–85°C
Operational Humidity	≤ 95%, non-condensing
Certifications	CE, FCC, UL, CSA, RCM IEC 62368-1:2023 IEC 61850-3:2015 IEC 61000-6-5:2015
Weight	3.76 kg
Ingress Protection	IP40

Holdover Accuracy (One Day)

Oscillator	Holdover Drift (First 24 Hours)
VCTCXO	680 microseconds
OCXO	10 microseconds
Rubidium	< 1 microsecond

Front Panel

Specification	Details
Display	192 × 32-pixel LCD display
Buttons	Three navigation buttons
LEDs	One green sync LED One red alarm LED
Administration Ethernet	One RJ45 for CMT and SNMP
Administration 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 VDC 150 mA
TTL Output	Eight switchable BNC IRIG-B (B00x) Programmable pulse DCF77 0–5 VDC 150 mA
AM IRIG-B	Four switchable BNC AM IRIG-B (B12x) ± 8 VP-P (Peak to Peak)
IRIG-B Input	Two switchable BNC 0–5 VDC
Serial Time String	Two RJ12 serial outputs One RS232 (±3V–±15V) One RS422 (±5V)
Fiber Pulse	Two ST fiber pulse outputs Multimode 62.5/125 µm, ʎ 820 nm
High-Voltage Switching	HV MOSFET IRIG-B (B00x) Programmable pulse DCF77 Up to 250 VDC
Alarm Relays	Two NO/NC alarm relays Up to 250 VDC
GNSS Input	One TNC antenna connection Multi-band GNSS receiver 5V, ≤ 100 mA
Power	AC/DC (IEC 320) 100–240 VAC 120–250 VDC Or DC (3-pin) 24–120 VDC
Optional Secondary Power	AC/DC (IEC 320) 100–240 VAC 120–250 VDC Or DC (3-pin) 24–120 VDC

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