RELIABLE SECURE CONNECTIVITY

Advanced SyncPro: XTS8600

IEC 61850-3 NTP Server & IEEE 1588 PTP Grandmaster

User Manual

V1.03

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This PDF Document contains internal hyperlinks for ease of navigation.
For example, click on any item listed in the **Table of Contents** to go to that page.

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Important Announcement

Disclaimer

We have checked the contents of this manual for agreement with the hardware and the software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual is reviewed regularly and any necessary corrections will be included in subsequent editions.
Suggestions for improvement are welcome. All other product's names referenced herein are registered trademarks of their respective companies.

Preface

This manual contains some advanced network management knowledge, instructions, examples, guidelines, and general theories. The contents are designed to help users manage the device and use its software, a background in general theory is a must, when reading it. Please refer to the Glossary for technical terms and abbreviations.

Who Should Use This User Manual

This manual is to be used by qualified network personnel or support technicians who are familiar with network operations and might be useful for system programmers or network planners as well. This manual also provides helpful and handy information for first time users. For any related problems, please contact your local distributor. If they are unable to assist you, please redirect your inquiries to www.Agatel.co.uk.

Warranty Period

AGATEL provides a limited 5-year warranty for XTS8600 product

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1 Introduction

1.1 Product Overview

IEC 61850-3 HV & IEEE 1613 NTP Server & IEEE 1588 PTP Grandmaster with -40 to +85°C Operating Temperature

Our state-of-the-art NTP Server and IEEE 1588 PTP Grandmaster XTS8600 is fully certified to IEC 61850-3 HV & IEEE1613 standards, ensuring robust performance and reliability in harsh substation environments. Designed to deliver precise time synchronization across your entire power grid infrastructure, this device offers superb accuracy and stability. The IEC 61850-3 HV & IEEE 1613 certification guarantees that our NTP Server & PTP Grandmaster can withstand electromagnetic interference, temperature fluctuations, and other environmental stresses typical of substation settings, ensuring uninterrupted performance and enhanced system reliability.

Power Industry Compliance and Extreme Durability

- -40 to +85°C Operating Temperature
- Certified for IEC61850-3 HV, IEEE 1613
- Voltage Range for Power Applications: 85 – 264 VAC or 88 – 300 VDC (AC series)
- Voltage Range for General Applications: 19 – 66 VDC (DC Series)
- MIL-STD-810G & MIL-STD-810F Military grade reliability
- Five Years Warranty & 20 Years MTBF

Precision Timing and Holdover Accuracy

- Proven PRTC-B (<40ns), PTP (<40ns), and NTP (<80 µs) Accuracy, Tested by Calnex
- Excellent Holdover Performance: <0.5 µs/8 Hours
- High Frequency Stability of OCXO versus Temperature: Over -40°C to +85°C: 2.0 ppb
- High Frequency Stability of OCXO versus Time: Slope Per Day: ± 0.3 ppb, Per Year Cumulated: ± 50 ppb
- Antenna Cable Latency Compensation: Ensures Accuracy of GNSS Time Source

Advanced GNSS Capabilities and Signal Optimization

- Multiple Constellations with Up to 3 GNSS (GPS, Galileo, GLONASS, and BeiDou)
- 72-Channel GNSS Receiver Capability with -167 dBm Navigation Sensitivity
- High-Sensitivity Antenna for GNSS or GPS Only
- Satellite Data for GNSS Time Source Management and Antenna Installation
- GNSS Tuning Configuration to Avoid Poor Signal Reception from Specific Satellites

Enhanced Antenna Protection and Signal Integrity Solutions

- Jamming and Spoofing Detection with Notification
- Selectable Anti-Jamming Antenna
- Antenna Vulnerability Detection and Notification: Short Circuit and Disconnection
- Selectable Entry and Advanced Robust Surge Arrestors

Antenna Installation and Signal Extension Solutions

- Satellite Signal Strength Information Assists in Antenna Placement and Installation
- Antenna Installation Guide with Selectable Kits
- Selectable Amplifier for Extending Antenna Cable up to 300 meters (LMR400)
- Supports 300M+ IRIG-AM Cable Length and 150M for Other Sync-Out Signals (RG58 A/U)

Comprehensive Power and Telecom Profile Support

- Supports C37.238-2011 Power Profile with Mandatory VLAN Support
- Supports C37.238-2017 Power Profile
- Supports IEC/IEEE 61850-9-3:2016 Power Utility Profile
- Supports Telecom: ITU-T G.8265.1 Frequency, ITU-T G.8275.1 Phase/Time, ITU-T G.8275.2 Phase/Time, Telecom-2008
- Upgradable to TSN Profiles: 802.1AS Profile
- Upgradable to Enterprise Profiles: Enterprise Profile
- Upgradable to Media Broadcast Profiles: SMPTE ST 2059-2 and AES67 Media Profile

Compliance with ITU-T G.826x SyncE Standards

- Architecture and Performance Compliance with ITU-T G.8261
- Performance Adherence to ITU-T G.8262
- Signalling Channel Support as per ESMC G.8264

Multi-Level Redundancy and Failover Protection

- Power Redundancy: Dual Normal DC / Dual AC with External Power Supplies
- Device Redundancy: Clustering for NTP, BMCA for PTP
- Network Redundancy: Bonding & LACP for NTP, PRP for PTP
- Link Redundancy: SFP & Copper Combo Ports

Time Sync Solutions for Legacy Power Equipment and IED

- Configurable Sync-Out Channels
- Supports Multiple IRIG-B Modulation Types: AM, TTL, and RS-485
- Complete IRIG-B Time Format Support: Including IEEE 1344 & C37.118.1
- Supports AFNOR French Time Code
- Supports PPS and 10 MHz Square Wave Output
- Cable Latency Compensation: Ensures Accuracy for IRIG-B and PPS Adjustment

Leap Seconds and Time Offset Management

- Leap Seconds Management for NTP, PTP, and IRIG-B
- Local Time and Daylight-Saving Time Support for PTP and IRIG-B
- RTC for Local Time Preservation

Proactive Notifications: From Emergency to Information Level

- Syslog with Detailed Event Coverage
- SNMP Trap
- Relay

Passive Notifications: Easy Monitoring and Event Log Review

- Event Log with Detailed Event Coverage
- 3x3 Grid LED: Displays System Status and Alarm levels.

Versatile Device Management, Backup and Configuration

- Dedicated Management Ethernet Port for Streamlined Device Access and Control
- Console Interface for CLI and OOB Management
- AGATEL-Defined MIB for Comprehensive Device Monitoring and Management.
- SSH and Toggleable Telnet for Remote CLI Access.
- AGATEL Device Management Utility for Easy and Efficient Device Commissioning.
- Backup/Restore Configurations via SD/MMC, Web, and NIMBL

Integrated Security and Access Control

- Trust Key Authentication for NTP
- SNMPv3 Authentication and Encryption
- TACACS+/RADIUS Integration for Centralized Authentication, Authorization, and Accounting.
- Embedded TPM for Secure Key Storage and Cryptographic Operations.
- User Account and Privilege Management to Control Access and Permissions.
- Unsecure Protocols Disabled by Default for Enhanced Security.

1.2 Product Specifications

Table 1-1 XTS8600 Series Specifications

Technical Specifications		
Model Name	*XTS8600/XTS8600I Series*	
GNSS Receiver Specifications		
GNSS Input ports	*1x GNSS Input; SMA (F) - active Antenna*	
GNSS Module specific Information	*Multi-Constellation Supported: GPS L1, GLONASS L1, BeiDou B1, Galileo E1 Maximum Concurrent Constellations: 3* *Leap Second: Supported Sensitivity for GPS:* • *Tracking: -166 dBm* • *Reacquisition: -160 dBm* • *Cold Start: -148 dBm* • *Hot Start: -160 dBm*	
Acquisition Times	*Cold Start: < 45 seconds Warm Start: < 7 seconds*	
Antenna Requirements	*3.3 V, < 50 mA* *Minimum gain=5dB; Maximum gain + Cable Attenuation ≤ 40dB*	
GNSS Vulnerability Mitigation	*Jamming*	*Support Detection, Warning and Switch to OCXO Holdover*
	Spoofing	*Support Detection, Warning and Switch to OCXO Holdover (GNSS Antenna Only)*
Antenna Vulnerability Mitigation	*Antenna Cable Short*	*Support Detection, Warning and Switch to OCXO Holdover Mode*
	Antenna Disconnection	*Support Detection, Warning and Switch to OCXO Holdover Mode*
Antenna specification (Accessories)		
GNSS Antenna (70100000000090G)	*GNSS receiver: GPS L1, GLONASS L1, BeiDou B1, Galileo E1* *LNA Gain: 40dB min* *Weather-Proof Housing: IP69K* *Operating and Storage Temperature: -40°C ~85°C* *ESD: ±15KV Air Discharge* *Mechanical size: 66.5 mm dia. x 21 mm* *H MIL-STD-810F* *Supply Voltage Range: 2.5 to 16VDC*	
GPS Antenna (70100000000091G)	*GNSS receiver: GPS L1, Galileo E1* *LNA Gain: 40dB min* *Weather-Proof Housing: IP69K* *Operating and Storage Temperature: -40°C ~85°C* *ESD: ±15KV Air Discharge* *Mechanical size: 66.5 mm dia. x 21 mm* *H MIL-STD-810F* *Supply Voltage Range: 2.5 to 16VDC*	

Anti-Jamming GNSS Antenna (70100000000098G)	*GNSS Receiver: GPS L1, GLONASS L1, BeiDou B1, Galileo E1* *LNA Gain: 40dB typ.* *Weather-Proof Housing: IP67* *Operating and Storage Temperature: -40°C - 85°C* *ESD: ±15KV Air Discharge* *Mechanical Size: 100 mm dia. x 102 mm* *H MIL-STD-810F* *Supply Voltage Range: 2.5 to 16VDC*
Maximum Antenna Cable Length	*Antenna cable:* *Without amplifier:* *LMR-400: 150M CFD-200: 50M RG58A/U: 25M* *With Amplifier:* *LMR-400: 250M CFD-200: 80M RG58A/U: 50M*
Maximum Sync-Out Cable Length	*RG58 A/U Sync-Out cable:* *1PPS, 10MHz, IRIG-B TTL: 150M* *IRIG-B AM: 150M @ 1K impedance , 300M @ 10K impedance* *IRIG- B RS485: 1200M*
Maximum Antenna Cable Length	*Antenna cable:* *Without amplifier:* *LMR-400: 150M CFD-200: 50M RG58A/U: 25M* *With Amplifier:* *LMR-400: 250M CFD-200: 80M RG58A/U: 50M*
Maximum Sync-Out Cable Length	*RG58 A/U Sync-Out cable:* *1PPS, 10MHz, IRIG-B TTL: 150M* *IRIG-B AM: 150M @ 1K impedance , 300M @ 10K impedance* *IRIG- B RS485: 1200M*
Proven Clock Accuracy (Relative to UTC)	
1PPS	*±40 ns Peak* *1
Demodulated IRIG-B	*±40 ns Peak* *1
Modulated IRIG-B AM	*±1 µs Peak* *1
RS-485 IRIG-B	*±100 ns Peak* *1
PTP Timestamp	*±40 ns Peak* *1
NTP Timestamp	*±50 us Peak , ±40 us Average* *1
Holdover accuracy - OCXO	*< 0.5 us / 8 hours / < 72 us / 7 days* *2
	1. Device locked to satellites for at least 24 hours. *2. Device locked to satellites for at least 48 hours before holdover*
Network Interface	
Ethernet Standards	*IEEE 802.3 10BaseT* *IEEE 802.3u 100BaseT(X)* *IEEE 802.3ab for 1000BaseT(X) IEEE 802.3u for 100Base-FX IEEE 802.3z for 1000Base-X*
Gigabit Ethernet Ports	*Two Combo ports, 2x 10/100/1000BASE-T(X) RJ45 or 2x 100/1000 Base-X SFP Support Synchronous Ethernet (SyncE) per ITU-T G.8261 ITU-T, G.8262 and G.8264 ESMC), PTP- Capable and NTP-Capable*
Management Port	*1x 10/100 BASE-T(X) RJ45, NTP-Capable*
I/O	

Console	1x DB9 Serial Console Port
SD slot	1x micro-SD slot
Relay - Alarm Contact	Rated Operational Voltage: 24 VDC Continuous carrier: 1A Normal Open Pickup time: 2.5ms Turn-off time: 1ms
Sync-Out	
Standard Sync-Out (Sync 1, Sync 2)	Two configurable output channels (coaxial BNC (F) connector): 1. 10MHz (Square Wave) 21 PPS/PPM/PPH Output (Square Wave, configurable pulse width) • IRIG-B TTL (Support IEEE1344 and C37.118.1) • AFNOR French Time Code • BCD, BJT, ST and ST Checksum (Contact sales for these timecodes)
Extend Sync-Out (XTS8600I) (Sync 3 ~ Sync 6)	Three extra configurable output channels (Sync 3 ~ Sync 5, coaxial BNC (F) connector): 1. 10MHz (Square Wave) 21 PPS/PPM/PPH Output (Square Wave, configurable pulse width) 3. IRIG-B TTL B000~B007 (Support IEEE1344 and C37.118.1) 4. IRIG-B AM B120~B127 (Support IEEE1344 and C37.118.1) 5. AFNOR French Time Code 6. BCD, BJT, ST and ST Checksum (Contact sales for these timecodes) One extra standalone channel (Sync 6, TB3 connector) 3. IRIG-B RS-485 B000~B007 (Support IEEE1344 and C37.118.1)

Electrical Output Drive Levels	
1PPS	5VDC 20 mA TTL compliant
IRIG-B TTL	5VDC 20 mA TTL compliant
Modulated IRIG-B	5Vp-p, 3.3:1 ratio, AM, Sinewave
IRIG-B RS485	±5 VDC IRIG-B Half-Duplex; 32 Transceivers Max. a bus
Frequency	
Oscillator	Advanced managed OCXO, with temperature drifting compensation
IEEE1588 Profiles	
Default	IEEE 1588V2 (PTPv2) Default UDP (IEEE1588-2008 Annex D and J) Default 802.3 (IEEE1588-2008 Annex F and J)
Power	IEC/IEEE61850-9-3-2016 Power Utility Profile IEEE C37.238-2011 Power Profile, with VLAN support IEEE C37.238-2017 Power Profile, with VLAN support
Telecom	ITUT-G.8265.1 Frequency ITUT-G.8275.1 Phase/Time ITUT-G.8275.2 Phase/Time
AVBTSN	802.1AS Profile
Enterprise	Enterprise Profile
*Media Broadcast (In Development Plan)	SMPTE ST 2059-2 AES67 Media Profile
System Modes	
GNSS Locked Mode	Synchronizes time with GNSS signals for high accuracy

Holdover Mode	*Maintains time using the OCXO clock after GNSS is unavailable*	
Free Run Mode	*Operates independently using RTC as the time source along with the OCXO clock.*	
Functions & Protocols		
Protocols	*Network Synchronization*	*RFC 1119 (NTPv2) Server* *RFC 1305 (NTPv3) Server* *RFC 5905 (NTPv4) Server* *RFC 1769 (SNTPv3) Server* *RFC 2030 (SNTPv4) Server*
	Network Protocols	*VLAN (IEEE 802.1q) filtering/tagging* *IEEE 802.1p QoS* *DSCP* *IPv4,* *IPv6* *TCP,* *UDP* *DHCP Client* *TACAS+/ RADIUS*
	Redundancy	*Devices Clustering (NTP Only) PRP (IEC 62439-3)* *Bonding – Active & Backup Bonding -- LACP* *Combo Ports*
	Management	*HTTP, HTTPS* *SNMP v1/v2,v3* *SSH/ Telnet (CLI), could be enabled/disabled Console CLI* *Estimated Time Accuracy* *GNSS Status* *Power Status* *PTP & NTP Status* *SD/MMC Backup & Restore*
	Event & Alarm	*Event Log* *Syslog* *Relay & Alarm Management* *SNMP Trap*

Physical Characteristics	
Housing *Dimension (W x H x D)* *Weight Installation*	*SPCC w/Zinc Plated Body + Aluminum cover IP30 Metal Housing* *252.8 x 220 x 44* *2KG (AC + IRIG-B) / 1,9KG (DC + IRIG-B)* *1U Rack-mountable or DIN-Rail Kits (Optional)*
Power Supply	
Rated Supply Voltage	*110 – 240 VAC, 50/60HZ (XTS8600 AC series)* *110 – 250 VDC (XTS8600 AC series)* *24 – 60 VDC (XTS8600 DC series)*
Input Voltage Range	*85 – 264 VAC, 50/60 HZ (AC series) 88 – 300 VDC, (AC series)* *19 – 66 VDC, (DC series)*
Power Consumption	*Approximately 9.4 W (Max)*
Environmental Limits	

Operating Temperature	*-40°C to +85°C (-40°F to 185°F)*
Storage Temperature	*-40°C to +85°C (-40°F to 185°F)*
Operating Altitude	*5100m*
Ambient Relative Humidity	*5% to 95% (Non-condensing)*

Dimensions and Layout

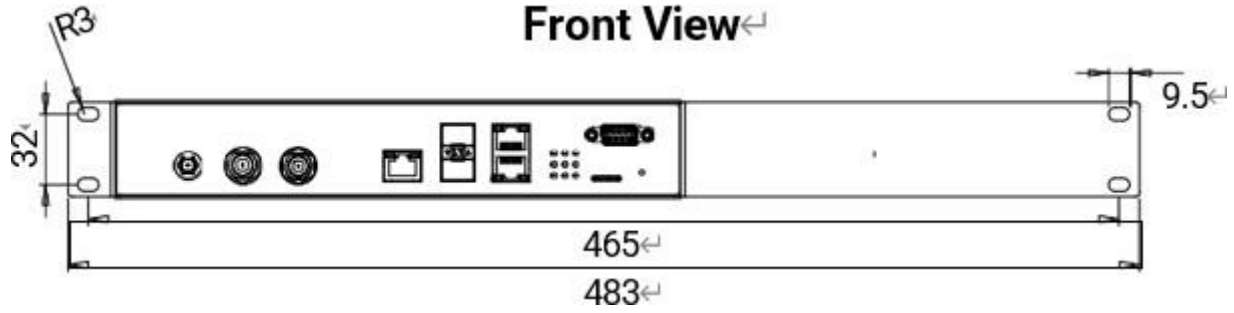


Figure 1-1 XTS8600 Dimension - Front View

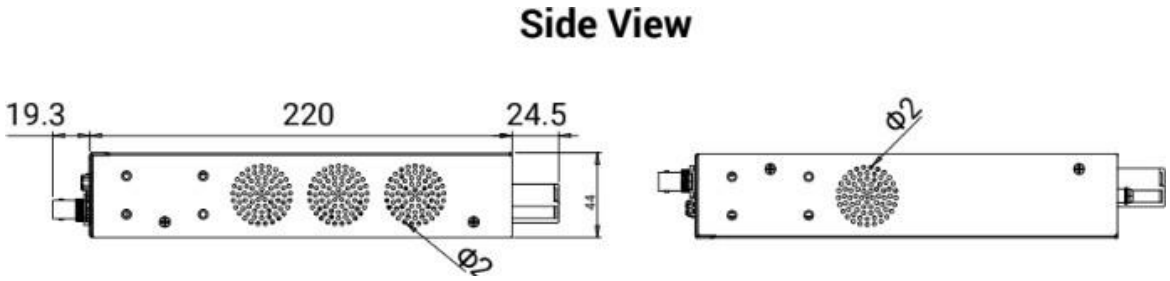


Figure 1-2 XTS8600 Dimension - Side View

Table 1-2 XTS8600 Models

Main core and Modules				
Model Name	**Part Number**	**Ethernet Port**	**Sync-Out**	**Input Voltage Range**
XTS8600-DC	*1P1XTS86000001G*	*1 x 10/100 MGMT RJ45 port and 2 x 100/1000 RJ45/SFP combo ports*	*Standard Sync-Out (Total Sync-Out Channels:2)*	*Dual 19-66 VDC*
XTS8600-AC	*1P1XTS86000002G*			*Single 85-264 VAC or 88-300 VDC*
XTS8600I-DC	*1P1XTS8600I001G*		*Extend Sync-Out (Total Sync-Out Channels:6t)*	*Dual 19-66 VDC*
XTS8600I-AC	*1P1XTS8600I002G*			*Single 85-264 VAC or 88-300 VDC*

1.4 Regulatory Approval

Table 1-3 XTS8600 Regulatory Approval

Regulatory Approvals				
Safety	UL 62368-1 , CB IEC62368-1/EN62368-1 (UL Certified Operating Temperature: 75°C)			
EMC	FCC(EMI): FCC Part 15, Subpart B, Class A CE(EMI): EN 55032, EN61000-6-4, Class A EN 61000-3-2 (Current Harmonics) EN 61000-3-3 (Voltage Flicker) CE(EMS): EN 55035, EN61000-6-2 CE(GNSS): EN 303 413. EN 301 489-19			
Power Automation	IEC61850-3, IEEE 1613			
Test	Item		Value	Level
IEC 61000-4-2	ESD	Contact Discharge Air Discharge	±8KV ±15KV	4 4
IEC 61000-4-3	RS	Enclosure Port	10(V/m), 80-3000MHz 20(V/m), 80-1000MHz	3
IEC 61000-4-4	EFT	AC Power Port DC Power Port Signal Port	±4.0KV ±4.0KV ±2.0KV	4 4 Special
IEC 61000-4-5	Surge	AC Power Port AC Power Port DC Power Port DC Power Port Signal Port	Line-to Line±2.0kV Line-to Earth±4.0kV Line-to Line±1.0kV Line-to Earth±2.0kV Line-to Earth±4.0kV	4 4 4 3 4
IEC 61000-4-6	CS	0.15-80MHz	10V rms 0.15-80MHz, 80% AM	3
IEC 61000-4-8	PFMF	(Enclosure)	100A/m continuous, 1000A/m (3s)	5
IEC 61000-4-11	DIP	AC Power Port	30% reduction (Voltage Dips), 1 period 60% reduction (Voltage Dips), 50 period 100%, reduction (Voltage interruptions), 5 period 100% reduction (Voltage interruptions), 50 period	-
IEC 61000-4-16	Main Frequency Voltage	DC Input Port Signal Port	30V Continuous, 300V 1s 30V Continuous, 300V 1s	4 4
IEC 61000-4-17	Ripple	DC Input Port	10% of unit	3
IEC 61000-4-18	Damped Oscillatory	AC Power Port	2.5KV common, 1KV differential mode @ 1MHz	3
		Signal Port Telecommunication Port	2.5KV common, 1KV differential mode @ 1MHz	3
IEC 61000-4-29	DC Voltage Dips & Interruptions	DC Input Port	30% Reduction (Voltage Dips):0.1 sec 60% Reduction (Voltage Dips):0.1 sec 100% Reduction (Voltage Interruption):0.05 sec	

Shock *Drop* *Vibration*	*MIL-STD-810G Method 516.5* *MIL-STD-810F Method 516.5* *MIL-STD-810F Method 514.5 C-1 & C-2*
RoHS2	*Yes*
MTBF	*20 years*
Warranty	*5 years / Upgradable to 10 years*

1.5 Connectors

XTS8600/XTS8600I Series Front View

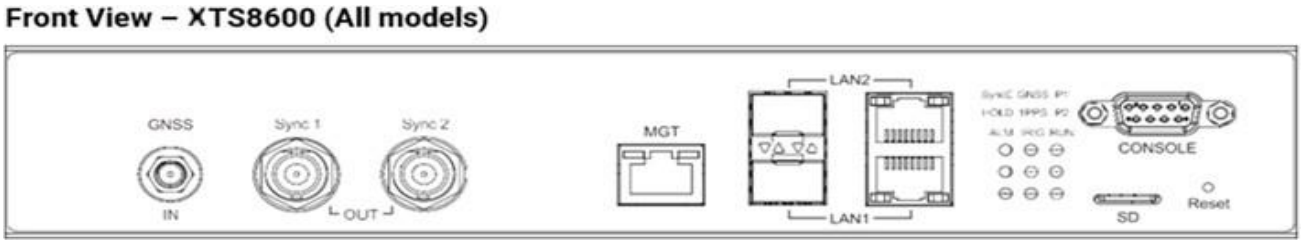


Figure 1-4 XTS8600/XTS8600I Connectors - Front View

XTS8600I DC Series Back view

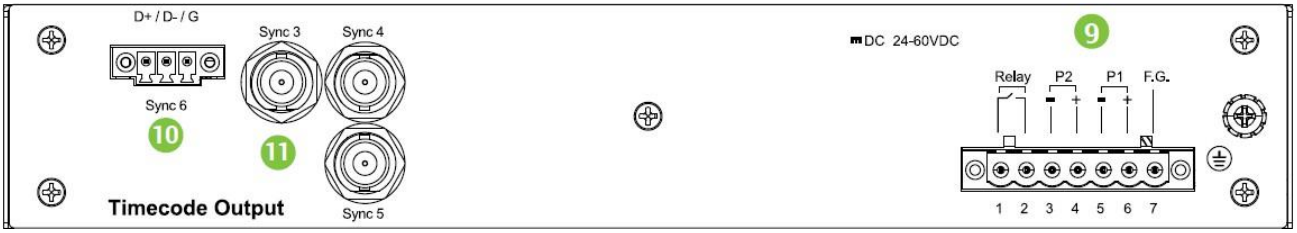


Figure 1-5 XTS8600I DC Series Connectors - Back View

XTS8600 AC Series Back view

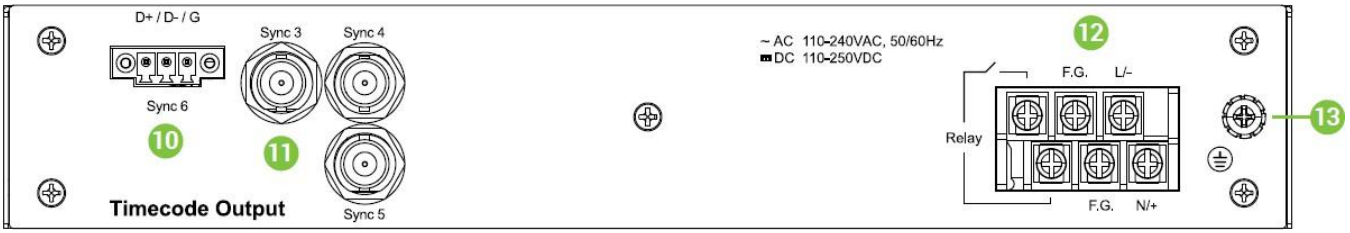


Figure 1-6 AC Series Connectors - Back View

① GNSS/GPS Antenna Input

Table 1-4 GNSS/GPS Antenna Input

Connector Type	IO	Description
SMA Female	Input	GNSS/GPS Module Spec: ■ Multi-Constellation Supported: GPS L1, GLONASS L1, BeiDou B1, Galieo E1 ■ GNSS Module latency: <15ns GNSS/1PPS output latency

		■ Leap Second: Supported ■ GNSS constellations: Supported Acquisition Time: ■ Cold Start: < 45 seconds ■ Warm Start: < 7 seconds Antenna Requirements: ■ 3.3 V, < 50 mA ■ Minimum gain=5dB; Maximum gain = 40dB Suggested Type of Antenna Cable ■ Long Distance: LMR-400 ■ Short Distance: RG58A/U Maximum Antenna Cable Length: ■ Without RF amplifier (59902561G) ■ LMR-400: 150M RG58A/U: 25M ■ With RF Amplifier (59902561G) ■ LMR-400: 250M RG58A/U: 45M

② Synchronized Time Output 1~2

Table 1-5 Synchronized Time Output 1~2

Connector Type	IO	Description
BNC Female	Output	Two Configurable Output Channels: ■ 10 MHZ ■ TTL compliant / 2.4VDC @ 50 Ohm impedance ■ 1PPS ■ TTL compliant / 2.4VDC @ 50 Ohm impedance ■ IRIG-B TTL ■ 5VDC TTL Compliant ■ IRIG-B Format: B000~B007 ■ Support IEEE1344 and C37.118.1 ■ AFNOR French Time Code

		■ BCD, BJT, ST and ST Checksum (Contact sales for these timecodes)

③ Management Ethernet Port

Table 1-6 Management Ethernet Port

Connector Type	IO	Description
RJ45	Bidirectional	1x 10/100 BASE-T(X) RJ45

④ LAN/SFP Combo Port

Table 1-7 LAN/SFP Combo Port

Connector Type	IO	Description
RJ45	Bidirectional	■ Two Combo ports, 2x 10/100/1000BASE-T(X) RJ45 ■ Support Synchronous Ethernet (SyncE)
SFP	Bidirectional	■ 2x 100/1000 Base-X SFP ■ Support Synchronous Ethernet (SyncE)

Note: **Combo Port**

XTS8600 combo port is the single network interface that offers two types of physical connections: one for a copper Ethernet port (RJ-45) and another for an SFP (Small Form-factor Pluggable) port. These two connections share the same network port and cannot be used simultaneously.

The XTS8600 will prioritize SFP connection over the RJ45 for Auto-Failover Feature. The Auto-Failover Feature of a combo port maintains continuous connectivity by seamlessly switching between SFP and copper Ethernet interfaces. The SFP port is prioritized when both connections are active, and the port automatically switches to copper if the SFP fails, without user intervention. This transition keeps all IP network settings unchanged, ensuring uninterrupted service and eliminating the need for reconfiguration, making the process efficient and transparent.

⑤ LED Indicators

See subsection 1.6 for more detail description of LED indicators

- SyncE: SyncE Status
- HOLD: Holdover Status
- ALM: System Warning Alert
- GNSS: Satellites Status
- 1PPS: Pulse-Per-Second Status
- IRIG: IRIG-B Timecode Output Status
- P1: Power 1 Connection Status

- P2: Power 2 Connection Status
- Run: System Working Status

⑥ Console Port

Table 1-8 Console Port

Connector Type	IO	Description
DB9 Female	Bidirectional	1x DB9 Serial Console Port for Command Line Interface Pin: 2 — Description: RX Pin: 3 — Description: TX Pin: 5 — Description: GND Pin: Other Pins — Description: Unused

⑦ MicroSD Card Slot

Table 1-9 MicroSD Card Slot

Connector Type	IO	Description
MicroSD	Bidirectional	Support for SDHC card with a maximum capacity of 64GB ■ Complies With MMC4.3, SD, SDIO 2.0 Specifications ■ Support FAT32, EXT2 and EXT3 file systems

⑧ Reset & Default

Table 1-10 Reset & Default

Connector Type	IO	Description
Pinhole	Input	■ Click for 5 seconds to reset system ■ Long Click for more than 10 seconds to reset to factory default

⑨ DC Power Input / Relay Output

DC Power Input:

Table 1-11 DC Power Input

Connector Type	IO	Description
TB7 (Pin 3 to Pin 7)	Input	Dual Redundant DC Power ■ Reverse Polarity Protection: Yes Rated Supply Voltage ■ 24 – 60 VDC, 0.24-0.6A (DC series) Input Voltage Range ■ 19 – 66 VDC, 0.2-0.8A (DC series)

Relay Output:

Table 1-12 Relay Output

Connector Type	IO	Description
TB7 (Pin1 to Pin 2)	Relay	Normal Open: When alarm occurs, these pins are shorted with 0Ω resistance (Close State). In normal operation without the alarms, the pins remain open with infinite resistance (∞Ω) (Open State).

Pin	Description
1	RY-
2	RY+

⑩ Synchronized Time Output 6

Table 1-13 Synchronized Time Output 6

Connector Type	IO	Description
TB3	Output	One Fixed IRIG-B RS-485 Output Channel: ■ IRIG-B RS-485 ■ ±5VDC ■ IRIG-B Format: B000~B007 ■ Support IEEE1344 and C37.118.1 ■ AFNOR French Time Code ■ BCD, BJT, ST and ST Checksum (Contact sales for these timecodes

⑪ Synchronized Time Output 3~5

Table 1-14 Synchronized Time Output 3~5

Connector Type	IO	Description
BNC Female	Output	Three Configurable Output Channels: ■ 10 MHZ ■ TTL compliant / 2.4VDC @ 50 Ohm impedance ■ 1PPS ■ TTL compliant / 2.4VDC @ 50 Ohm impedance ■ IRIG-B TTL ■ 5VDC TTL Compliant ■ IRIG-B Format: B000~B007 ■ Support IEEE1344 and C37.118.1 ■ AFNOR French Time Code ■ BCD, BJT, ST and ST Checksum (Contact sales for these timecodes) ■ IRIG-B AM ■ 5Vp-p, 3:1 ratio, AM, Sinewave ■ IRIG-B Format: B120~B127 ■ Support IEEE1344 and C37.118.1 ■ BCD, BJT, ST and ST Checksum (Contact sales for these timecodes)

		* When multiple IRIG-B AM channels are used, only one setting for the IRIG-B AM format, antenna, and sync-out cable compensation can be applied.

⑫ AC Power Input / Relay Output

AC Power Input:

Table 1-15 AC Power Input

Connector Type	IO	Description
M3 Screw	Input	Dual Redundant DC Power ■ Reverse Polarity Protection: No Rated Supply Voltage ■ 110 – 240 VAC, 0.2-0.3A, 50/60HZ (AC series) ■ 110 – 250 VDC, 0.06-0.15A (AC series) Input Voltage Range ■ 85 – 264 VAC, 0.2-0.35A, 50/60 HZ (AC series) ■ 88 – 300 VDC, 0.06-0.15A (AC series)

Relay Output:

Table 1-16 Relay Output

Connector Type	IO	Description
M3 Screw (Pin1 to Pin 2)	Relay	Normal Open: When alarm occurs, these pins are shorted with 0Ω resistance (Close State). In normal operation without the alarms, the pins remain open with infinite resistance (∞Ω) (Open State). Pin 1 is on the top side and Pin 2 is on the bottom side.

Pin	Description
1	RY-
2	RY+

⑬ Protected Earth

Table 1-17 Protected Earth

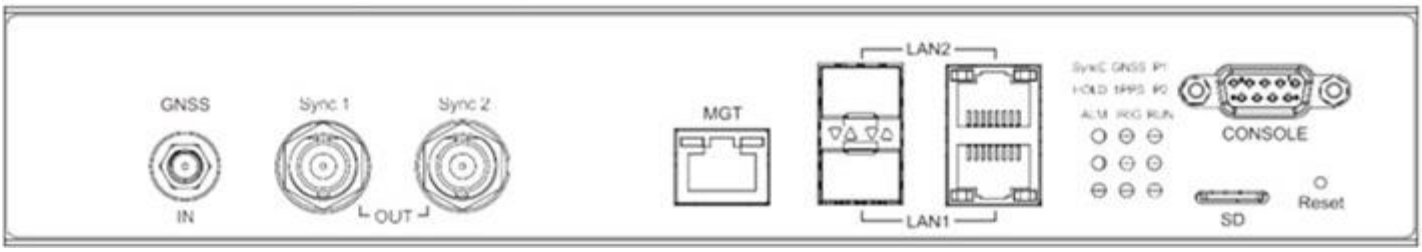
Connector Type	IO	Description
M4 Screw	GND	Protected Earth

1.6 LED Indicators

1.6.1

1.6.2 Front Pannel LED Indicators

Figure 1-7 Location of LED Indicators



In the image above, the areas highlighted in red are the Front Panel LED indicators. The XTS8600 features a series of LED indicators on its front panel, organized in a 3x3 grid. These LEDs provide at-a-glance information about the operational status and health of the device, helping users to quickly assess whether the system is functioning normally or if attention is required.

Table 1-18 LED Indicators

LED	Color	Behavior	Description
P1/ P2	Green	ON	PWR is connected
		OFF	PWR is disconnected
RUN	Green	Blinking	The System is running and ready
		OFF	The system is still booting up and is not yet ready.
GNSS	Green	ON	The GNSS is connected, and satellite lock has been established
		Blinking	The GNSS signal is present but has not met the user-defined lock conditions. (See GNSS Settings in the user manual)
		OFF	The antenna is disconnected, or the XTS8600 is operating in FreeRun mode
1PPS	Green	Blinking	PPS is transmitting
		OFF	No PPS transmission
IRIG	Green	On	IRIG-B is enabled but no transmission
		Blinking	IRIG-B is transmitting
		OFF	IRIG-B is disabled or No IRIG-B transmission
SyncE	Green	ON	SyncE Master is operating
		OFF	SyncE Master isn't operating
HOLD	Green	ON	Clock for Holdover mode is ready
		Blinking	System enters Holdover mode
		OFF	Clock for Holdover mode isn't ready
ALM	Red	ON	When an alarm occurs, the LED will stay on or blink as per the settings. (See Alarm Settings in the user manual)
		Blinking	
		OFF	No alarms have occurred among the configured alarms

1.6.3 LAN LED Indicators

The XTS8600 is equipped with LED indicators for the LAN and Management (MGT) ports, which provide real-time feedback on the status and activity of the network connections. These LEDs are located adjacent to the corresponding ports on the front panel, as shown in the diagram.

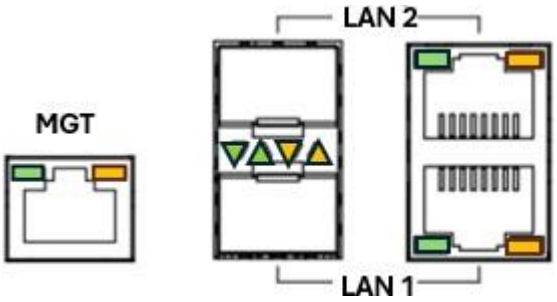


Figure 1-8 LAN LED Indicators

Table 1-19 LAN LED Behavior

LAN Behavior	Color	LED Behavior	Description
LAN1 & LAN2 Activity	Green	Blinking	Data transmission
		OFF	No data transmission
LAN1 & LAN 2 Link	Yellow	ON	Lan or SFP port is connected at 1000/100 Mbps
		OFF	Lan or SFP port is disconnected
MGT LAN Activity	Green	Blinking	Data transmission
		ON	No data transmission
MGT LAN Link	Yellow	ON	MGT port is connected at 100 Mbps
		OFF	MGT port is disconnected or MGT port is connected at 10 Mbps

2 XTS8600 Accessories Guide

2.1 Antenna

The XTS8600 Series offers two selectable antennas:

1. GNSS Antenna
2. GPS Antenna

Below are the specifications for the XTS8600 antennas. The XTS8600 can also use a user-supplied antenna, but it must meet the specification requirements of the GNSS receiver. Refer to subsection 3.1 Antenna

GNSS Antenna :

1. High-performance antenna designed for precision timing and demanding applications, including industrial, agricultural, and military use.
2. Incorporates a custom-designed, high-performance wideband patch element, a 42 dB gain low-noise amplifier (LNA), and a high-rejection SAW filter for out-of-band signals.
3. Delivers exceptional axial ratio, strong circular signal reception, superior multipath rejection, and robust out-of-band signal rejection.
4. Supports multiple GNSS constellations—BeiDou B1, Galileo E1, GPS-L1, GLONASS G1, and SBAS—within the 1559-1606 MHz range.
5. Equipped with a three-stage low-noise amplifier system and housed in a durable, weatherproof enclosure with a metal base, it ensures reliable performance in harsh environments.

Figure 2-1 Accessories - GNSS Antenna

Table 2-1 GNSS Antenna Specifications

Technical Specifications	
Accessory Name	*GNSS Antenna*
Antenna Specifications	
Frequency & Constellation	*High Gain Multi-Constellation Antenna* *Frequency Coverage: GPS & QZSS L1 | GALILEO E1 | BEIDOU B1 | GLONASS G1 Frequency Reception: 1559~1606 MHZ* *Out of Band Rejection: >32dB @ <1500 MHZ and >35dB @ 1640 MHZ*
Connector	*TNC Female*
Electric and RF Performance	*Gain: 42 dB typ., 40 dB min.* *Noise Figure: 1dB typ.* *VSWR: < 1.5:1 typ., 1.8:1 max.* *Supply Voltage Range: 2.5 to 16 VDC nominal, up to 50 mV p-p ripple* *Supply Current: 20 mA typ.* *ESD Current Protection: 15 kV air discharge*
Environmental Temperature	*Operating Temperature: -40 °C to +85 °C* *Storage Temperature: -55 °C to +95 °C*
Reliability	*Vibration: MIL-STD-810-E - Test Method 514.5* *Shock: MIL-STD-810-G - Test Method 516.6* *Salt Fog: MIL-STD-810-F - Test Method 509.5* *Other Tests: Hail, Humidity, Dust, Rain, Sand,* *Solar IP Rating: IP69K* *6: Complete Dust Tight* *9K: Protection against close range, powerful and high temperature water jets*
Compliance	*IPC-A-610, FCC, CE RED, RoHS, REACH*
Dimension and Mechanicals	*Size: 66.5 mm (dia.) x 76.3 mm* *(h.) Weight: 150g* *Mount: Through-hole (100 mm ground plane provided)*

GPS Antenna :

1. High-quality, permanently mounted GPS-L1 antenna, specifically engineered for professional precision timing purposes.
2. Incorporates a custom-designed, high-performance wideband patch element, a 40 dB gain low-noise amplifier (LNA), and a high-rejection SAW filter for out-of-band signals.
3. Delivers exceptional axial ratio, strong circular signal reception, superior multipath rejection, and robust out-of-band signal rejection.
4. This antenna offers a ±10 MHz bandwidth cantered on 1575.42 MHz, effectively covering GPS-L1, Galileo E1, and SBAS (WAAS/EGNOS/MSAS) signals.
5. The antenna is encased in a permanent-mount, industrial-grade weatherproof housing, ensuring durability in demanding environments.

Figure 2-2 Accessories - GPS Antenna

Table 2-2 GPS Antenna Specifications

Technical Specifications	
Accessory Name	*GPS Antenna*
Antenna Specifications	
Frequency & Constellation	*High Gain Multi-Constellation Antenna* *Frequency Coverage: GPS L1 | GALILEO E1* *Frequency Reception: 1565.42~1585.42 MHZ* *Out of Band Rejection:* *>42dB @ < 1560 MHZ* *>31dB @ >1600 MHZ* *>45dB @ >1620 MHZ*
Connector	*TNC Female*

Electric and RF Performance	*Gain: 40 dB min.* *Noise Figure: 1dB* *typ.* *VSWR: < 1.5:1 typ., 1.8:1 max.* *Supply Voltage Range: 2.5 to 16 VDC nominal, up to 50 mV p-p ripple* *Supply Current: 15 mA typ.* *ESD Current Protection: 15 kV air discharge*
Environmental Temperature	*Operating Temperature: -40 °C to +85 °C* *Storage Temperature: -55 °C to +95 °C*
Reliability	*Vibration: MIL-STD-810-E - Test Method 514.5* *Shock: MIL-STD-810-G - Test Method 516.6* *Salt Fog: MIL-STD-810-F - Test Method 509.5* *Other Tests: Hail, Humidity, Dust, Rain, Sand,* *Solar IP Rating: IP69K* *6: Complete Dust Tight* *9K: Protection against close range, powerful and high temperature water jets*
Compliance	*IPC-A-610, FCC, CE RED, RoHS, REACH*
Dimension and Mechanicals	*Size: 66.5 mm (dia.) x 76.3 mm* *(h.) Weight: 150g* *Mount: Through-hole (100 mm ground plane provided)*

2.2 RF Inline Amplifier

RF Inline Amplifier :

1. The RF Inline Amplifier is an affordable, durable, and waterproof in-line amplifier that offers a 25dB gain across the 1559 MHz to 1610 MHz frequency band.
2. This amplifier is specifically designed to enhance all GNSS L1 frequencies. It incorporates a two-stage low noise amplifier (LNA) with a mid-section SAW filter, making it ideal for extending cable lengths in applications like mast-mounted setups, large vehicles, and timing systems, all while maintaining system sensitivity.

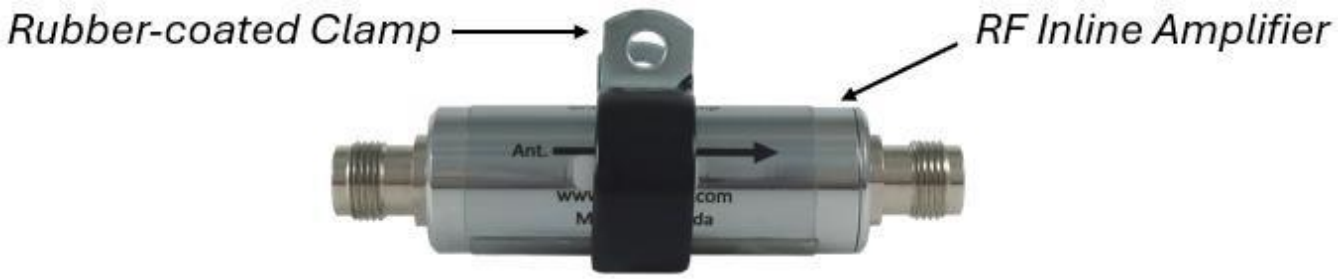


Figure 2-3 Accessories - RF Inline Amplifier

Table 2-3 RF Inline Amplifier Specifications

Technical Specifications	
Accessory Name	*RF Inline Amplifier*
Antenna Specifications	
Frequency	*Bandwidth: 1559~1610 MHZ*
Connector	*TNC Female*
Electric and RF Performance	*Normal Gain: 25 dB +4/-0 dB typ.* *Noise Figure: 2 dB typ.* *Pass Band Ripple: ±2 dB* *Impedance: 50 Ohms* *Input and Output VSWR: 1.5 typ. / 2 max.* *Reverse Isolation: > 35dB (Amplifier is Directional)* *Supply Range Voltage: 3 to 10 VDC* *Supply Current: 10mA typ, 15mA max*
Environmental Temperature	*Operating Temperature: -40 °C to +85 °C*
Reliability	*IP Rating: IP67*
Compliance	*IPC-A-610, FCC, CE RED, RoHS, REACH*
Dimension and Mechanicals	*Size: 20 mm (dia.) x 85 mm (L.) (Including Length of TNC Female Connector) Weight: < 85g*

2.3 Surge Protector

The XTS8600 Series offers two selectable surge protectors:

1. Surge Protector
2. Advanced Surge Protector

Surge Protector :

Including L-Bracket , Hex Nut, Toothed Lock Washer and Rubber Washer.

1. Connector: TNC (Female) to TNC (Male)
2. Impedance: 50 Ohm
3. Frequency Range: DC 0~ 6 GHZ
4. VSWR: < 1.5
5. Gas Tube DC Spark Over Voltage: 230V
6. Gas Tube Impulse Discharge Current (Wave 8/20 us)10 Times (5 Times Each Polarity): 10KA
7. Durability: 500 Cycles Min
8. Depth: 68 ± 0.5 mm Width: 22.8 mm Height: 22.8 mm
9. Operating Temperature: -40 °C to +90 °C
10. Waterproof: IP65
11. RoHS Compliance
12. **L-Bracket:** Diameter of screw: 5 mm

Figure 2-4 Accessories - Surge Protector

Advance Surge Protector:

Including: One Surge Protector, One L-Bracket, one N-type Male to TNC Male adapter and one N-type Male to TNC Female adapter.

1. Connector: N-Type (Male) to N-Type (Female)
2. Impedance: 50 Ohm
3. Cut-Off Frequency Range: > 3 GHZ
4. VSWR: < 1.10 (≤ 2GHz)
5. Gas Tube DC Spark Over Voltage: 280V
6. Gas Tube Impulse Discharge Current: 20KA
7. Waterproof: IP55
8. Operating Temperature: -40 °C to +80 °C
9. Depth: 67 mm Width: 25 mm Height: 25 mm
10. Regulatory: IEC 61643-21
11. **L-Bracket:** Diameter of screw: 5.2 mm

Figure 2-5 Accessories - Advanced Surge Protector

2.4 Mounting Kits

Mounting Kits:

The XTS8600 mounting kit includes three items: an L-bracket mount, a pipe mount, and a ground plane. Refer to subsection 3.3 Antenna Installation, for instructions on how to use these items to install the antenna.

Mount Adapter (M18 to 3/4" Pipe):

- Material: Aluminum
- Dimension: 29.5 mm (H) x 31.75 mm (W), with 22 mm Diameter

L-Bracket:

- Material: Aluminum
- Diameter of antenna hole: 7.5 mm
- Diameter of screw: 1.87 mm

Ground Plane:

- Material: Aluminum
- Diameter: 100 mm

Figure 2-6 Accessories - Mounting Kits

2.5 SFP Transceivers

Below table lists all the verified SFP modules for the XTS8600. These verified SFP modules ensure compatibility and optimal performance with the XTS8600 in a range of network configurations.

Table 2-4 Verified SFP Transceivers

Part number	Data Rates	Wavelength	Light Source	Media	Distance	Temperature
XTR-38-FM-2K	125~155 Mbps	1310 nm	FP	Multi-mode	2 KM	-40°C ~85°C
XTR-38-FS-30K	155 Mbps	1310 nm	FP	Single-mode	30 KM	
XTR-28-SX-550M	1.25 Gbps	850 nm	VCSEL	Multi-mode	550 M	
XTR-38-SX-2K		1310	FP	Multi-mode	2 KM	
XTR-38-LX-10K		1310	FP	Single-mode	10 KM	
XTR-38-EX-40K		1310	DFB	Single-mode	40 KM	

2.6 External Power Adapters

Refer to AGATEL SDR for the spec.

3 Antenna Installation Guide

3.1 Antenna Selection

The XTS8600 is optimized for use with an active antenna featuring an integrated Low-Noise Amplifier (LNA) to effectively capture GNSS signals, which reach the earth at a low power of approximately -130 dBm. The verified XTS8600 antenna is equipped with a pre-amplifier that expertly filters and amplifies these signals before passing them to the receiver. Given that GNSS signals cannot pass through conductive or dense materials, the antenna must be installed outdoors in a location with an unobstructed view of the sky. Considerations for waterproofing and operating temperature are also essential.

For the best performance, we highly recommend using the XTS8600 verified antenna, as outlined in subsection 2.1 Antenna. While users may opt to use their own antenna, it must meet certain baseline requirements as below spec requirements. Please note that AGATEL cannot guarantee optimal GNSS signal quality if a non-verified antenna is used.

Spec Requirements of User-Supplied Antenna:

- **GNSS Spectrum**: GPS L1 or GNSS (GPS & QZSS L1 | GALILEO E1 | BEIDOU B1 | GLONASS G1)
- **Frequency**: 1559MHZ~1606MHZ
- **Connector**: SMA Female or TNC Female
- **Operating Voltage**: 3.3VDC ±5%,
- **Maximum Operating Current**: 50mA
- **Gain value**: The antenna gain to the device should not exceed 40dB
- **Noise Figure**: < 1.5dB is recommended
- **ESD Protection**: 15KV air discharge is recommended
- **Operating Temperature**: Depends on the annual outdoor high and low peak temperatures
  - -40 °C to +85 °C is recommended
- **Waterproof**: IP67 is recommended

3.2 Cable Selection

Cable length is the primary factor contributing to signal attenuation. Different cables have varying levels of loss, which can significantly impact the overall RF gain. It is important to select a cable that minimizes loss while ensuring durability and flexibility for the intended application.

Suggested Maximum Antenna Cable Length:

Table 3-1 Suggested Maximum Antenna Cable Length

Cable Type	Antenna Type	Surge Protector	RF Inline Amplifier	Suggested Maximum Cable Length
RG-58 A/U	GNSS	*Surge Protector or Advanced Surge Protector*	No	25 meters
RG-58A/U	GPS		No	25 meters
RG-58 A/U	GNSS		*Yes*	50 meters
RG-58A/U	GPS		*Yes*	50 meters
CFD-200	GNSS		No	50 meters
CFD-200	GPS		No	50 meters
CFD-200	GNSS		*Yes*	80 meters
CFD-200	GPS		*Yes*	80 meters
LMR-400	GNSS		No	150 meters
LMR-400	GPS		No	150 meters
LMR-400	GNSS		*Yes*	250 meters
LMR-400	GPS		*Yes*	250 meters

Note: ***Suggested Maximum Cable Length***
The suggested maximum cable length listed in the table provides a conservative recommendation based on tested and verified results.

While it's possible to extend beyond these suggested lengths by calculating the signal loss and determining a theoretical maximum length, it's essential to note that cable quality varies significantly between manufacturers. Additionally, older cables may not perform as efficiently as new ones. The suggested values here consider these factors, ensuring reliable performance by using conservative calculations and confirming effectiveness through practical testing.

Recommended Cable Types:

RG-58A/U:

It is a flexible and cost-effective coaxial cable that is commonly used for shorter cable runs and less demanding applications. Its smaller diameter makes it easy to install in tight spaces, and it is suitable for applications where cost and flexibility are primary concerns. However, RG-58A/U has higher signal attenuation, meaning it is not ideal for long cable runs or high-frequency applications, as it may result in signal loss over greater distances.

CFD-200:

It is a medium-grade coaxial cable that offers a balanced trade-off between performance, size, and flexibility. Compared to RG-58A/U, CFD-200 provides lower signal attenuation, making it more suitable for moderate cable lengths where signal quality is still a concern. While it does not match the ultra-low loss characteristics of LMR-400, it is thinner and more flexible, which makes it easier to install in constrained environments. CFD-200 is a practical choice for users seeking better performance than RG-58A/U without the bulk and rigidity of LMR-400.

LMR-400:

It is a low-loss coaxial cable known for its superior performance in maintaining signal integrity over longer distances. It has significantly lower attenuation compared to RG-58A/U, making it the preferred choice for applications requiring longer cable runs or where minimizing signal loss is crucial. The trade-off is that LMR-400 is thicker, less flexible, and generally more expensive than RG-58A/U, which may make installation more challenging in tight or complex environments.

Cable Selection:

In summary, RG-58A/U is best suited for shorter, less critical runs where cost and flexibility are the main priorities. CFD-200 offers a middle-ground solution, providing better signal performance than RG-58A/U while remaining more flexible and easier to install than LMR-400. It is ideal for moderate cable lengths where a balance between performance and manageability is needed. LMR-400, on the other hand, is recommended for longer runs and high-performance applications where maintaining signal quality is essential..

3.3 Antenna

Installation Antenna

Connection Setup:

As shown below, there are four steps to install the Antenna and connect to the XTS8600.

Be sure to read subsection 3.1 Antenna Selection, and subsection 3.2 Cable Selection, before proceeding with the antenna installation.

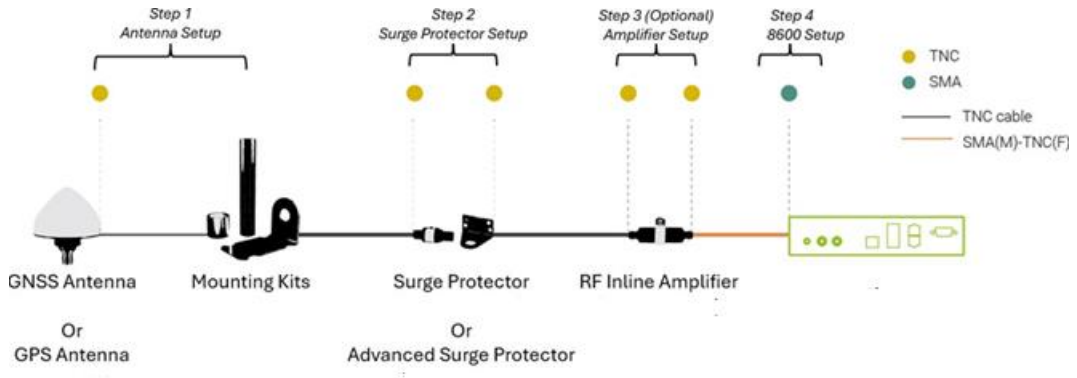


Figure 3-1 Antenna Connection Setup

Antenna Installation Completion Diagram:

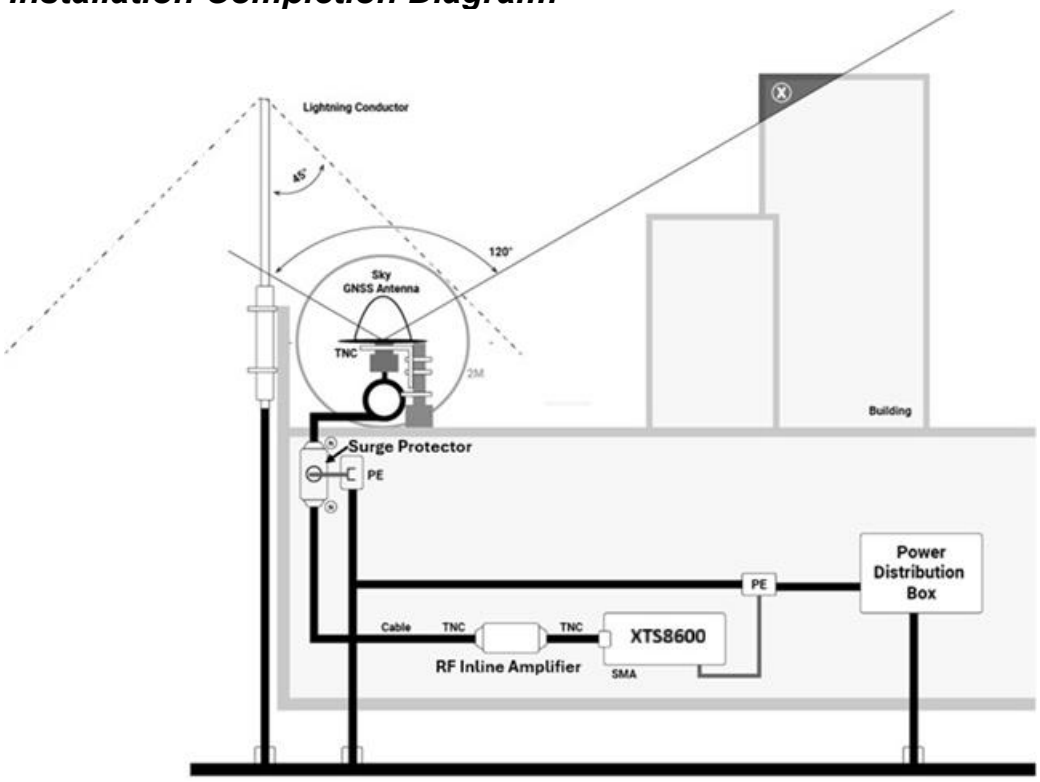


Figure 3-2 Antenna Installation Completion Diagram

Step 1 - Antenna Setup:

Step 1-1: Personal Safety During Installation

1. Please strictly follow the construction safety regulations established in each country or region.
2. Please refrain from sending personnel for installation, operation, or maintenance during adverse weather conditions.

Step 1-2: Site Confirmation for Antenna Installation

1. Mount the antenna in a clear sky view area, with no obstructions within a 120-degree elevation to vertical.
2. Keep it at a distance from high-power transmitters to avoid interference. When installing multiple GNSS/GPS antennas, ensure at least 1 meter of separation between them.
3. If there is a lightning rod, place it within the 45° range, maintaining a distance of more than 2 meters from the lightning rod.

4. Avoid routing the antenna cable in areas where it may be submerged in standing water.

Step 1-3: Determine the quantity and length of TNC cables needed.

Since a surge protector is highly recommended, you will need at least two TNC cables. One TNC cable connects the antenna to the surge protector, while the other TNC cable connects the opposite side of the surge protector to the XTS8600. If an RF Inline Amplifier is also used, you will need three TNC cables.

/*Important Notice*/: The total cable length must not exceed the maximum suggested length as described in subsection 3.2 Cable Selection.

Step 1-4: Antenna Assembly and Mounting:

Refer to section 2 XTS8600 Accessories Guide for the mounting kits and antenna. The picture below indicates both the item names and their order for antenna installation. Customers can also use their existing 3/4" pipe with the item 6 M18 Mount Adapter to secure the antenna. If so, skip all item 3 (L-Bracket) installation steps.

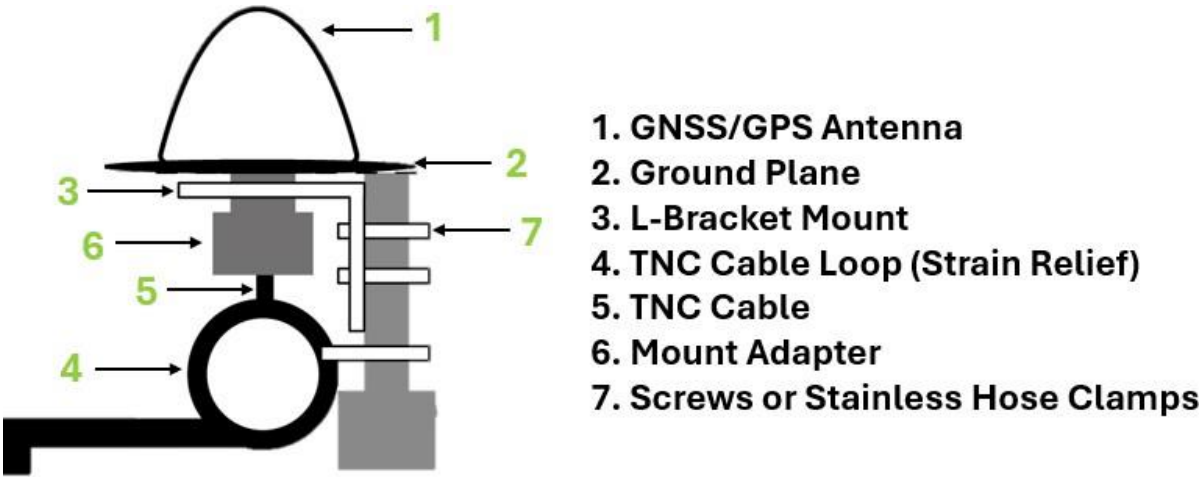


Figure 3-3 Antenna Assembly and Mounting

1. Rotate to remove the stainless-steel washer and stainless-steel panel nut from the antenna.

Figure 3-4 Washer and Nut of Antenna

2. Pass the ground plane through the bottom of the antenna.
   - A ground plane is recommended for all XTS8600 antennas, as it greatly enhances signal strength and improves positioning accuracy and precision.

3. Place the rubber washer between the L-bracket and the aluminum ground plane to reduce the risk of galvanic corrosion.
4. Pass the L-bracket mount through the bottom of the antenna
5. Rotate the stainless-steel washer so it is pressed tightly against the L-bracket. Rotate the stainless-steel nut so it is pressed tightly against the stainless-steel washer. Teflon tape can be used for electrical insulation and waterproofing.
6. Create a loop in the cable and use a tie wrap to secure it to the pole. This will help relieve any tension on the cable
   - Strain relief is essential to protect the cable from tension or pulling forces that could damage the connection or internal wires.
7. Pass the TNC cable through the 6 mounting adapter and connect it to the TNC female connector on the antenna.
8. Rotate the mount adapter to secure it onto the antenna
9. Use screws through the screw holes on the L-bracket to secure it to a wall or pipe or use stainless hose clamps to attach the L-bracket to a wall or pipe to secure the antenna. The screw hole is 1.87 mm.

   /*Important Notice*/: The Rubber Washer, Teflon Tape, Stainless Hose Clamps (Mounting Clamp) and Screws are not provided by AGATEL. These are the commonly used materials with high availability for purchase.

Step 2 – Surge Protector Setup:

Step 2-1: Location Confirmation for Surge Protector

1. Once the antenna cable enters indoors, it's strongly suggested to connecting it to a surge protector as the first line of defense against lightning surges from outside entering through the cable

Step 2-2: Surge Protector Installation

1. Pass the surge protector through the small L-bracket (included in the surge protector package)
2. The screw hole of surge protector L-Bracket is around 5 mm. Use screws through the screw holes on the L-bracket to secure it to a wall or pipe.
3. Using TNC cable, attach one end of the surge protector to antenna and the other end to the XTS8600.
4. Ground the surge protector

Step 3 – RF Inline Amplifier Setup (Optional):

/*Important Notice*/: Read subsection 3.2 Cable Selection and check whether you actually need the RF Inline Amplifier. Using a short cable with an RF Inline Amplifier may damage the XTS8600 GNSS receiver.

Step 3-1: Location Confirmation for RF Inline Amplifier

1. The RF Inline Amplifier is best located as close as possible to the device.

Step 3-2: RF Inline Amplifier Installation

1. Amplifiers are directional and must be installed according to the orientation shown on the product label, with the arrow pointing away from the antenna.
2. Using TNC cable, attach one end of the Inline Amplifier to antenna and the other end to the XTS8600.

3. Use screws through the screw holes on the rubber-coated clamp to secure Amplifier to a wall or pipe.

Step 4 – XTS8600 Setup:

Step 4-1: Relieve tension on the antenna cable connected to XTS8600

1. A 2-meter SMA (M) to TNC (M) cable is included with the purchase of the XTS8600 GNSS or GPS antenna. This cable is designed to alleviate tension on the antenna connection to the XTS8600, particularly beneficial for rigid cables such as the LMR400.
2. If you are using your own antenna, an SMA (M) to TNC (F) adapter is included with the purchase of XTS8600. It is highly recommended to use flexible, shorter cables (approximately 2 meters) such as CFD-200 or RG-58 A/U to reduce tension on the antenna connection to the XTS8600.

Step 4-2: Check Status on XTS8600 Web

If you have faithfully followed steps 1 through 4, the antenna installation and cable connection to the XTS8600 are complete. Next, check the antenna and GNSS status on the XTS8600 Web interface. Follow the instructions in the subsection below to access the XTS8600, view the status, and configure the related settings.

1. Subsection 4.2 Rack mount Installation (Rack mount is optional if needed)
2. Subsection 4.3.1 Grounding the XTS8600
3. Subsection 4.3.2 Power Connection
4. Subsection 4.3.4 Web Connection – MGT Interface
5. Subsection 4.3.6 Commissioning GNSS and Antenna

4 Quick-Start Guide

In the Quick Start Guide, users should follow the items marked as **Mandatory** for proper connection and initial commissioning of the XTS8600. Steps labelled as **Recommended** or **Optional** can be performed based on specific requirements.

Table 4-1 Necessary and Optional Quick-Start Items

Connection and Initial Commissioning	Necessity	Note
4.1 Unboxing the XTS8600 Packaging Box	Mandatory	
3. Antenna Installation Guide	Mandatory	For Grandmaster mode
4.2 Rack mount Installation	Mandatory	For Rack mount
4.3.1 Grounding the XTS8600	Mandatory	
4.3.2 Power Connection	Mandatory	
4.3.3 Reset to Default	Optional	
4.3.4 Web Connection – MGT Interface	Mandatory	
4.3.5 CLI Connection – Console Port	Optional	
4.3.6 Commissioning GNSS and Antenna	Mandatory	For Grandmaster mode
4.3.7 LAN1/LAN2 Connection	Mandatory	
4.3.8 Commissioning NTP Server	Mandatory	For NTP Server
4.3.9 Commissioning PTP Service	Mandatory	For PTP Service
4.3.10 Connecting Sync-Out Module	Optional	
4.3.11 Commissioning Sync-Out Module	Optional	
4.3.12 Relay (Alarm Contact) Connection	Recommended	
4.3.13 Commissioning Relay, Trap and Alarm LED	Recommended	
4.3.14 MicroSD Card Installation	Optional	

4.1 Unboxing the XTS8600 Packaging Box

When you receive the XTS8600 package, carefully unpack the box and place the contents in a secure location. Cross-check the contents with the packing list to ensure all parts, as shown in the pictures below, are present. If anything is missing, contact AGATEL (https://agatel.co.uk/) immediately for support.

Figure 4-1 Unboxing the XTS8600

Table 4-2 XTS8600 Unboxing Items

Item Number	Item	Description
1	XTS8600 Hardware Installation Guide	The manual containing installation instructions and setup guidelines for the XTS8600.
2	Two SFP Interface Dusty Covers.	Protective covers for the SFP interfaces to prevent dust or debris from entering.
3	SMA Male-to-TNC Female Adapter	A connector adapter for TNC cable connections to the GNSS antenna.
4	TB3 Male Connector	A terminal block connector for external connections, typically used for XTS8600I Sync-Out Channel 6 (RS-485 IRIG-B). Refer to item 10 in subsection 1.5 Connectors. This item is only included in XTS8600I series.
5	8 x Countersunk Flat Head Screws	Screws used for securing the XTS8600 and mounting brackets during installation.
6	Left Mounting Bracket	A bracket used to mount the XTS8600 to a rack, designed for the left side.
7	XTS8600 Device	The XTS8600 itself, a high-performance PTP Grandmaster and NTP server device.

8	Right Mounting Bracket	A bracket used to mount the XTS8600 to a surface or rack, designed for the right side.
9	TB7 Male Connector	7 pins 5.08mm terminal block for connecting DC power and relay. Refer to item 9 in subsection 1.5 Connectors. This item is only included in XTS8600/XTS8600I DC version.

4.2 Rack Mount Installation

Refer to subsection 4.1 for the items and their descriptions. To install the XTS8600 in a rack, begin by attaching the Left Mounting Bracket (Item 6) and Right Mounting Bracket (Item 8) to the sides of the XTS8600 device (Item 7). Use the Countersunk Flat Head Screws (Item 5) to secure both brackets to the device. Ensure the brackets are tightly fastened to provide stability during operation. Once the brackets are attached, carefully align the device within the rack and secure it in place with additional screws, if needed, based on the rack specifications.

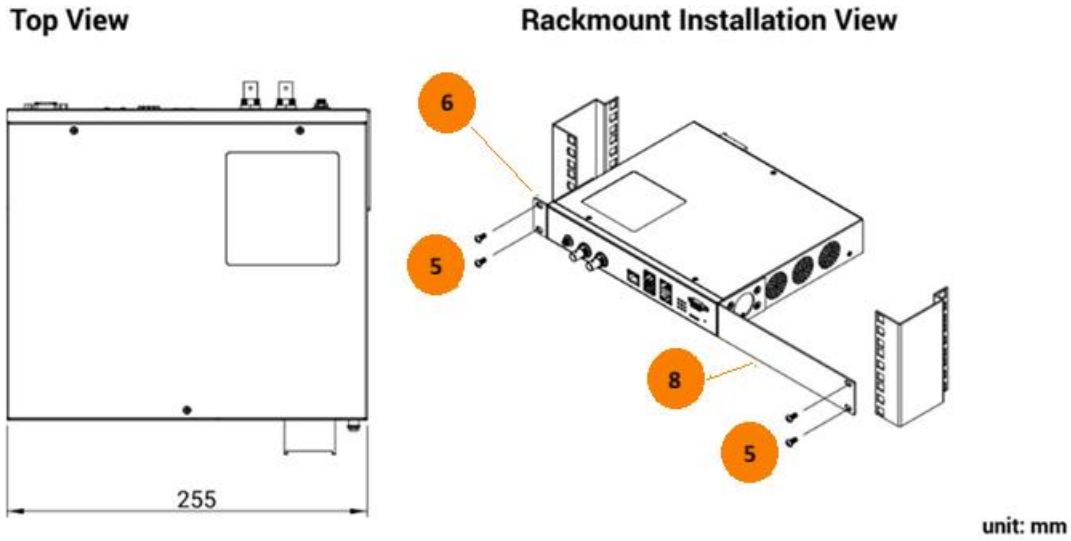


Figure 4-2 Rackmount Installation

4.3 Connection and Initial Commissioning

4.3.1 Grounding the XTS8600

Refer to item 13 in subsection 1.5 for the location of XTS8600 grounding. All grounding electrodes at each building or structure served must be bonded together to create a unified grounding electrode system.

1. To properly ground the XTS8600, use the M4 screw labelled as item 13 of subsection 1.5 Connectors to connect the device to a reliable earth ground, following local electrical codes. This grounding helps protect the device from electrical surges and interference, enhancing reliability and safety.
2. Ensure all connected equipment shares a common ground to avoid ground loops, and regularly inspect connections for security and corrosion. Use compatible, low-resistance cables and connectors for optimal grounding performance.

4.3.2 Power Connection

The following table shows the specifications for the XTS8600 DC and AC power. This will help you set up the power connection.

Table 4-3 Power Connection

	DC Power	AC Power
Supporting Models	XTS8600-DC / XTS8600I-DC	XTS8600-AC / XTS8600I-AC
Connector	TB7 5.08mm Female	M4 Screw
Pin Definition	Refer to item 9 of subsection 1.5	Refer to item 12 of subsection 1.5
Power Inputs	Two DC Inputs	Single AC Input / Using two external power adapters (SDR-75-24) with XTS8600 DC model for two AC Inputs
Power Redundancy	Yes	Yes
Power Input Range	19 – 66 VDC	85 – 264 VAC, 50/60 HZ 88 – 300 VDC
Power Consumption	9.4W @ 264VAC (Max)	
Power Protection	Reverse power input Overvoltage protection Overcurrent protection Power Line surge protection	Overvoltage protection Overcurrent protection Power Line surge protection

DC Power Connection:

1. A TB7 5.08mm male connector is included with the XTS8600 shipment to connect to the DC power input and relay shown in the diagram below. Refer to subsection 4.1 Unboxing the XTS8600 Packaging Box, item 9 for details on the TB7 5.08mm male connector.
2. To connect DC power to the device, follow the labelled terminal layout in the diagram below. Terminals 4 and 5 (labelled P1 + and P2 +) are the positive inputs for the primary and secondary power supplies, respectively. Connect the positive leads from your DC power sources to these terminals. Terminals 3 and 6 are the negative terminals for P1 and P2, respectively, and should be connected to the negative leads from your power sources.

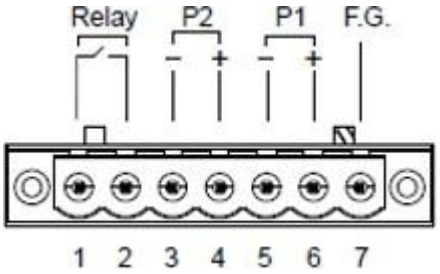


Figure 4-3 DC Power Connection

AC Power Connection:

1. To connect AC power to the XTS8600, use the M4 screw as shown in the diagram. Connect the N/+ terminal to the AC power line (positive/live) and the L/- terminal to the AC neutral. The F.G. (Frame Ground) terminals provide grounding for the device chassis, offering protection against electrical noise and potential faults. Make sure all connections are secure and follow safety guidelines to ensure reliable operation.
2. XTS8600 supports only a single AC power connection. Two external power adapters, SDR-75-24, are required with the DC model of the XTS8600 to achieve dual AC power connection.

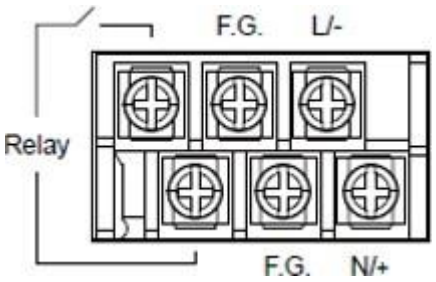


Figure 4-4 AC Power Connection

4.3.3 Reset to Factory Default

1. Refer to item 8 in subsection 1.5 for the location of XTS8600 Reset Pinhole.
2. To reset the XTS8600 to factory default settings, press and hold the reset pinhole for 10 seconds. You will hear a distinct buzzer sound, different from the sound made when the XTS8600 restarts, indicating that the reset to default process is starting. Note that performing a factory reset is not necessary for the initial setup out of the box; it's intended for restoring the device to its original settings if configuration changes need to be erased.

4.3.4 Web Connection – MGT Interface

Before connecting to the web, you should set up the IP address to access the XTS8600 web interface.

Refer to item 3 in subsection 1.5 for the location of the XTS8600 MGT interface. The MGT interface is used for web configuration, remote CLI (including Telnet and SSH), AGATEL Device Management Utility, SNMP management, and SNMP Trap/Inform. Additionally, it can also be used as an NTP server. In other words, aside from PTP, it can support all other network communications that the XTS8600 provides.

MGT Interface Spec:

The MGT interface features an RJ-45 connector with a default IP & Netmask of 192.168.2.1 / 255.255.255.0, supporting 10/100 BASE-T(X) speed with auto-negotiation mode. It provides access to the web interface and supports remote CLI management, SNMP management, SNMP Trap/Inform, and acts as an NTP server. The Device Management Utility can be used for additional configuration and management. However, the MGT interface does not support PTP, clustering, PRP, bonding, or SyncE Master functionality. Firmware updates are supported through this interface. For LAN LED status, users can refer to subsection 1.6.2 for more information

Table 4-4 MGT Interface Spec

	MGT Interface
Connector Type	RJ-45
Default IP & Netmask	192.168.2.1 / 255.255.255.0
Speed	1x 10/100 BASE-T(X) with Auto-negotiation mode only
LAN LED	Refer to subsection 1.6.2
Access Web Interface	Yes
Management – Remote CLI	Yes
Device Management Utility	Yes
SNMP Management	Yes
SNMP Trap/Inform	Yes
NTP Server	Yes
PTP	No
Redundancy -Clustering	Yes
Redundancy - PRP	No
Redundancy - Bonding	No
FW Update	Yes
SyncE Master	No

Default Account and Password:

The default password could be changed in subsection 5.4.3 Password .

Table 4-5 Default Account and Password

Login Parameter	Value
Username	admin
Password	agatel

Using default IP of MGT interface to connect Web:

The default IP address for the XTS8600 MGT interface is 192.168.2.1. To connect to the XTS8600 web interface, ensure your computer is on the same network subnet. Set your computer's IP address to something in the 192.168.2.x range but avoid 192.168.2.1 to prevent conflicts. Once your network settings are configured, open a web browser and enter *https://192.168.2.1* in the address bar. This will take you to the XTS8600 web interface.

For initial login, the factory default username is **admin** and the password is **default**. Use these credentials to log in and begin configuration.

Configure MGT Interface IP via Device Management Utility for web access.:

/*Important Notice*/: If you have already used the default IP of the MGT interface to connect to the XTS8600 Web, you may skip this section. However, it is strongly recommended to install the AGATEL Device Management Utility, as this tool can also be used to configure other LAN interfaces of the XTS8600 or update the firmware.

AGATEL Device Management Utility is a lightweight tool that helps you configure the network settings of all XTS8600 network interfaces to connect to the web interface.

1. Click this link: AGATEL Device Management Utility to download and install

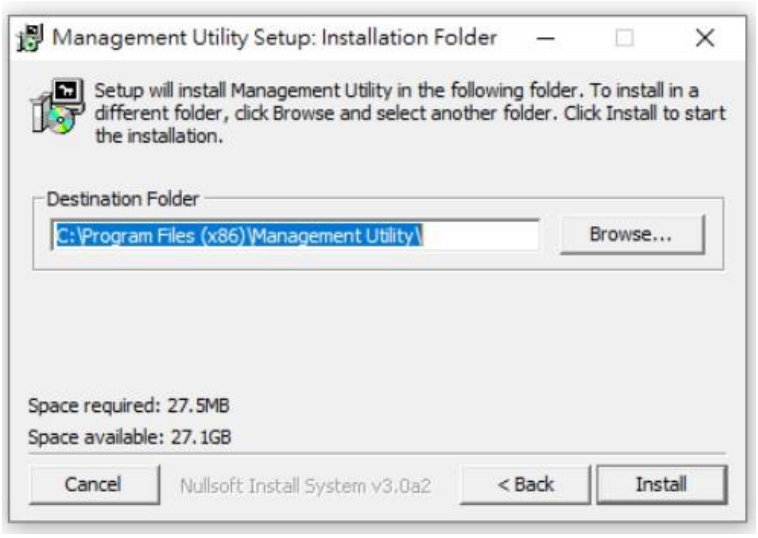


Figure 4-5 Install AGATEL Device Management Utility

2. After installation, run the Device Management Utility and click the search button, highlighted in yellow, to display all AGATEL devices.

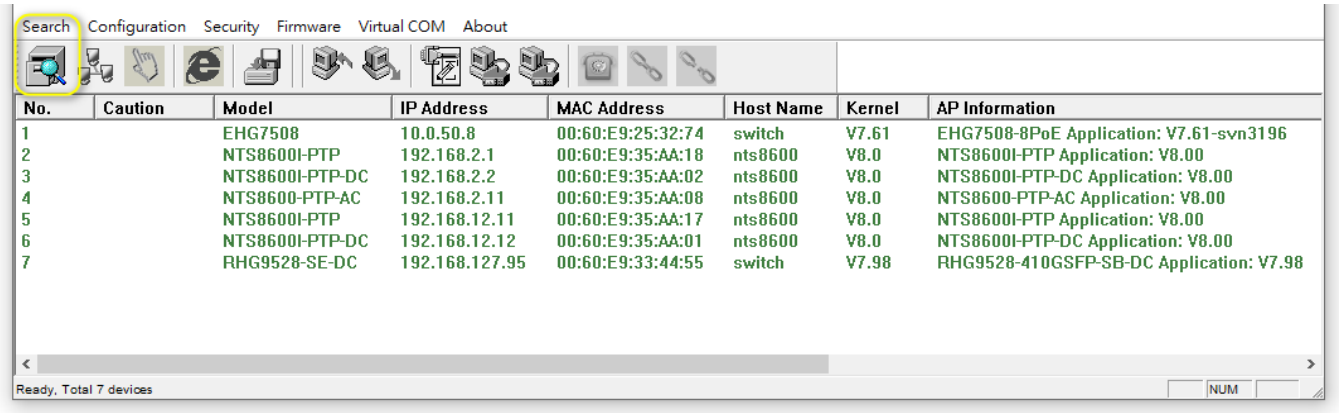


Figure 4-6 Search XTS8600

3. Select the XTS8600 device for which you intend to configure the IP of the MGT interface. Then, click the configuration icon in the toolbar, highlighted in yellow. The Network Settings interface will appear, allowing you to configure the MGT interface. Please note that if LAN1, LAN2, and the MGT interface are all linked and connected to the same subnet, they will all be displayed. This also allows you to configure LAN1 or LAN2 as needed.

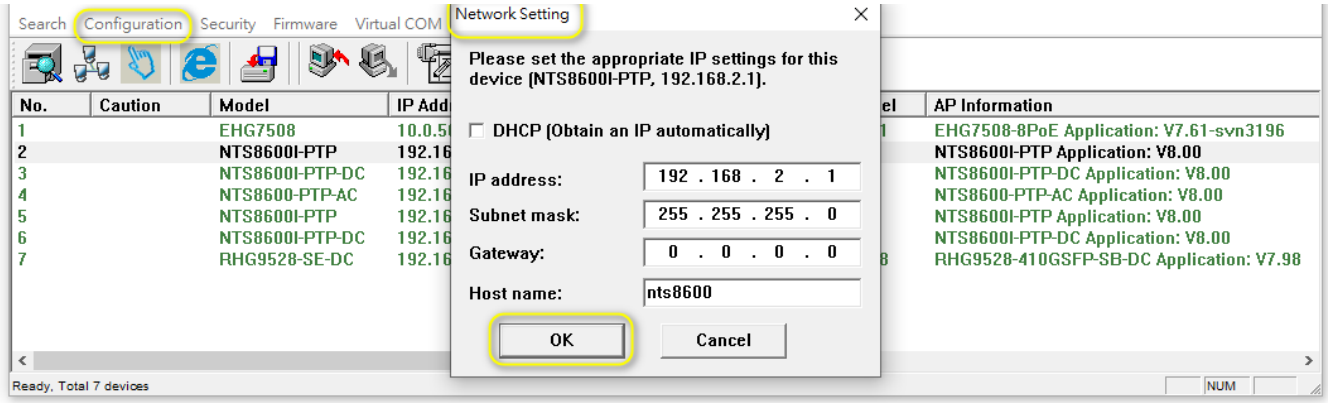


Figure 4-7 Network Setting - Management Utility

Connecting to XTS8600 Web

1. Once your network settings are configured, whether using the default IP of the MGT interface or configured through the Device Management Utility, open a web browser and enter *https://YOUR-CONFIGURED-IP-ADDRESS* in the address bar. This will take you to the XTS8600 web interface.

2. If this is the first time users are accessing the XTS8600, the web browser (e.g., Google Chrome) may detect that the XTS8600 does not have a valid certificate authority. Users can proceed by clicking the Advanced button, as shown in the figure below.

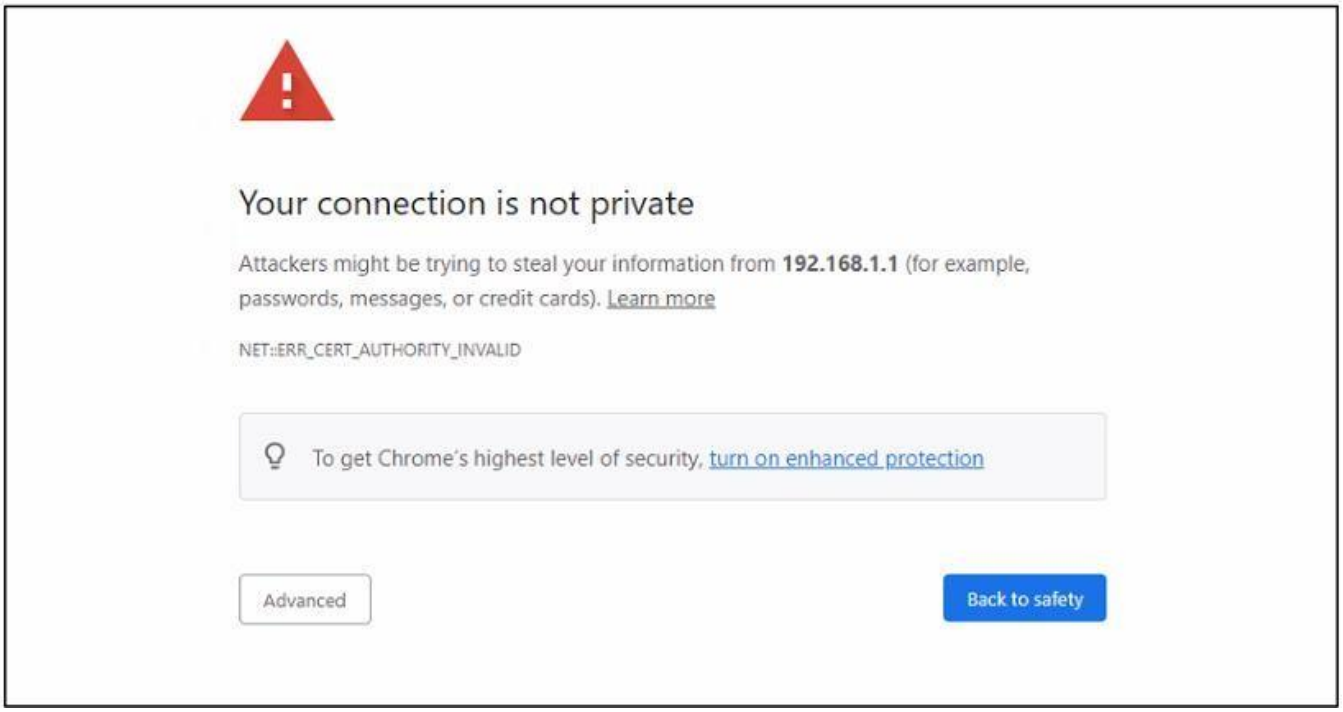


Figure 4-8 Warning of Valid Certificate - Chrome

3. After clicking the Advanced button, an explanation will appear below, as shown in the figure below. At the bottom of the page, a hyperlink is provided for users to access the web GUI

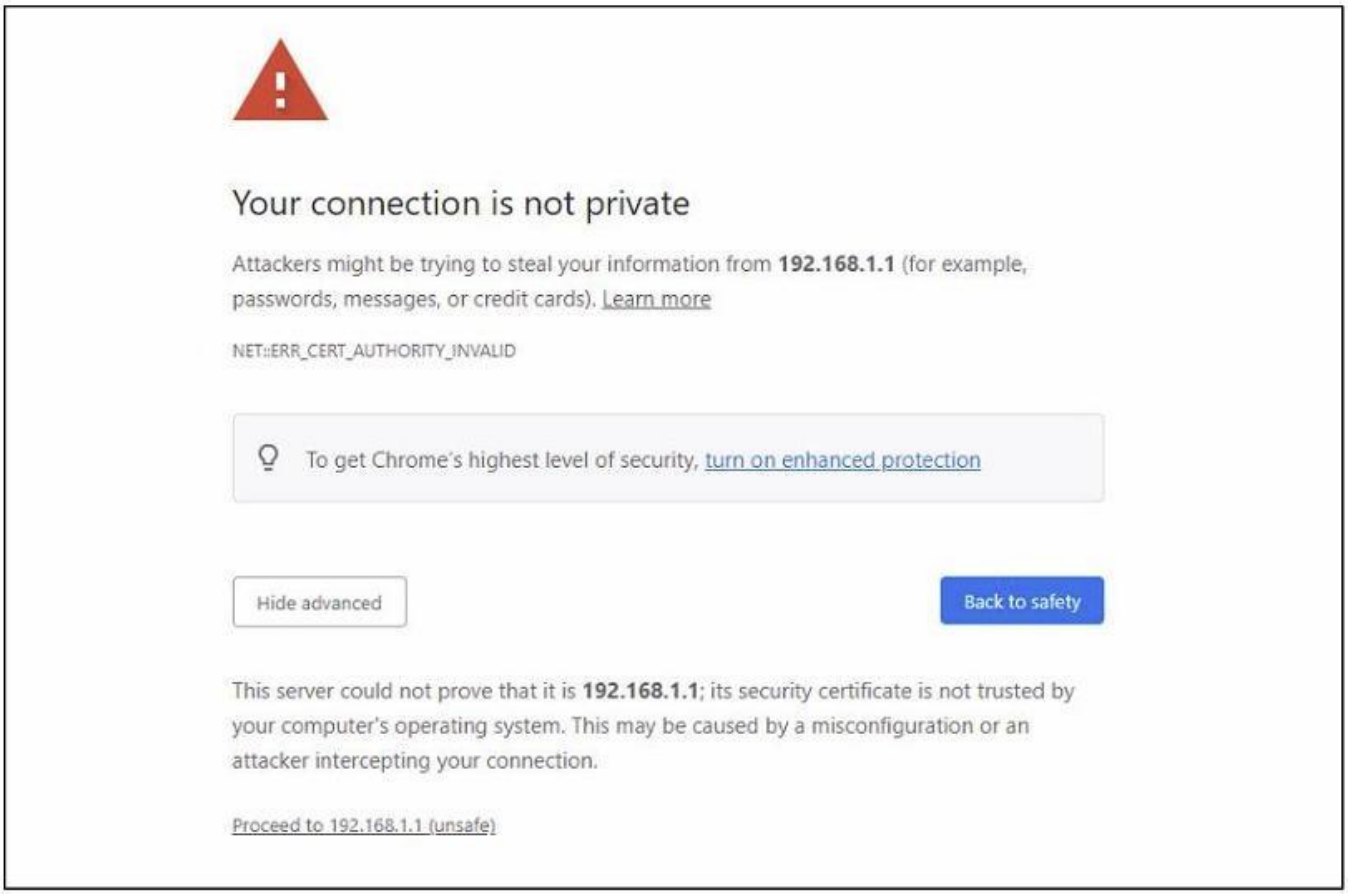


Figure 4-9 Warning of Valid Certificate #2 - Chrome

4. For initial login, the factory default username is **admin** and the password is **default**. Use these credentials to log in and begin configuration. It's strongly recommended to change the password after the initial login.

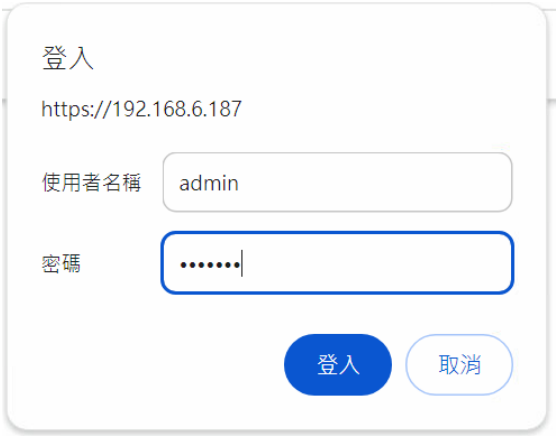


Figure 4-10 Login Window

4.3.5 CLI Connection – Console Port

/*Important Notice*/: The XTS8600 currently does not support the CLI function. However, this feature is already in development and will be included in an upcoming firmware release as soon as possible. Stay tuned for updates to enhance your XTS8600 experience.

Refer to item 6 in subsection 1.5 Connectors for the location, connector and PIN definitions of XTS8600 Console Port.

The front panel includes a bi-directional RS-232 port compliant with the EIA standard. This serial port allows access to the command line interface (CLI), enabling status checks and configuration of the time server.

PIN Definitions of Console Port:

Table 4-6 PIN Definitions of Console Port

Connector Type	IO	Description
DB9 Female	Bidirectional	1x DB9 Serial Console Port for Command Line Interface

Pin	Description
2	RX
3	TX
5	GND
Other Pins	Unused

Default Setting of Console Port:

User can change the console port settings in subsection 5.4.5 Console Port.

Table 4-7 Default Setting of Console Port

Setting	Value
Dat Rate	115200 bps
Parity	None
Data Bits	8
Stop Bits	1
Flow Control	None

4.3.6 Commissioning GNSS and Antenna

1. ***Check Antenna Status***:

   1.1 Ensure you have followed Section 3 of the Antenna Installation Guide to correctly select the cable and install the antenna.

   1.2 Refer to subsection 6.6 Clock Information and check the Antenna Status. It shall show "Connected".

2. ***Check the Constellation and Signa Reception from Satellite***:

   2.1 The default constellation setting enables both GPS and GLONASS. Refer to subsection 5.3.1 GNSS Settings to change the constellation settings for receiving corresponding satellite signals. Before changing the constellation settings, ensure that your antenna supports the selected constellation.

   2.2 Refer to subsection 6.6, Clock Information, and review the following statuses with their suggested values. If you switch to a different constellation, ensure that from 2.2.4 onward, you check the average dB value of the enabled constellation.

      2.2.1 Visible Satellites: Greater than 12

      2.2.2 Satellites Used: Greater than 8

      2.2.3 Average dB value: Greater than or equal to 20dB

      2.2.4 GPS Average dB value: Either the GPS or GNSS average dB value is greater than or equal to 20 dB.

      2.2.5 GLONASS Average dB value: Either the GPS or GNSS average dB value is greater than or equal to 20 dB.

   2.3 Under normal conditions, the device should start connecting and obtain the correct time within 5 to 10 minutes after powering on. The **GNSS Status** described in the subsection 6.6 Clock Information shall show "**Locked**".

3. ***What to Do if the Satellite Signal Is Weak***:

   3.1 Check the Antenna Placement: Refer to Section 3 of the Antenna Installation Guide.

      3.1.1 Ensure the antenna is installed in an open area with a clear view of the sky, free from obstructions like buildings, trees, or other structures.

      3.1.2 Relocate the antenna to a higher position, if possible, to improve signal reception.

   3.2 Verify Antenna Specification: Refer to subsection 3.1 Antenna Selection

      3.2.1 Confirm that the antenna is compatible with the GNSS constellations you are using (e.g., GPS, GLONASS).

      3.2.2 Check if the antenna has the appropriate gain and noise specifications for optimal performance.

   3.3 Check Cable Length and Attenuation: Refer to subsection 3.2 Cable Selection

      3.3.1 Verify that the cable length is appropriate for the antenna and does not cause excessive signal attenuation. If the cable is too long, consider using a low-loss cable or adding an amplifier to boost the signal

   3.4 Evaluate Environment Interference:

      3.4.1 Identify and reduce potential sources of electromagnetic interference (e.g., nearby electronic devices, power lines).

      3.4.2 Relocate the antenna away from such interference if needed.

   3.5 Restart the GNSS Receiver: Refer to 5.3.1 GNSS Settings

3.5.1 If all else fails, perform a cold restart of the GNSS receiver to refresh its connection to satellites and recalibrate signal reception.

4. ***Antenna Cable Latency Compensation:*** Refer to 5.3.1 GNSS Settings

4.1 Enter the latency values based on the type and length of the antenna cable connected to the antenna.

4.2 If an RF inline amplifier is used, please enter its value as well.

4.3.7 LAN1/LAN2 Connection

XTS8600 LAN1 and LAN2 are combo ports. Refer to item 4 in subsection 1.5 Connectors for the location, explanation of combo port, connector and PIN definitions of XTS8600 LAN1 and LAN 2 interface.

LAN1 & LAN2 Interface Spec:

This LAN1 & LAN2 Interface Spec provides a comprehensive overview of the specifications and features of the LAN1 and LAN2 interfaces for the XTS8600 device. Both interfaces are RJ-45 & SFP combo ports, supporting speeds of 10/100/1000BASE-T(X) RJ45 with auto-negotiation and 100/1000 Base-X SFP with configurable fixed speeds. The default IP & Netmask for LAN1 is 10.0.50.1 / 255.255.0.0, while for LAN2, it is 192.168.1.1 / 255.255.255.0.

Users can refer to related sections for verified SFP modules and LAN LED indicators. Both interfaces support SNMP management, NTP server functions, PTP, and various redundancy options, including clustering, PRP, and bonding. The firmware can be updated via the Device Management Utility, and SyncE Master is supported. Notably, web access and remote CLI management are not available through these interfaces.

Table 4-8 LAN1 & LAN2 Interface Spec

	LAN1	LAN2
Connector Type	RJ-45 & SFP Combo	RJ-45 & SFP Combo
Default IP & Netmask	10.0.50.1 / 255.255.0.0	192.168.1.1 / 255.255.255.0
RJ45 Speed	100/1000BASE-T(X) RJ45 Auto-negotiation mode only	100/1000BASE-T(X) RJ45 Auto-negotiation mode only
SFP Speed	100/1000 Base-X SFP Configurable 100 or 1000 fixed speed (See 5.1.1 IP Settings)	100/1000 Base-X SFP Configurable 100 or 1000 fixed speed (See 5.1.1 IP Settings)
Verified SFP Modules	See 2.5 SFP Transceiver	See 2.5 SFP Transceiver
LAN LED	See 1.6.2 LAN LED Indicators	See 1.6.2 LAN LED Indicators
Access Web Interface	No	No
Management – Remote CLI	No	No
Device Management Utility	Yes	Yes
SNMP Management	Yes	Yes
SNMP Trap/Inform	Yes	Yes
NTP Server	Yes	Yes
PTP	Yes	Yes
Redundancy -Clustering	Yes	Yes
Redundancy - PRP	Yes	Yes

Redundancy - Bonding	Yes	Yes
FW Update	Yes, only through *Device Management Utility*	Yes, only through *Device Management Utility*
SyncE Master	Yes	Yes

4.3.8 Commissioning NTP Server

1. ***Check Clock Operation Mode***: Refer to subsection 5.3.1 GNSS Settings
   1.1 Use **Grandmaster** mode to get the time source from GNSS/GPS or use **FreeRun** mode if you do not want to connect the antenna and prefer to get the time source from the system clock.
2. Check the **GNSS Status**: Refer to Subsection 6.6 Clock Information.
   2.1 The status shall be in **Locked** state when using **Grandmaster** mode. If not, please refer to section 3 Antenna Installation Guide and subsection 4.3.6 Commissioning GNSS and Antenna.
   2.2 In **FreeRun** mode, the status shall be **Non-GNSS (FreeRun)**.
3. ***Setup System Time***: Refer to Subsection 5.3.2 System Time
   3.1 Set the Local Date and Time
   3.2 Select the Time Zone
   3.3 Check whether Daylight Saving Time needs to be enabled
4. ***Configure and Enable NTP Server:*** Refer to Subsection 5.3.4 NTP Settings
   4.1 Verify IP and Netmask: Ensure that the IP and Netmask for the selected network interface (LAN1, LAN2, or MGT) are configured correctly.
   4.2 Set the Broadcast Interval (Optional): In the Broadcast section, set the desired interval (in seconds) for broadcasting NTP messages.
   4.3 Set the Multicast Settings (Optional): Enter the multicast IP address (e.g., 224.0.1.1) and set the interval (in seconds) in the Multicast section.
   4.4 Enable Authentication (Optional): To enable authentication for the NTP service, check the "Enable" box in the Authentication section and select the type (e.g., Symmetric Key).
   4.5 Choose the appropriate Trust key index for secure communication if required (Optional).
   4.6 Select and Enable the NTP Service: Choose the network interface (LAN1, LAN2, or MGT) for which you want to enable the NTP service.
   4.7 Enable Broadcast or Multicast (Optional): If you want the NTP service to broadcast or multicast, check the "Enable" box under the Broadcast or Multicast columns for the chosen interface.
   4.8 Review and Save Settings: After configuring all the necessary options, save the changes to apply the NTP service settings.
5. ***Setup NTP Leap Seconds List:*** Refer to Subsection 5.3.4 NTP Settings
   5.1 Download NTP Leap Second List from the default Web Site or Import the NTP Leap Second List from you local drive.
   5.2 Check the Expire Date of NTP Leap Seconds List.
6. **Setup Clustering – Device Redundancy** (Optional): Refer to Subsection 5.1.5 Cluster
7. **Setup Bonding – Network Redundancy** (Optional): Refer to Subsection 5.1.4 Bonding/PRP

4.3.9 Commissioning PTP Service

1. ***Check Clock Operation Mode***: Refer to subsection 5.3.1 GNSS Settings
   1.1 Use **Grandmaster** mode to get the time source from GNSS/GPS or use **FreeRun** mode if you do not want to connect the antenna and prefer to get the time source from the system clock.
2. Check the **GNSS Status**: Refer to Subsection 6.6 Clock Information.
   2.1 The status shall be in Locked state when using **Grandmaster** mode. If not, please refer to section 3 Antenna Installation Guide and subsection 4.3.6 Commissioning GNSS and Antenna.
   2.2 In **FreeRun** mode, the status shall be **Non-GNSS (FreeRun)**.
3. ***Setup System Time***: Refer to Subsection 5.3.2 System Time
   3.1 Set the **Local Date** and **Time**.
   3.2 Select the **Time Zone**.
   3.3 Check whether **Daylight Saving Time** needs to be enabled.
4. ***Configure and Enable PTP Master:*** Refer to Subsection 5.3.3 PTP Settings
   4.1 Configure and Enable PRP if PRP Redundancy is needed: Refer to subsection of 5.1.4 Bonding/PRP.
   4.2 In **PTP Common Settings** of subsection 5.3.3 PTP Settings, select the **Profile** of XTS8600 LAN1, LAN2 or PRP interface you would like to deploy. While PRP is enabled, the PTP settings for LAN1 and LAN2 cannot be configured.
   4.3 Adjust the **Profile-Specified Settings** to fit your PTP network. Be sure to review the **Profile-Specified Settings** in subsection 5.3.3 PTP Settings, and understand each option before making any changes.
   4.4 If there are multiple PTP time servers, adjust and review the **BMCA-Related Status and Settings** in Subsection 5.3.3, 5.3.3 PTP Settings, to prioritize the Best Master PTP Clock.
   4.5 (Optional) Adjust the **Miscellaneous Settings** in subsection 5.3.3 PTP Settings for Layer 3 PTP time synchronization.
   4.6 Review and Save Settings: After configuring all the necessary options, save the changes to apply the PTP service settings.
5. ***Check PTP Status:*** Refer to Subsection 6.5 Timing Information
   5.1 Check the **Status** of enabled PTP interface. It shall be **Grandmaster or Master**.
   5.2 Check the **PTP Clock Class**. It shall be 6 when GNSS/GPS is locked or 13 when **Clock Operation Mode** is in **FreeRun** mode.
   5.3 Check the **Clock Accuracy**. It shall be less than 100ns.

Note: **PTP Time Synchronization**
When operating in Grandmaster mode, after the system has booted, you must complete at least one synchronization with GNSS before PTP packets will begin transmitting once PTP is enabled. In Free-Run mode, this requirement does not apply.

.

4.3.10 Connecting Sync-Out Module

1. ***Connect to Sync-Out Module:***

   1.1 Refer to item 2 ,10 and 11 of subsection 1.5 Connectors for the location and connector spec.

   1.2 Go Through subsection 5.3.5 Sync-Out Modules for the settings explanation.

   1.3 Maximum cable length

   1.3.1 The maximum cable length of RG58 AU: 300M for IRIG-AM signal and 150M for other Sync-Out signals.

   1.3.2 The maximum cable length of RS485 cable: 1.2KM for Sync-Out Channel 6.

   1.3.3 (Optional) Extend the transmission range of Sync-Out Channel 6 from 2 km (multi-mode fiber) to 30 km (single-mode fiber) by using the Serial to fiber converter.

4.3.11 Commissioning Sync-Out Module

1. ***Setup System Time***: Refer to Subsection 5.3.2 System Time

   1.1 Set the Local Date and Time.

   1.2 Select the Time Zone.

   1.3 Check whether Daylight Saving Time needs to be enabled.

2. **Configure and Enable Sync-Out Channel**: Refer to subsection 5.3.5 Sync-Out Modules

   2.1 Select the signal type in **Sync-Out Configuration**.

   2.2 Select the **IRIG-B format**, **Parity**, and **IRIG-B Time Reference** for the corresponding channel if you want to output an IRIG-B signal.

   2.3 Enter the deployed G-58 A/U cable length for Sync-Out cable latency compensation.

   2.4 Review and Save Settings: After configuring all the necessary options, save the changes to apply the Sync-Out Modules settings.

4.3.12 Relay (Alarm Contact) Connection

The XTS8600 has one relay. For the location, connector, and PIN definitions of the XTS8600-DC and XTS8600I-DC, refer to item 9 in subsection 1.5, Connectors. For the XTS8600-AC and XTS8600I-AC, refer to item 12 in subsection 1.5, Connectors.

1. The relay connection for the XTS8600 features a normal open relay with two pins: Pin 1 (RY-) and Pin 2 (RY+). These pins form the relay circuit, which closes when an alarm or designated event is triggered, allowing current to flow and activating connected external devices or alarms.
2. The relay is designed for a rated operational voltage of ≤ 24 VDC and supports a continuous carrier current of 1A. Ensure proper wiring to these pins according to your system requirements to enable effective monitoring and response during triggered events.

4.3.13 Commissioning Relay, Trap and Alarm LED

1. **Enable more events that can trigger the Relay**: Refer to subsection 5.4.4 Alarm Settings
   1.1 The XTS8600 supports nine events that trigger the relay
   1.2 In factory default, only **DC Power Lost** and **GNSS Antenna Shorted** will trigger the Relay.
2. **Enable more events that can trigger the SNMP Trap**: Refer to subsection 5.4.4 Alarm Settings
   2.1 The XTS8600 supports 12 events that trigger SNMP traps
   2.2 In factory default, only **DC Power Lost** and **GNSS Antenna Shorted** will trigger the SNMP Trap
3. **Configure Alarm LED Behaviors**: Refer to subsection 5.4.4 Alarm Settings
   3.1 The XTS8600 supports seven levels of alarm severity, mapping to five Alarm LED behaviors.
   3.2 Configure the alarm severity to map the corresponding Alarm LED behaviors.
4. **Review and Save Settings**
5. **Configure the SNMP Trap/Inform Settings**: Refer to subsection 5.2 SNMP Settings
   5.1 Select SNMP Trap/Inform **Version**.
   5.2 Enter **SNMP Trap/Inform Server** IP Address and Port
   5.3 Configure the **Community** if it's SNMP V1 or V2C
   5.4 Configure the **Security Level**, **SNMP V3 Trap/Inform Account**, **Authentication** and **Privacy** settings if it's SNMP V3.
   5.5 Review and Save Settings.

4.3.14 MicroSD Card Installation

Refer to item 7 in subsection 1.5 connectors for the location, spec of XTS8600 MicroSD socket.

Applications of XTS8600 MicroSD Card.

1. Update XTS8600 FW
2. Backup Configuration
3. Backup Event Logs
4. Restore Configurations

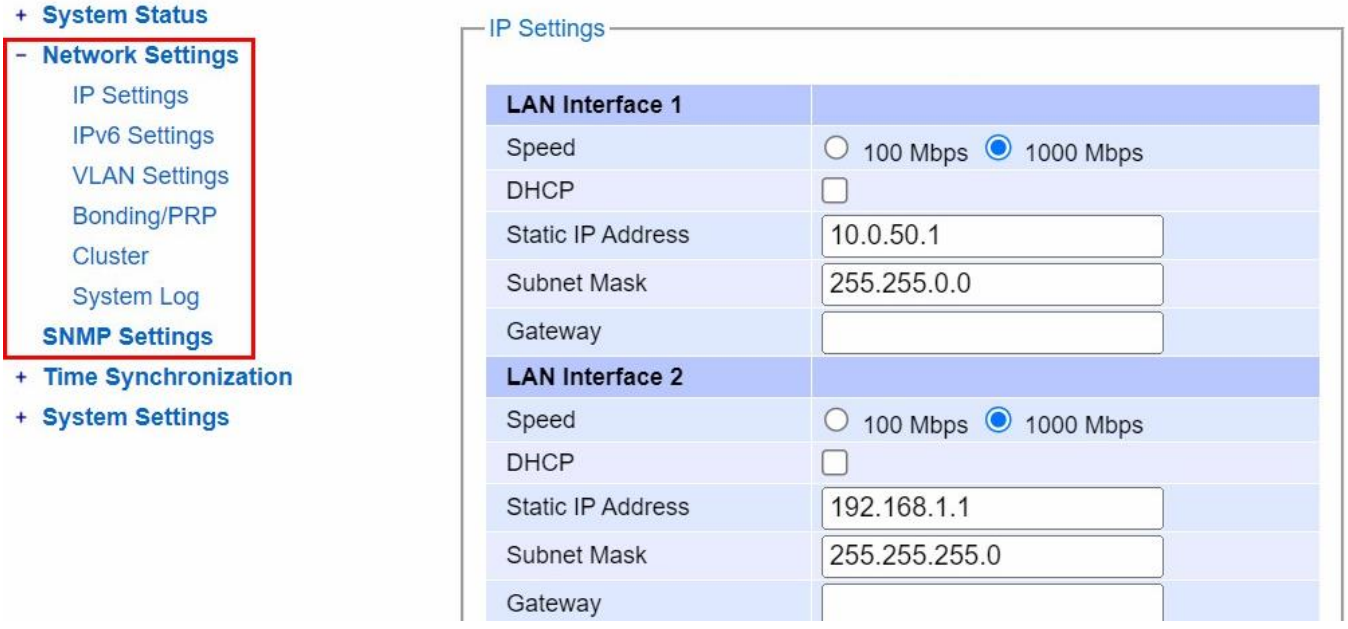
/*Important Notice*/: The XTS8600 currently does not support the above MicroSD applications. However, this feature is already in development and will be included in an upcoming firmware release as soon as possible. Stay tuned for updates to enhance your XTS8600 experience.

5 Web Interface - Configurations

5.1 Network Settings

The "Network Settings" subsection of the web interface includes several key configuration items that allow users to manage network parameters. As highlighted in red in the picture below, these items include IP Settings for defining the XTS8600 IP addresses, IPv6 Settings for configuring IPv6 networking, and VLAN Settings for setting up Virtual LANs. Additionally, there are options for Bonding/PRP, which support network redundancy and increased reliability, as well as Cluster settings for clustering configuration. The System Log option is also available to view network-related logs and events, providing useful information for monitoring and troubleshooting.

Figure 5-1 Network Settings



5.1.1 IP Settings

This subsection is divided for LAN1, LAN2 and MGT Port. LAN1/SFP1 and LAN2/SFP2 are Combo ports. They will share the same LAN setting. When both LAN1/SFP1 or LAN2/SFP2 are plugged, the Fiber interface will take the priority over the Copper interface. Since Fiber Standard does not support auto-negotiation, please set the Fiber speed. If you're using VLAN, check "Enable VLAN" checkbox and the disabled field will be enabled for input.

LAN1, LAN2 and MGT Interface for IPV4 Settings:

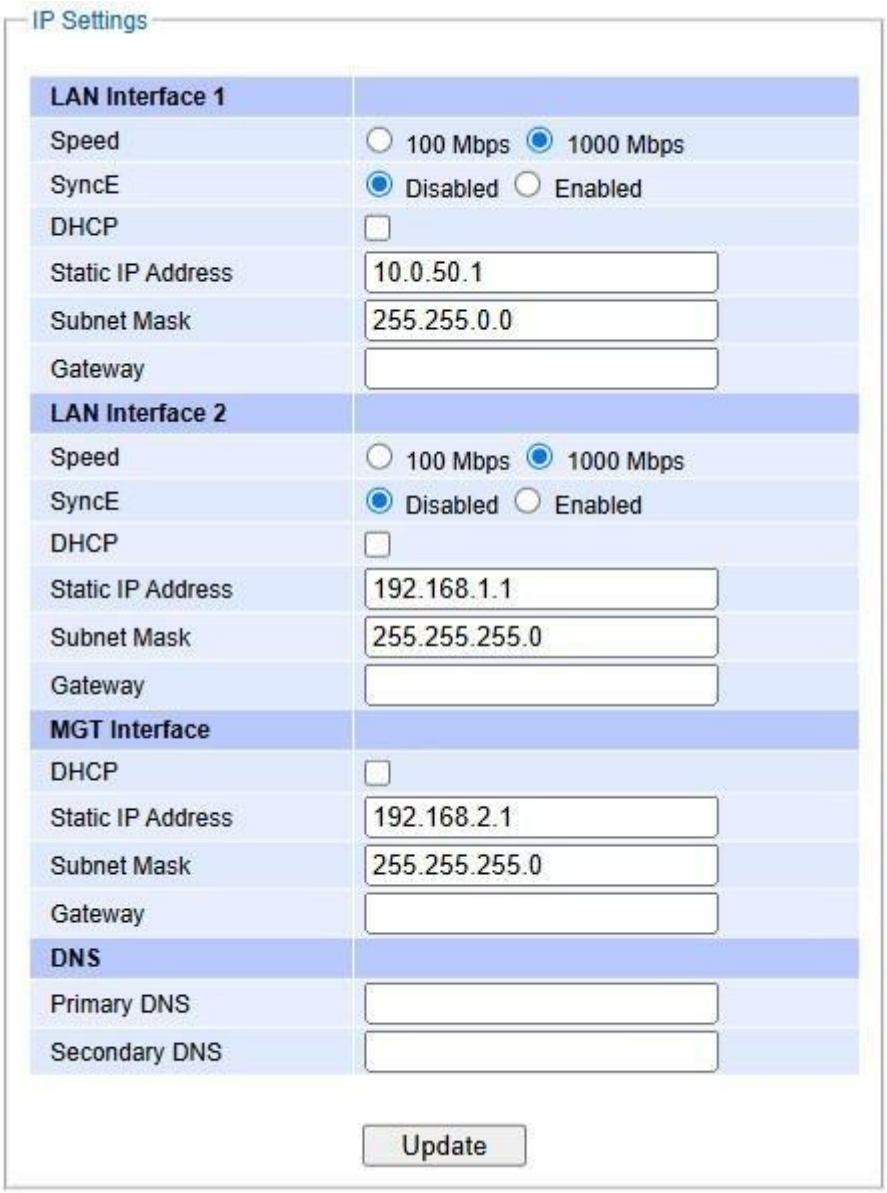


Figure 5-2 Network Settings -> IP Settings

Speed – LAN1 and LAN2:

Setting	Factory Default	Setting Explanation
100 Mbps	1000 Mbps	Select the Fiber-speed for the LAN1 or LAN2 interfaces. The copper speed will be determined by auto-negotiation
1000 Mbps		

Note:
XTS8600 features SFP and copper combo ports with an auto-failover function that ensures seamless connectivity. When both the SFP and copper interfaces are connected, the SFP interface is prioritized. If the SFP link goes down, the copper interface will automatically take over, using the same IP settings to maintain continuous network operation.

To use the auto-failover function effectively, users should configure the IP and speed settings based on the SFP interface. For example, if a 100Mbps SFP module is connected to LAN1 and a 1000Mbps copper interface is also connected to LAN1, the speed setting should be set to 100Mbps.

SyncE – LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
Enabled	Disabled	Enable the SyncE.
Disabled		Disable the SyncE

Note: **What's SyncE?**
Synchronous Ethernet (SyncE) is a physical-layer technology that enables stable, traceable frequency synchronization over Ethernet. Unlike PTP, which distributes time and phase at the packet layer, SyncE ensures all net work elements operate at a consistent frequency, reducing jitter and wander. SyncE is essential in high- precision environments—such as telecom networks and power utilities—where PTP alone may not deliver sufficient frequency stability.

It is especially valuable in long chains of switches or congested networks. For profiles like ITU-T G.8275.1, SyncE is expected to be enabled (although it's not required) throughout the network to provide better frequency stability for the phase/time-of day synchronization.

DHCP – LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable the DHCP of LAN1 or LAN2 or MGT interface. When DHCP is enabled, the XTS8600 will automatically obtain an IP address from a DHCP server on the network.
Unchecked		Disable the DHCP

Static IP Address – LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
LAN 1 Interface Static IP Address	10.0.50.1	If DHCP is disabled, you must manually enter a static IP address for the LAN1 or LAN2 or MGT interface. These addresses are used to identify the XTS8600 on their respective networks
LAN 2 Interface Static IP Address	192.168.1.1	
MGT Interface	192.168.2.1	

Static IP Address		

Subnet Mask - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
LAN 1 Interface Subnet Mask	255.255.0.0	The subnet mask determines the size of the network. A subnet mask is a vital networking tool that helps devices understand where the network ends and where individual devices begin.
LAN 2 Interface Subnet Mask	255.255.255.0	
MGT Interface Subnet Mask	255.255.255.0	

Note:
Small Network: If you have a small network with a few devices, you might use a subnet mask of 255.255.255.0. This setup allows for up to 254 devices on that network.

Larger Network: If you manage a larger network, you might use a subnet mask of 255.255.0.0, which allows for more devices to be connected.

Gateway - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
LAN 1 Interface IPV4 Gateway	None	Enter the IP address of the default gateway, which enables the device to communicate with devices outside its local network. If the device does not need to interact with external networks, this field can be left blank.
LAN 2 Interface IPV4 Gateway	None	
MGT Interface IPV4 Gateway	None	

Primary DNS:

Setting	Factory Default	Setting Explanation
IP Address of Primary DNS Server	None	These fields are used to specify the DNS servers for the XTS8600. DNS servers translate human-readable domain names (like www.example.com) into IP addresses, allowing the XTS8600 to resolve network names.

Note:
In NTP Leap Seconds of "Time Synchronization → NTP Settings", you have to specify Gateway and DNS if you want to update NTP second list from web.

Secondary DNS:

Setting	Factory Default	Setting Explanation
IP Address of Secondary DNS Server	None	Secondary DNS providing a fallback option if the Primary DNS server fails. By ensuring that both DNS servers are correctly configured, you can enhance the reliability and resilience of your network.

5.1.2 IPV6 Settings

LAN1, LAN2 and MGT Interface IPV6 Settings:

LAN Interface 1	
IPv6 Mode	Disabled
IPv6 Address	fd00:6ef:ff00:1::1
Prefix	64
Gateway	fd00:6ef:ff00:1::ffff
LAN Interface 2	
IPv6 Mode	Disabled
IPv6 Address	fd00:6ef:ff00:2::1
Prefix	64
Gateway	fd00:6ef:ff00:2::ffff
Management Interface	
IPv6 Mode	Disabled
IPv6 Address	fd00:6ef:ff00:ffff::1
Prefix	64
Gateway	fd00:6ef:ff00:ffff::ffff

Figure 5-3 Network Settings -> IPV6 Settings

IPV6 Mode - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable IPv6 of corresponding LAN1 or LAN2 or NGT interface.
Unchecked		Enable IPv6 of corresponding LAN1 or LAN2 or NGT interface.

IPV6 Address - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
LAN 1 Interface IPV6 Address	fd00:6ef:ff00:1::1	IPV6 address of LAN1, LAN2 and MGT interface.
LAN 2 Interface IPV6 Address	fd00:6ef:ff00:2::1	
MGT Interface IPV6 Address	fd00:6ef:ff00:ffff::1	

Note:

An IPv6 address is 128 bits long, which is significantly larger than the 32-bit IPv4 address. Following explain the key components of an IPv6 address:

3. *Hexadecimal Digits: Each group of four hexadecimal digits (e.g., 2001, 0db8, etc.) represents 16 bits. The full address consists of eight groups, totalling 128 bits.*
4. *Colons (:): Colons (:) are used to separate the groups of hexadecimal digits.*
5. *Leading Zeros: Leading zeros in a group can be omitted to shorten the address. For example, 0db8 can be written as db8, and 0000 can be written as 0.*
6. *Double Colon (::) Notation: When consecutive groups contain only zeros, they can be compressed using a double colon (::). However, this can be used only once in an address to avoid ambiguity. Example: 2001:0db8:0000:0000:0000:0000:0000:1 can be shortened to 2001:db8::1.*
7. *Example of IPv6 Address Formats:*
   - *Full Format: 2001:0db8:85a3:0000:0000:8a2e:0370:7334*
   - *Compressed Format: 2001:db8:85a3::8a2e:370:7334*
   - *Loopback Address: The IPv6 loopback address, equivalent to 127.0.0.1 in IPv4, is written as ::1.*

Prefix - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
1 to 128	64	The prefix length determines the network portion of the IPv6 address, similar to a subnet mask in IPv4.

Note:

1. *Common Prefix Lengths:*
   - */64: The most common prefix length for IPv6 networks, providing a balance between network size and address allocation.*
   - */48 or /56: Often used by Internet Service Providers (ISPs) when assigning prefixes to customers, giving them the flexibility to create multiple /64 subnets.*
   - */128: Represents a single, unique IPv6 address. This is sometimes used for point-to-point links or for specific device addresses*.

Gateway - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
LAN 1 Interface IPV6 Gateway	None	This field specifies the IPv6 address of the gateway for the network. The gateway address is where traffic is routed when it needs to leave the local network.
LAN 2 Interface IPV6 Gateway	None	
MGT Interface IPV6 Gateway	None	

5.1.3 VLAN Settings

Each physical Ethernet interface can create a corresponding VLAN. Enabling VLAN may be required in certain power profiles. In the IEEE C37.238-2011 standard, all messages must be encapsulated within IEEE 802.1Q-tagged Ethernet frames, allowing for configurable priority levels and VLAN IDs. By default, the priority is set to 4, and the VLAN ID (VID) is set to 0.

For example, if the VLAN of LAN1 is enabled with VLAN ID 0 and priority 4, and LAN1 PTP is enabled with the C37.238-2011 Power Profile, the VLAN ID 0 and priority 4 of the IEEE 802.1Q-tagged Ethernet frames will automatically be added to the LAN1 PTP traffic.

LAN1, LAN2 and MGT Port VLAN Settings:

LAN Interface 1	
Enable VLAN	☐
VLAN ID	100
VLAN Priority	0
VLAN IPv4 Address	0.0.0.0
VLAN IPv4 Netmask	0.0.0.0
VLAN IPv6 Address	
VLAN IPv6 Prefix	0
LAN Interface 2	
Enable VLAN	☐
VLAN ID	101
VLAN Priority	0
VLAN IPv4 Address	0.0.0.0
VLAN IPv4 Netmask	0.0.0.0
VLAN IPv6 Address	
VLAN IPv6 Prefix	0
Management Interface	
Enable VLAN	☐
VLAN ID	102
VLAN Priority	0
VLAN IPv4 Address	0.0.0.0
VLAN IPv4 Netmask	0.0.0.0
VLAN IPv6 Address	
VLAN IPv6 Prefix	0

Figure 5-4 Network Settings -> VLAN Settings

Enable VLAN - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable VLAN functionality of corresponding interface
Unchecked		Disable VLAN functionality of corresponding interface

VLAN ID - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
0 to 4094 (4091 and 4092 are reserved)	LAN1: 100	Set VLAN ID and create VLAN interface on LAN1
	LAN2: 101	Set VLAN ID and create VLAN interface on LAN2
	MGT: 102	Set VLAN ID and create VLAN interface on MGT

Note:
Devices in the same VLAN can communicate with each other, but they are isolated from devices in other VLANs, even if they are on the same physical network.

In IEEE 802.1Q, VLAN ID 0 has a specific meaning: it indicates that the frame is not associated with a specific VLAN, but the frame still carries 802.1p priority information for Quality of Service (QoS) purposes.

VLAN Priority - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
0 to 7	LAN1: 0	Set 802.1Q VLAN priority VLAN interface on LAN1.
	LAN2: 0	Set 802.1Q VLAN priority VLAN interface on LAN2.
	MGT: 0	Set 802.1Q VLAN priority VLAN interface on MGT.

Note:
VLAN priority, as defined by the IEEE 802.1Q standard, allows network traffic to be prioritized within a VLAN. The priority value is part of the 802.1Q tag, which is used in VLAN-tagged Ethernet frames.

VLAN Priority is a setting that allows you to assign a priority level to the traffic on this VLAN. It uses a range from 0 to 7, where 0 is the lowest priority and 7 is the highest.

This priority mechanism is known as 802.1P and provides Quality of Service (QoS). In the 802.1Q header, 802.1P uses 3 bits to define a priority code point (PCP), which can represent values from 0 to 7, where 0 is the lowest priority and 7 is the highest.

VLAN IPV4 Address - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
LAN 1 VLAN IPV4 Address	0.0.0.0	These fields allow you to assign the IPv4 address to the VLAN of corresponding LAN or MGT interface.
LAN 2 VLAN IPV4 Address	0.0.0.0	
MGT VLAN IPV4 Address	0.0.0.0	

VLAN IPV4 Subnet Mask - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
LAN 1 VLAN IPV4 Subnet Mask	0.0.0.0	These fields allow you to assign the IPV4 subnet mask to the VLAN
LAN 2 VLAN IPV4 Subnet Mask	0.0.0.0	
MGT VLAN IPV4 Subnet Mask	0.0.0.0	

VLAN IPV6 Address - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
LAN 1 VLAN Interface IPV4 Address	None	These fields allow you to assign the IPv6 address to the VLAN
LAN 2 VLAN Interface IPV4 Address	None	
MGT VLAN Interface IPV4 Address	None	

VLAN IPV6 Prefix - LAN1, LAN2 and MGT:

Setting	Factory Default	Setting Explanation
LAN 1 VLAN IPV6 Prefix	0	These fields allow you to assign the IPV6 Prefix to the VLAN
LAN 2 VLAN IPV6 Prefix	0	
MGT VLAN IPV6 Prefix	0	

5.1.4 Bonding/PRP

This subsection displays the settings for Bonding and PRP, two methods used to enhance network reliability and redundancy. Bonding is typically applied for network redundancy in NTP, while PRP is the standard and more common method for providing network redundancy in PTP. When either Bonding or PRP is enabled, the LAN1 and LAN2 network interfaces are combined into a single logical interface and will use the IPv4 settings configured here.

Bonding and PRP:

Select the mode based on your network's redundancy requirements. For NTP time synchronization, if you want to combine interfaces for redundancy or increased bandwidth, select "Bonding". For PTP time synchronization, if you require high availability with zero recovery time, select "PRP.

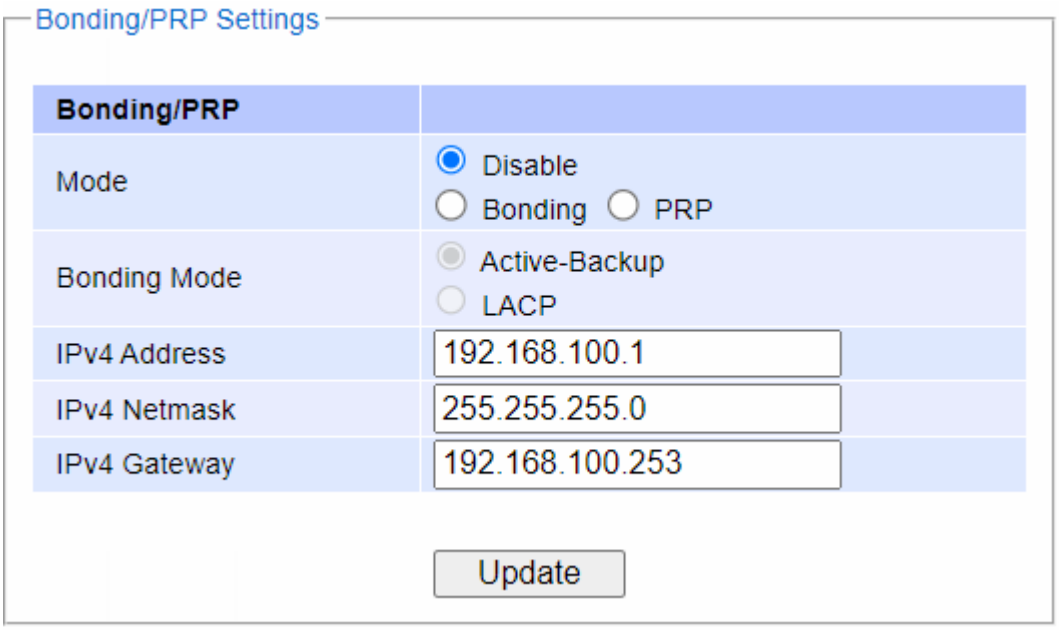


Figure 5-5 Network Settings -> Bonding/PRP Settings

Mode:

Setting	Factory Default	Setting Explanation
Disabled	Disabled	Neither bonding nor PRP is enabled. LAN1 and LAN2 operate independently based on the settings under “Network Setting → IP Settings”.
Bonding		Enable the bonding mode to select either Active-Backup or LACP. This is for the redundancy of NTP time synchronization.
PRP		Enable the PRP function. This is for the redundancy of PTP time synchronization.

- **Bonding**: Enable the bonding mode to select either Active-Backup or LACP (Link Aggregation Control Protocol). Both bonding modes combine the LAN1 and LAN2 network interfaces into a single logical interface to provide redundancy.
- **PRP**: PRP is a network protocol used to ensure no single point of failure and zero recovery time by providing two independent and parallel network paths. Here’s how PRP works, as illustrated in the figure 5-6:

1. *Dual Network Paths*: The XTS8600 sends identical data through both PRP LAN A and PRP LAN B simultaneously. Each PRP-capable end device receives this data through two different paths—one from LAN A and one from LAN B.
2. *Fault Tolerance*: If there is a failure in one of the networks (for example, if a cable is cut or a switch fails in PRP LAN A), the devices will still receive data from the remaining operational network (PRP LAN B). This ensures that there is no disruption in communication or time synchronization.
3. *Zero Recovery Time*: Because both networks operate in parallel, there is no delay or need for switchover time when a failure occurs. The system continues to function seamlessly.

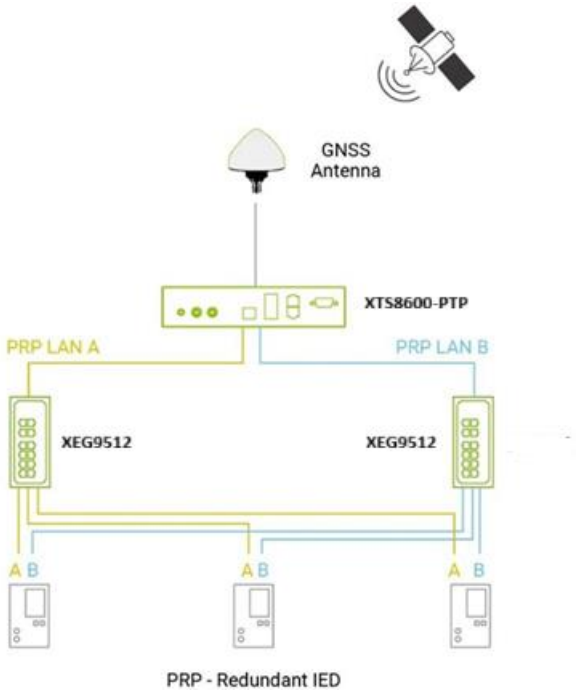


Figure 5-6 PRP Application

Bonding Mode:

Setting	Factory Default	Setting Explanation
Active-Backup	Active-Backup	Set the bonding mode to Active-Backup for a simple failover setup
LACP		Set the bonding mode to LACP if you want to aggregate bandwidth and redundancy.

- **Active-Backup**: Only one interface in the bond is active at a time. If the active interface fails, another interface in the bond takes over, ensuring continued network connectivity. No special configuration is needed. Unlike LACP mode, Active-Backup doesn't require any special setup on the network switches or end devices, making it easier to implement.

- **LACP**: Combines multiple network interfaces to increase bandwidth and provide redundancy. LACP dynamically manages the aggregation, ensuring load balancing and failover. LACP requires configuration on both ends of the connection. The devices communicate with each other to manage the links and ensure they are working together correctly.

Note: ***Selection of Active-Backup or LACP***

When choosing between Active-Backup and LACP, consider your specific needs. Active-Backup is best for simple redundancy without requiring special configurations on network switches or devices; if one interface fails, the other takes over seamlessly.

LACP, on the other hand, is ideal if you need to combine interfaces to increase bandwidth and distribute traffic evenly, though it requires configuration on both the switches and devices. Active-Backup is straightforward and reliable, while LACP offers enhanced performance and load balancing. Choose based on whether you prioritize simplicity or increased bandwidth and performance.

IPV4 Address:

Setting	Factory Default	Setting Explanation
IPV4 address of Bonding or PRP interface	192.168.100.1	The IPv4 address assigned to the bonding or PRP interface.

IPV4 Netmask:

Setting	Factory Default	Setting Explanation
IPV4 Netmask of Bonding or PRP interface	255.255.255.0	The IPV4 Netmask assigned to the bonding or PRP interface.

IPV4 Gateway:

Setting	Factory Default	Setting Explanation
IPV4 Gateway of Bonding or PRP interface	192.168.100.253	The IPv4 Gateway assigned to the bonding or PRP interface.

5.1.5 Cluster

Cluster Mode is a redundancy technique where multiple NTP servers work together as a unified cluster. These servers constantly exchange status updates to monitor health and synchronization. One server is automatically selected as the active master, handling all time synchronization requests, while the others remain on standby, ready to take over if the master fails. This ensures uninterrupted time services and high availability.

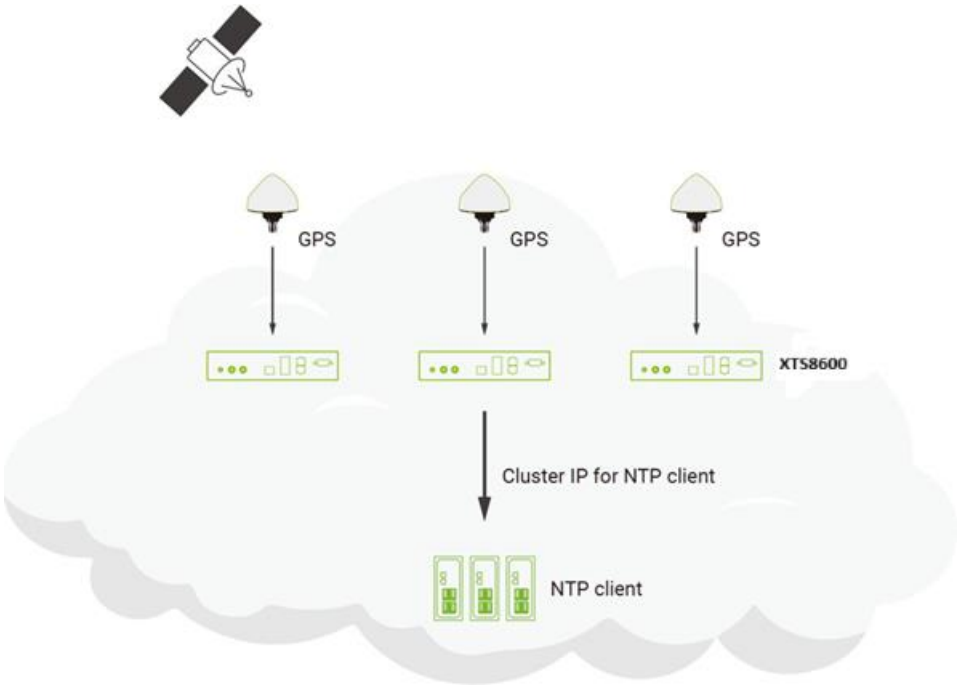


Figure 5-7 Cluster Application

The master server uses a shared cluster IP address, which remains the same even if the master role shifts to another server. This is particularly useful when NTP clients can only sync to a single IP, as it prevents the need for reconfiguration during a server failure. The process is seamless and invisible to clients, maintaining accurate time without disruption.

/*Important Notice*/: Clustering mode is designed for NTP application. Instead of clustering, PTP networks achieve redundancy by having multiple Grandmaster Clocks available. These Grandmasters are configured with priorities, and the BMCA automatically selects the best available Grandmaster to serve the network. If the active Grandmaster fails, the next best Grandmaster takes over instantly, ensuring continuous timing without the need for clustering.

Cluster Settings:

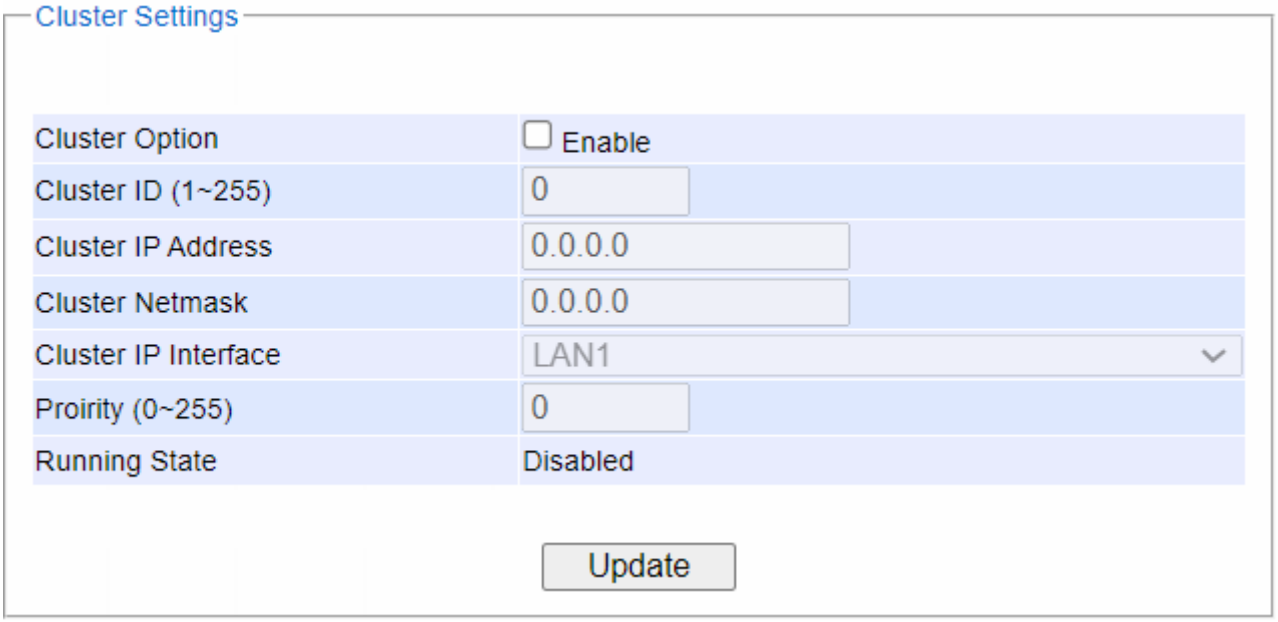


Figure 5-8 Network Settings -> Cluster Settings

Cluster Option:

Setting	Factory Default	Setting Explanation
Checked	Unchecked	This checkbox allows you to enable or disable the clustering feature.
Unchecked		

Cluster ID:

Setting	Factory Default	Setting Explanation
1~255	0	The Cluster ID is a unique identifier for the cluster, ranging from 1 to 255. All XTS8600s that are part of the same cluster must share the same Cluster ID.

Cluster IP Address:

Setting	Factory Default	Setting Explanation
Cluster IPV4 Address	0.0.0.0	Set the XTS8600 Cluster IP Address.

Cluster Netmask:

Setting	Factory Default	Setting Explanation
Cluster IPV4 Subnet Mask	0.0.0.0	Cluster Netmask works with the Cluster IP Address to define the network segment for the cluster.

Cluster IP Interface:

Setting	Factory Default	Setting Explanation
LAN1, LAN2, MGT, Bonding interface	LAN1	This setting allows you to choose which network interface (e.g., LAN1, LAN2, Management, or bonding Interface) will handle the Virtual IP Address

Priority:

Setting	Factory Default	Setting Explanation
0 ~ 255	0	The Priority setting determines the role of the XTS8600 within the cluster. The XTS8600 with the highest priority (closest to 0) is given preference in becoming the Master device responsible for handling the Cluster IP Address. Lower priority devices serve as Backups, taking over if the Master device fails.

Running State:

The Running State shows the status of the cluster configuration. Three states are available.

Status	Status Explanation
Disabled	It means that cluster function isn't enabled
Master	Cluster is enabled and the current XTS8600 is the clustering Master
Backup	Cluster is enabled and the current XTS8600 is the clustering Backup

5.1.6 System Log

Syslog is a standard protocol used to send system logs or event messages to a centralized server, helping with monitoring and troubleshooting network devices. The XTS8600 will proactively send Syslog notifications for various system events, including those related to the system, clock, security, and user activity. For details on the Syslog events, please refer to Appendix C.

XTS8600 series support two syslog serves for enhancing the robustness of your logging infrastructure, providing both redundancy and flexibility in how and where your logs are stored and managed.

Syslog Server1 & Server2 Configuration:

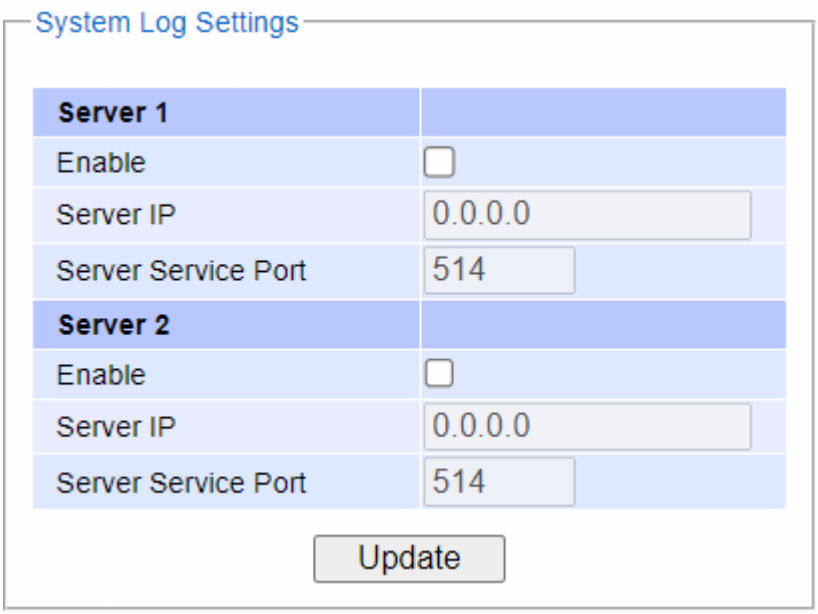


Figure 5-9 Network Settings -> System Log Settings

Enable:

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable the syslog server 1 or server 2
Unchecked		Disable the syslog server 1 or server 2

Server IP:

Setting	Factory Default	Setting Explanation
Syslog Server IPV4 Address	0.0.0.0	This field is where you enter the IP address of the Syslog server. The XTS8600 will send all sys logs to this IP address

Server Service Port:

Setting	Factory Default	Setting Explanation

1 ~ 65535	514	This is the port number on which the Syslog server is listening for incoming log messages. The standard port for Syslog is 514.

5.2 SNMP Settings

The subsection highlighted in red in the image shows the 'SNMP Settings', which are used to configure SNMP and related functions such as 'SNMP' or 'SNMP Trap/Inform'.

The XTS8600 offers comprehensive SNMP-based network management, supporting read access, trap/inform notifications, and write operations. With SNMP v1, v2c or v3, administrators can retrieve real-time diagnostics and system status through standard SNMP queries. For centralized event monitoring, the XTS8600 can send traps or informs to designated receivers, ensuring timely alerts across the network. Additionally, SNMP write access enables remote configuration of nearly all parameters available via the web interface—providing a flexible and scalable option for automated or large-scale deployments.

Download SNMP MIB:

The XTS8600 provides customized Management Information Base (MIB) modules designed for seamless integration with standard SNMP clients, enabling efficient device monitoring and management. The latest MIB files can be downloaded from the **Downloads** section on the XTS8600 public product page.

After installing the XTS8600 MIB on your SNMP client, you will be able to view the MIB object hierarchy as illustrated in Figure 5-11. The XTS8600 MIB hierarchy is organized under the path Agatel.products.timeSync.XTS8600 and provides structured SNMP access to key functions of the Grandmaster Timeserver. It consists of four main branches: **systemStatus**, **alarmStatus**, **configuration**, and **alarmNotification**.

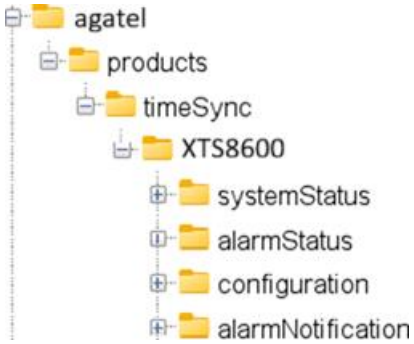


Figure 5-10 XTS8600 MIB Objects

The combination of **systemStatus**, **alarmStatus**, and **alarmNotification** corresponds directly to the **System Status** page in the web interface, offering real-time operational and alarm information via SNMP. The **configuration** branch maps to several web configuration pages, including **Network Settings**, **SNMP Settings**, **Time Synchronization**, and

System Settings. This hierarchy enables seamless integration with network management systems, allowing administrators to monitor and configure the XTS8600 through SNMP in parallel with the web UI.

Note: **Current Web Functions Not Supported by SNMP MIB Objects**
There are a few functions that are not currently implemented. Some of these will be added in the next firmware and MIB file release, while others—such as firmware update—will not be supported via SNMP due to user experience considerations.

1. *System Status*
   - *1.1 Event Log*
   - *1.2 System Information → FAE Debug Log*
2. *System Settings*
   - *2.1 Backup/Restore Config*
   - *2.2 Firmware Update*

Figure 5-11 SNMP Settings

System - SNMP Basic Object:

In the XTS8600 SNMP settings, "System Contact," "System Name," and "System Location," are essential SNMP objects required for SNMP versions V1, V2C, and V3. These fields allow administrators to define key system information for identification and management purposes.

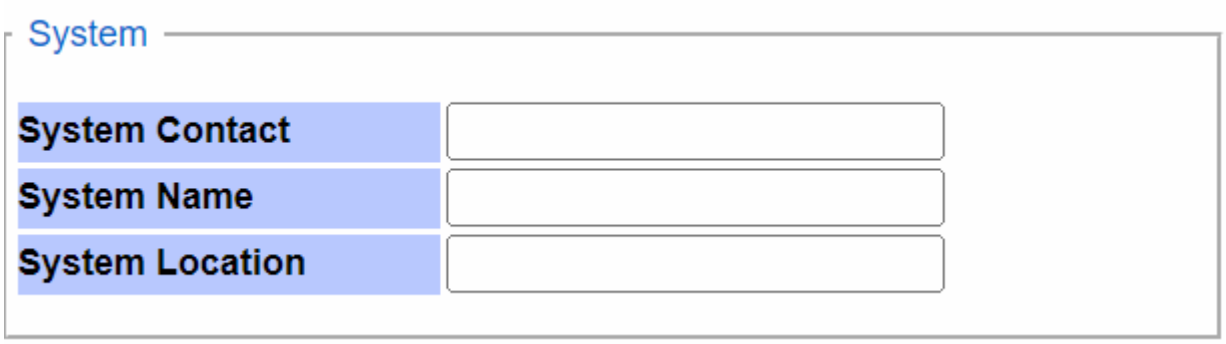


Figure 5-12 SNMP Settings -> System

System Contact:

Setting	Factory Default	Setting Explanation
Maximum of 255 characters	www.agatel.co.uk	An alphanumeric string that specifies a system contact name.

Note: **System Contact**

This field displays the contact information for the person responsible for the XTS8600 and is shown in the sysContact field of OID (1.3.6.1.2.1.1.4.0).

System Name:

Setting	Factory Default	Setting Explanation

Maximum of 255 characters	GMC	An alphanumeric string that specifies a device name.

Note: **System Name**

This field shows the name assigned to the device. The name is used to identify the device within the network and is shown in the sysName field of OID (1.3.6.1.2.1.1.5.0).

System Location:

Setting	Factory Default	Setting Explanation
Maximum of 255 characters	GMC's Location	An alphanumeric string that specifies a XTS8600 location.

Note: **System *Location***

This field provides the physical or logical location of the device. It helps network administrators know where the device is located and is shown in the sysLocation field of OID (1.3.6.1.2.1.1.6.0).

SNMP Settings – Common Settings:

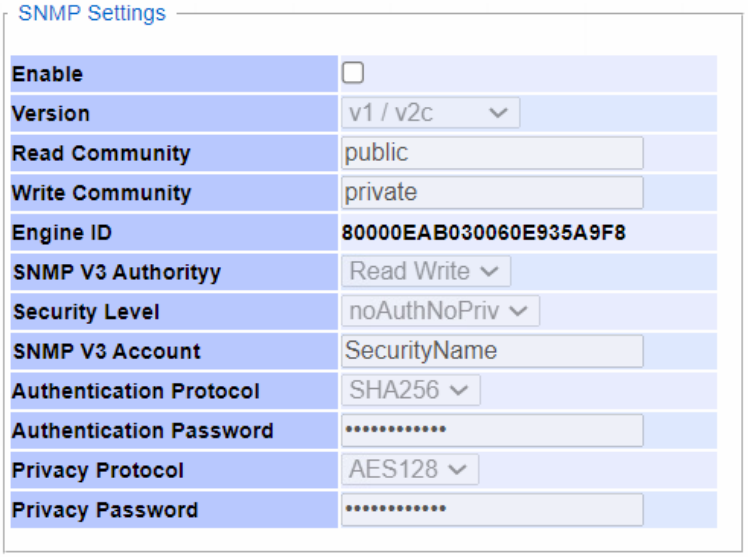


Figure 5-13 SNMP Settings -> Common Settings

Enable:

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable the SNMP server on XTS8600
Unchecked		Disable the SNMP server on XTS8600

Version: This setting lets you select the version of SNMP that the XTS8600 will use.

Setting	Factory Default	Setting Explanation
V1/V2C	V1/V2C	V1/V2C are earlier versions of SNMP that are less secure but widely supported
Only V3		SNMP V3 provides better security features, including encryption and authentication
V1/V2C/V3		Support all SNMP versions of V1, V2C and V3

SNMP Settings – V1 and V2C Settings:

Read Community*:*

Setting	Factory Default	Setting Explanation
Max. 30 characters	public	This is a password-like string that acts as a key for read-only access to the XTS8600 SNMP data.

Write Community*:*

Setting	Factory Default	Setting Explanation
Max. 30 characters	private	This string allows write access to the XTS8600 SNMP data. It's like a password that permits changes to be made through SNMP commands.

Note: **Read/Write Community**
Read/Write Community strings support the following characters: a-z, A-Z, 0-9, and the following special characters: ._-.

SNMP Settings – V3 Settings:

Engine ID*:*

Setting	Factory Default	Setting Explanation
Maximum of 32 hexadecimal characters	MAC address of MGT Interface	This Engine ID is a unique identifier for the SNMP V3 engine in this XTS8600 and ensures that SNMP messages are properly handled by the correct SNMP manager

Security Level - SNMP*:*

Setting	Factory Default	Setting Explanation
noAuthNoPriv	noAuthNoPriv	Set SNMP V3 to authenticate using a username, with no encryption.
AuthNoPriv		Set SNMP V3 to authenticate using MD5 or SHA algorithm, with no encryption.

AuthPriv		Set SNMP V3 to authenticate using MD5 or SHA algorithm, with DES and AES encryption.

Note: **Security Level**

Detail explanation of SNMP V3 security level

Table 5-1 SNMP V3 Security Level

Level	Authentication	Encryption	Description
noAuthNoPriv	Username	No	Access objects using an admin or user account without data encryption.
AuthNoPriv	MD5 SHA-1 SHA-256 SHA-512	No	Authentication is based on MD5 or SHA algorithms, with a minimum requirement of 8-character passwords for authentication.
AuthPriv		DES AES-128 AES-256	Authentication is based on MD5 or SHA algorithms, with a data encryption of DES or AES. A minimum of an 8-character password and a data encryption key are required for both authentication and encryption.

SNMP V3 Account*:*

Setting	Factory Default	Setting Explanation
At least 4 characters, (max. 32 characters)	SNMP-User	Username for SNMP V3 authentication

Note: **SNMP V3 Account**

The SNMP V3 Account can include the following characters: a-z, A-Z, 0-9, and the following special characters: ._-

SNMP V3 Authority*:*

Setting	Factory Default	Setting Explanation
Read only	Read Write	The user of SNMP V3 account only has read only access
Read Write		The user of SNMP V3 account has read and write access

Authentication Protocol*:*

Setting	Factory Default	Setting Explanation
MD5	SHA-256	Set MD5 as the authentication protocol
SHA-1		Set SHA-1 as the authentication protocol
SHA-256		Set SHA-256 as the authentication protocol
SHA-512		Set SHA-512 as the authentication protocol

Note: **SNMP V3 Authentication Protocol**

When choosing between MD5, SHA-1, SHA-256, and SHA-512, note that MD5 and SHA-1 are outdated and insecure. SHA-256 offers a strong balance of security and performance, while SHA-512 provides greater security but is slower. For modern needs, SHA-256 or SHA-512 is recommended.

Authentication Password*:*

Setting	Factory Default	Setting Explanation
8 to 30 characters	AuthPassword	Input the authentication password

Privacy Protocol*:*

Setting	Factory Default	Setting Explanation
DES	AES-128	Set DES as the encryption protocol
AES-128		Set AES-128 as the encryption protocol
AES-256		Set AES-256 as the encryption protocol

Note: **SNMP V3 Privacy Protocol**

For security, DES is outdated and weak. AES-128 provides strong encryption and is efficient for most uses. AES-256 offers the highest security but requires more resources. Use AES-256 for maximum protection, and AES-128 for balanced security and performance.

Privacy Password*:*

Setting	Factory Default	Setting Explanation
8 to 30 characters	PrivPassword	Input the authentication password

Note: **Authentication and Privacy Password**

*The Authentication and Privacy Password can include the following characters: a-z, A-Z, 0-9, spaces, and the following special characters: ! # $ % & ' ( ) * + , \ - . / : ; < = > @ [ ] ^ _ ` { | } ~.*

SNMP Trap/Inform Settings:

SNMP uses two methods for event notifications: Traps and Informs. A Trap is an unacknowledged message, while an Inform requires acknowledgment, making it more reliable. Informs are supported only in SNMP V2C and SNMP V3, while Trap V1 and Trap V2C are incompatible due to differences in message structures. For SNMPv3, both Trap V3 and Inform V3 offer advanced security features, including authentication and encryption, for enhanced communication reliability and security.

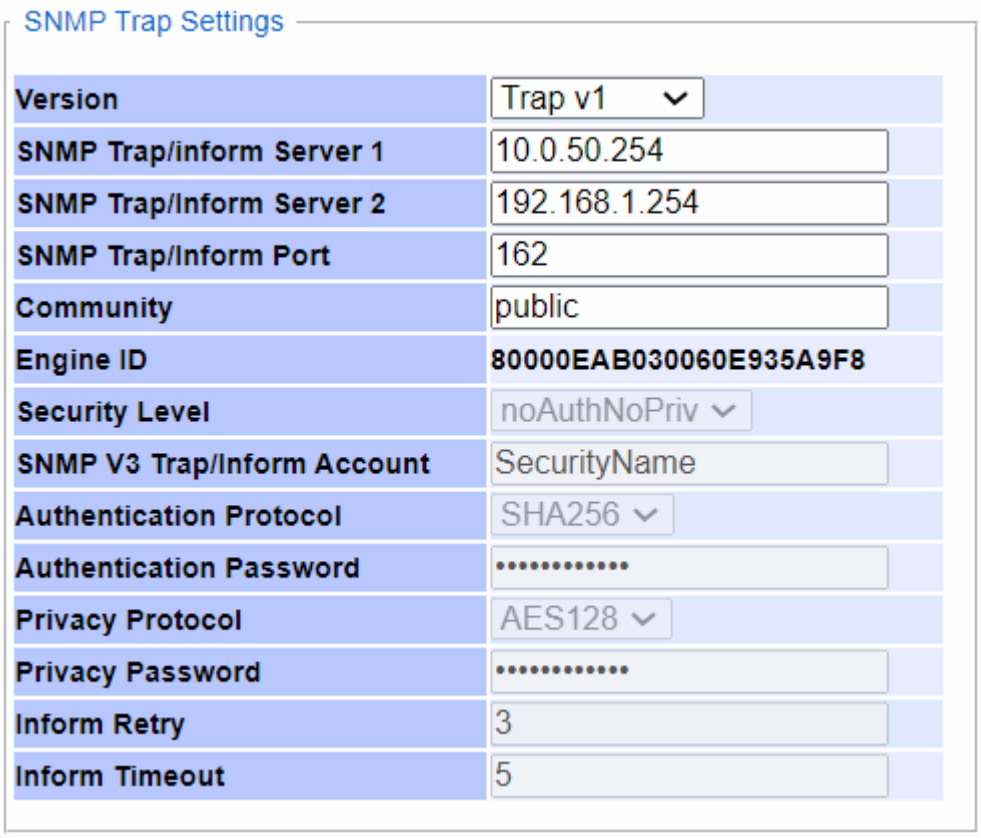


Figure 5-14 SNMP Settings -> Trap/Inform Settings

Version*:*

Setting	Factory Default	Setting Explanation
Trap V1	Trap V2C	Set SNMP Trap to V1
Trap V2C		Set SNMP Trap to V2C
Inform V2C		Set SNMP Inform to V2C
Trap V3		Set SNMP Trap to V3
Inform V3		Set SNMP Inform to V3

SNMP Trap/Inform Server 1:

Setting	Factory Default	Setting Explanation
SNMP Trap Server 1 IPV4 Address	10.0.50.254	Set the IP address of Primary SNMP Trap/Inform server

SNMP Trap/Inform Server 2:

Setting	Factory Default	Setting Explanation
SNMP Trap Server 2 IPV4 Address	192.168.1.254	Set the IP address of secondary SNMP Trap/Inform server

SNMP Trap/Inform Port:

Setting	Factory Default	Setting Explanation
1 ~ 65535	162	Set the SNMP Trap/Inform UDP port

Community*:*

Setting	Factory Default	Setting Explanation
Max. 30 characters	What if the public	Authentication string for SNMPv1 and v2c to secure Trap/Inform communication

Note: **Community**
Read/Write Community strings support the following characters: a-z, A-Z, 0-9, and the following special characters: ._-.

Engine ID*:*

Setting	Factory Default	Setting Explanation
Maximum of 32 hexadecimal characters	MAC address of MGT Interface	This is a read-only field, and its value is derived from the SNMPv3 Engine ID. It's identical to the SNMP v3 Engine ID.

Security Level – SNMP Trap*:* See the **Security Level** setting of SNMP for more detail.

Setting	Factory Default	Setting Explanation
noAuthNoPriv	noAuthNoPriv	Set SNMP V3 Trap/Inform to authenticate using a username, with no encryption.
AuthNoPriv		Set SNMP V3 to Trap/Inform authenticate using MD5 or SHA algorithm, with no encryption.
AuthPriv		Set SNMP V3 to Trap/Inform authenticate using MD5 or SHA algorithm, with DES and AES encryption.

SNMP V3 Trap/Inform Account:

Setting	Factory Default	Setting Explanation
At least 4 characters, (max. 32 characters)	SNMP-User	Username for SNMP V3 Trap/Inform authentication

Note: **SNMP V3 Trap/Inform Account**
The SNMP V3 Trap/Inform Account can include the following characters: a-z, A-Z, 0-9, and the following special characters: ._-

Authentication Protocol:

Setting	Factory Default	Setting Explanation
MD5	SHA-256	Set MD5 as the Trap/Inform authentication protocol
SHA-1		Set SHA-1 as the Trap/Inform authentication protocol
SHA-256		Set SHA-256 as the Trap/Inform authentication protocol
SHA-512		Set SHA-512 as the Trap/Inform authentication protocol

Note: **SNMP V3 Authentication Protocol**
When choosing between MD5, SHA-1, SHA-256, and SHA-512, note that MD5 and SHA-1 are outdated and insecure. SHA-256 offers a strong balance of security and performance, while SHA-512 provides greater security but is slower. For modern needs, SHA-256 or SHA-512 is recommended.

Authentication Password:

Setting	Factory Default	Setting Explanation
8 to 30 characters	AuthPassword	Input the Trap/Inform authentication password

Privacy Protocol:

Setting	Factory Default	Setting Explanation
DES	AES-128	Set DES as the Trap/Inform encryption protocol
AES-128		Set AES-128 as the Trap/Inform encryption protocol
AES-256		Set AES-256 as the Trap/Inform encryption protocol

Note: **SNMP V3 Trap/Inform Privacy Protocol**
For security, DES is outdated and weak. AES-128 provides strong encryption and is efficient for most uses. AES-256 offers the highest security but requires more resources. Use AES-256 for maximum protection, and AES-128 for balanced security and performance.

Privacy Password:

Setting	Factory Default	Setting Explanation
8 to 30 characters	PrivPassword	Input the authentication password

Note: **Authentication and Privacy Password**

*The Authentication and Privacy Password can include the following characters: a-z, A-Z, 0-9, spaces, and the following special characters: ! # $ % & ' ( ) * + , \ - . / : ; < = > @ [ ] ^ _ ` { | } ~.*

Inform Retry*:*

Setting	Factory Default	Setting Explanation
1 ~ 99	3	Set for resending the SNMP Inform if there is no acknowledgement from the SNMP manager.

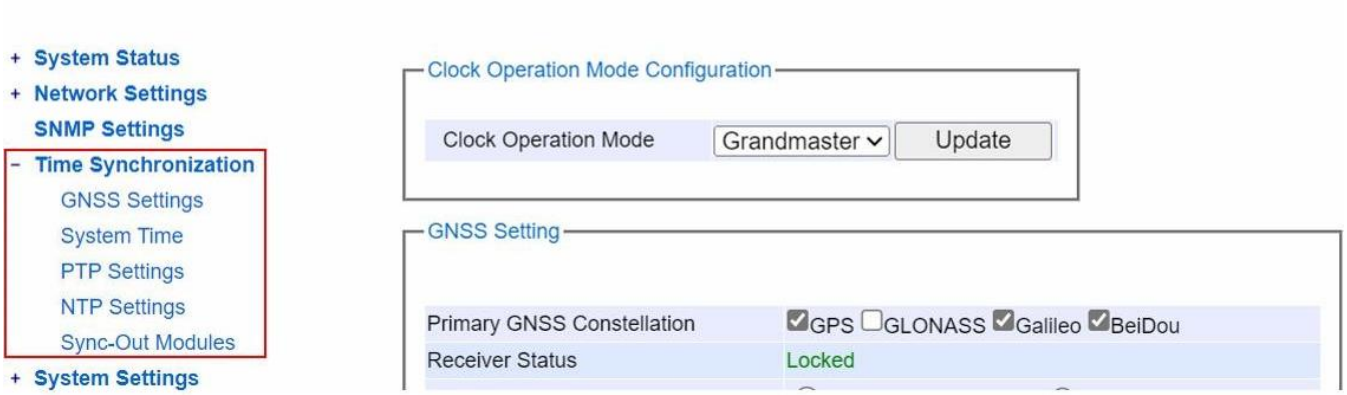
Inform Timeout*:*

Setting	Factory Default	Setting Explanation
1 ~ 300 seconds	10	Set to determine if there is no acknowledgement from the SNMP manager.

5.3 Time Synchronization

The "Time Synchronization" subsection provides key configuration options for managing time settings and protocols. These include **GNSS Settings** for configuring satellite systems like GPS, GLONASS, Galileo, and BeiDou; **System Time** to set the XTS8600 current time; **PTP Settings** for Precision Time Protocol; **NTP Settings** for Network Time Protocol; and **Sync-Out Modules** for managing external synchronization modules.

Figure 5-15 Time Synchronization



5.3.1 GNSS Settings

Clock Operation Mode Configuration:

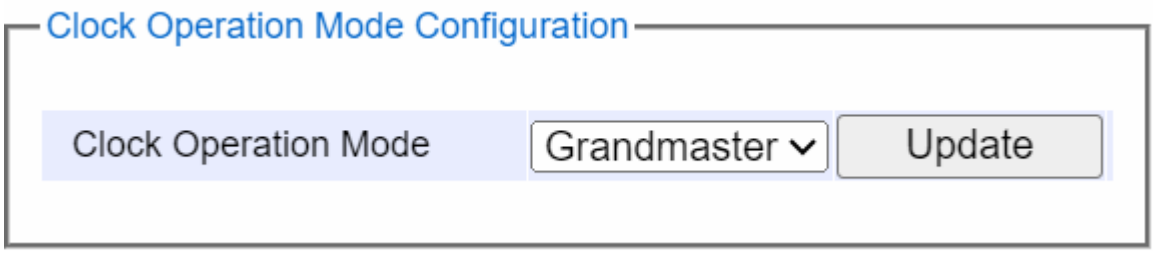


Figure 5-16 Time Synchronization -> GNSS Settings -> Clock Operation Mode

Clock Operation Mode*:*

Setting	Factory Default	Setting Explanation
Grandmaster	Grandmaster	The time source is GNSS. The XTS8600 system connects to a GNSS/GPS antenna to correctly initiate the output of time synchronization
FreeRun		The time source is the RTC. In Freerun mode, NTP/PTP operation is immediately enabled without requiring a GNSS antenna connection. The NTP/PTP protocol activates as soon as the system starts, even without GNSS signal.

Note: **Clock Operation Mode**

There are two modes available: Grandmaster and FreeRun. FreeRun Mode is very helpful during on-site deployments. Technicians can first use FreeRun Mode to confirm the internal NTP/PTP settings and network environment. After that, they can switch to Grandmaster mode to verify the connection of the GNSS cable and antenna.

GNSS Setting:

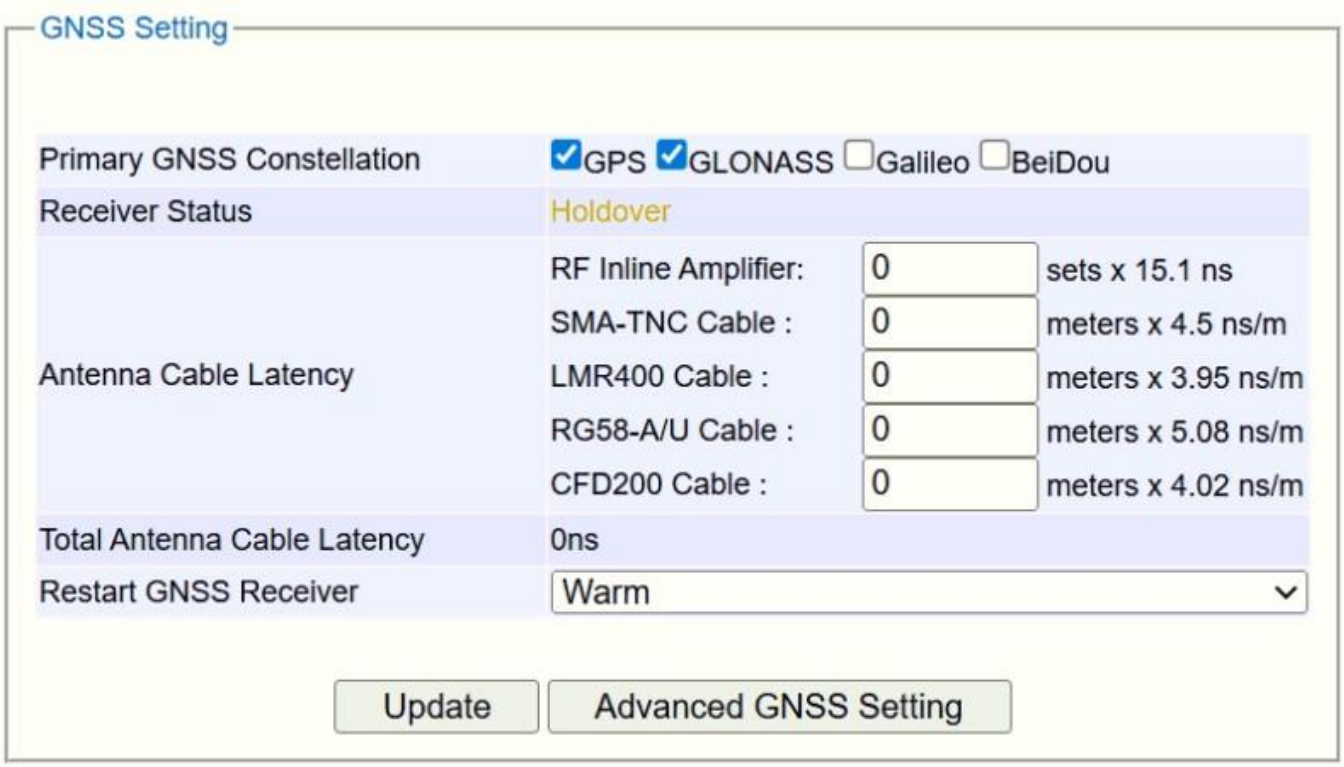


Figure 5-17 Time Synchronization -> GNSS Settings

Primary GNSS Constellation*:*

Setting	Factory Default	Setting Explanation
GPS	GPS & GLONASS	Check the checkbox to enable GPS signal reception
GLONASS		Check the checkbox to enable GLONASS signal reception
Galileo		Check the checkbox to enable Galileo signal reception
BeiDou		Check the checkbox to enable BeiDou signal reception

Note: **Primary GNSS Constellation**

The XTS8600 GNSS modules are advanced receivers capable of concurrently receiving and tracking multiple GNSS systems, including GPS, Galileo, GLONASS, and BeiDou. Thanks to the dual-frequency RF front-end design, they can process either GLONASS or BeiDou signals simultaneously with GPS and Galileo, enabling reception from three GNSS systems at once.

By default, XTS8600 receivers are set to operate with GPS and GLONASS concurrently. Following table show the set of permissible combination if the GNSS antenna is used. If GPS Antenna is used, only GPS and Galileo signal could be received.

Table 5-2 Concurrent Available GNSS Constellation

GPS	Galileo	GLONASS	BeiDou
●	●	-	-
●	●	●	-
●	●	-	●
●	-	●	-
●	-	-	●
-	●	●	-
-	●	-	●
-	-	●	●
●	-	–	–
–	●	–	–
–	–	●	–
–	–	–	●

Receiver Status*:*

Status	Status Explanation
Locked	The receiver is accurately synchronized with the GNSS/GPS signal
Spoofing	The receiver detects a potential false GNSS/GPS signal (spoofing attack)
Holdover	The receiver is maintaining synchronization without a current GNSS/GPS signal, using its internal clock.

Antenna Cable Latency*:*

The "Antenna Cable Latency" subsection lets users configure delays from components like Surge Protectors, RF In-line Amplifiers, and Adaptor Connectors, each with predefined delay values. Users can also input cable lengths for various types (e.g., SMA-TNC, LMR400, RG58-A/U, and CFD200), which have specific delays per meter. These inputs help calculate the total signal delay in the antenna setup.

Antenna Cable Latency – RF Inline Amplifier*:*

Setting	Factory Default	Setting Explanation
0 ~ 1	0	Input the number of RF Inline Amplifier used for calculating and compensating the latency. The typical value is 0 or 1 if it's deployed

Note: **Antenna Cable Latency – RF Inline Amplifier**

A Grandmaster needs an RF Inline Amplifier to boost GNSS/GPS signal strength, especially when the antenna is far from the Grandmaster. This helps overcome signal loss from long cable runs or weak satellite signals, ensuring accurate timing. Refer to Chapter 2 of the accessories guide for specs or the XTS8600 datasheet for part numbers.

Antenna Cable Latency – SMA-TNC Cable*:*

Setting	Factory Default	Setting Explanation
0 or Cable Length in meters	0	Input the length of SMA-TNC cable used for calculating and compensating the latency.

Note: **Antenna Cable Latency – SMA-TNC Cable**
The antenna connector on the XTS8600 is SMA Female. When you purchase an antenna from the XTS8600 accessories, a 2-meter SMC Male to TNC Male cable is included, making it easy to connect to a TNC antenna.

Antenna Cable Latency – LMR400 Cable*:*

Setting	Factory Default	Setting Explanation
0 or Cable Length in meters	0	Input the length of LMR400 cable used for calculating and compensating the latency. Typically, the maximum length is 150 meters and 250 meters with RF Inline Amplifier

Antenna Cable Latency – RG58 A/U Cable*:*

Setting	Factory Default	Setting Explanation
0 or Cable Length in meters	0	Input the length of RG58 cable used for calculating and compensating the latency. Typically, the maximum length is 25 meters and 45 meters with RF Inline Amplifier

Antenna Cable Latency – CFD200 Cable*:*

Setting	Factory Default	Setting Explanation
0 or Cable Length in meters	0	Input the length of CFD200 cable used for calculating and compensating the latency.

Antenna Cable Latency – Total Antenna Cable Latency*:*

Setting	Factory Default	Setting Explanation
0 or Cable Length in meters	0	The accumulated latency includes all configured latency from the amplifier, surge protector, adaptor connector and different cables.

Restart GNSS Receiver*:* User can restart the GNSS Receiver according to following two types

Setting	Factory Default	Setting Explanation
Cold	Warm	Force XTS8600 GNSS receiver to perform cold restart.
Warm		Force XTS8600 GNSS receiver to perform warm restart.

Note: **Restart GNSS Receiver**

- **Cold**: The GNSS receiver will clean up all satellite-related information. The receiver must conduct a comprehensive search across all potential time, frequency, and satellite combinations. Upon detection of a satellite signal, it initiates tracking to extract ephemeris data. The restarting time depends on the satellite signal strength. Typically, this will be less than 45 seconds.
- **Warm**: The GNSS receiver retain approximate satellite-related information. Normally it just needs to download the ephemeris data. The restarting time depends on the satellite signal strength. Typically, this will be less than 7 seconds.

Advanced GNSS Setting:

Click Advanced GNSS Setting next to the Update button as Figure 5-18. More GNSS settings for GNSS lock conditions can be configured here as Figure 5-19. The default Advanced GNSS settings are suitable for most XTS8600 installations, including antennas with ideal or less-than-ideal sky views. These settings should only be changed if specific reception or timing issues are identified.

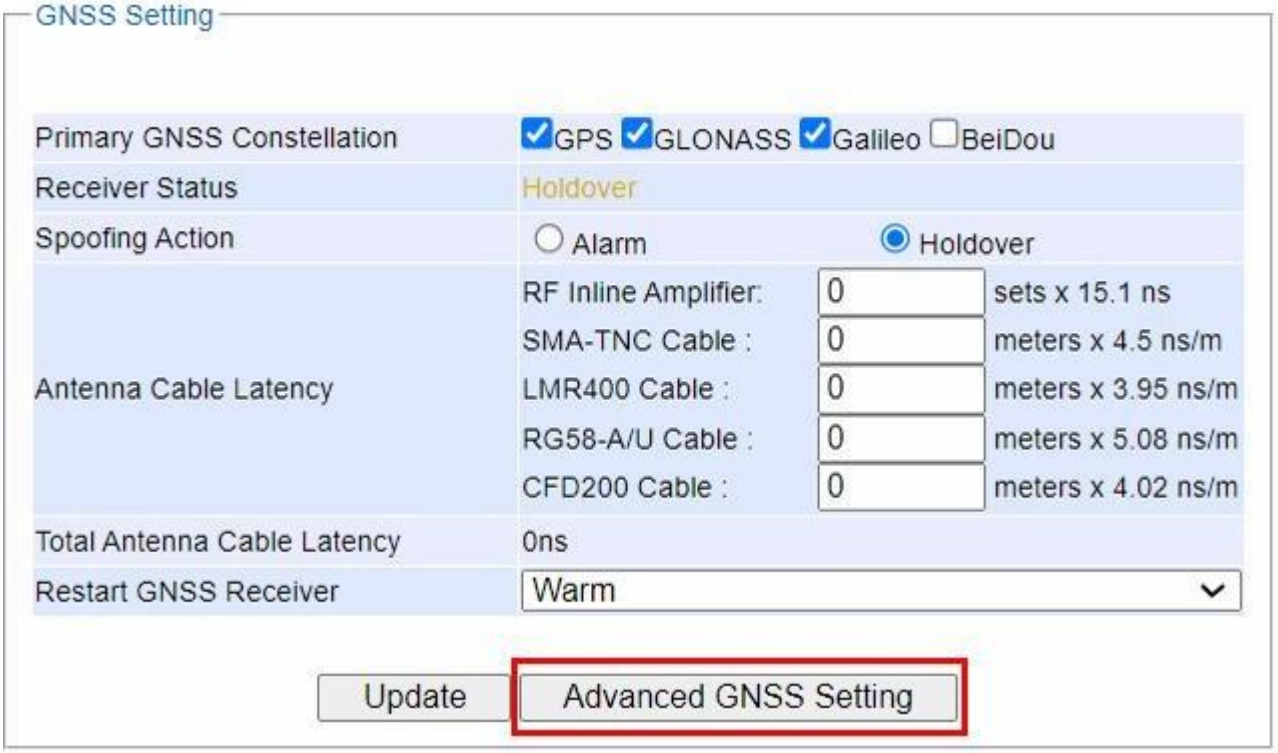


Figure 5-18 Time Synchronization -> Advanced GNSS Settings Button

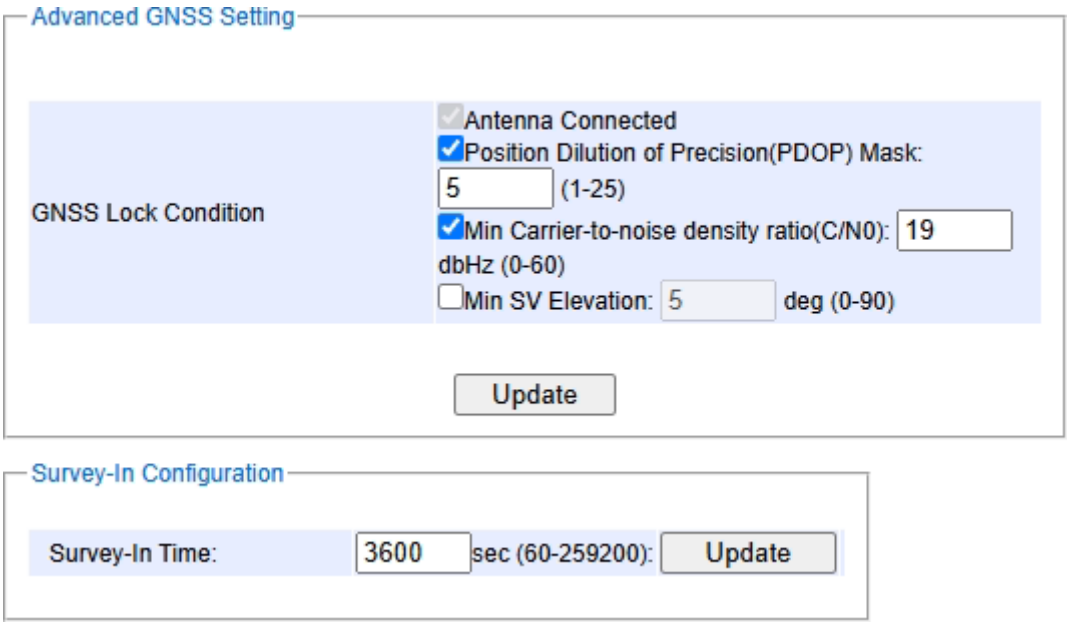


Figure 5-19 Time Synchronization -> Advanced GNSS Settings

Antenna Connected*:*

Setting	Factory Default	Setting Explanation
Enable	Enable	Make the antenna connection a condition for GNSS locking. This is read-only setting for user's awareness.

Position Dilution of Precision (PDOP) Mask*:*

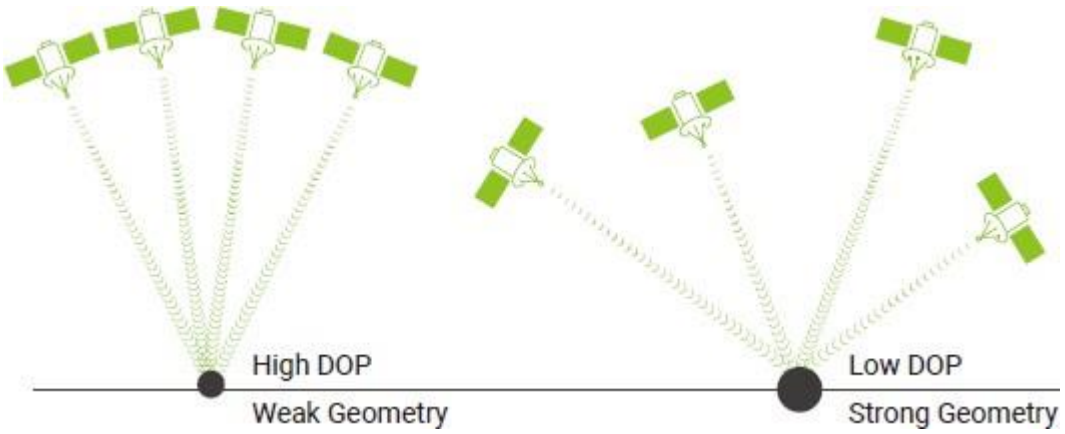


Figure 5-20 Advanced GNSS Settings - PDOP

PDOP is a measure of the accuracy of the GNSS position data received by the Grandmaster. It indicates how satellite geometry impacts the precision of the position calculation. A lower PDOP value signifies better satellite

geometry and higher accuracy, while a higher PDOP value indicates less favourable satellite positions and reduced accuracy.

For timing applications, the PDOP mask is still an important factor, but the focus is slightly different than for positioning. Here are some guidelines for PDOP values in timing applications:

Position Dilution of Precision (PDOP) Mask*:*

Setting	Factory Default	Setting Explanation
1 ~ 25	5	Input the PDOP value for optimizing satellite signal

Note: **Position Dilution of Precision (PDOP) Mask**

- **PDOP Values for Timing Applications**:
  - *PDOP ≤ 2: Ideal – This is considered excellent and provides the highest accuracy for timing applications. The satellite geometry is optimal, which helps ensure precise time synchronization.*
  - *PDOP 2-4: Good – This range is generally suitable for most timing applications, offering a good balance between satellite geometry and timing accuracy.*
  - *PDOP 4-6: Acceptable – While this range is less ideal, it can still be acceptable for timing applications where extreme precision is not critical. However, timing accuracy might slightly degrade.*
  - *PDOP > 6: Marginal/Poor – A PDOP above 6 indicates poor satellite geometry, which can lead to less accurate timing. This is not recommended for applications requiring high precision time synchronization.*
  - *PDOP > 8: Not Recommended – For timing purposes, a PDOP above 8 usually results in unacceptable timing errors due to very poor satellite geometry. It's best to avoid using data with such high PDOP values for timing.*
- **Recommended PDOP Mask Value for Timing Applications:**

  For timing applications, a PDOP mask of 5 or lower is typically recommended. This ensures that the GNSS signals used for time synchronization are based on good satellite geometry, leading to more accurate and reliable timing.

Min Carrier-to-Nosie Density Ratio (C/NO) Mask*:*

Setting	Factory Default	Setting Explanation
0 ~ 60	19	Input the **Min C/NO** value. The value you enter represents the threshold, meaning any GNSS signal with a C/NO lower than this value will not be used for GNSS lock operations.

Note: **Min Carrier-to-Nosie Density Ratio (C/NO) Mask**

Min C/N0 is a measure of the signal quality of the GNSS signal received by the Grandmaster. It represents the ratio of the power of the carrier signal (The main signal of interest, such as GNSS signal) to the noise density in the surrounding environment. A higher C/N0 value indicates a stronger and clearer signal, leading to more reliable and accurate GNSS data. Conversely, a lower C/N0 value suggests a weaker signal, which may result in less accurate positioning and timing information.

To achieve the best performance, use a C/No mask of 35 dB-Hz when the antenna is placed outdoors with an unobstructed view of the sky. For indoor environments or locations where the sky view is limited, it's important

to lower the mask to accommodate weaker signals. In such cases, a C/No mask of 0 dB-Hz (zero) is recommended

Elevation Mask*:*

The primary reason for using an elevation mask is to filter out signals from satellites that are low on the horizon. These signals are more likely to be affected by atmospheric interference, multipath effects (where signals bounce off surfaces before reaching the antenna), and obstructions like buildings or trees. By setting an elevation mask, you can improve the accuracy and reliability of the GNSS data. The default value is 5 and permitted range is 0 to 90. Following is the recommended value.

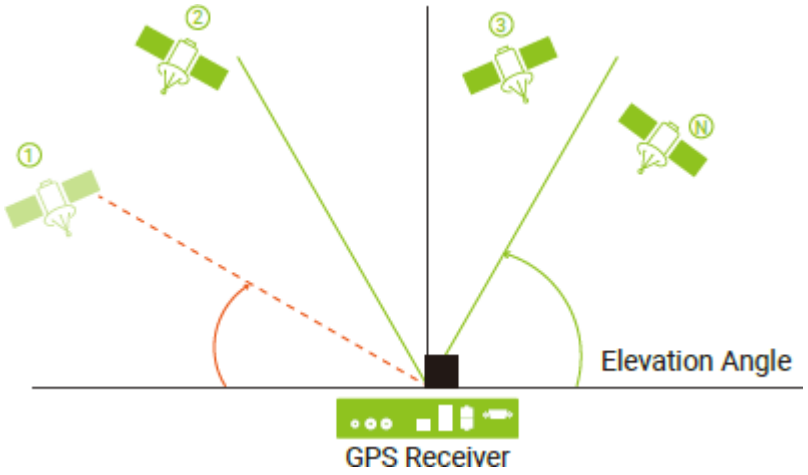


Figure 5-21 Advanced GNSS Settings - Elevation

Min SV Elevation Mask:

Setting	Factory Default	Setting Explanation
0 ~ 90	5	Input the **Min SV Elevation** value. The value you enter represents the threshold, meaning any GNSS satellite with an elevation angle lower than this value will not be used for GNSS lock operations.

Note: **Elevation Mask - Recommended Value for Timing Applications**

- Low Mask (e.g., 5°-10°): Useful in open environments with minimal obstructions, allowing the Grandmaster to use more satellites, which can improve satellite geometry but at the cost of potentially including noisier signals.
- High Mask (e.g., 15°-30°): Recommended in environments with potential obstructions or interference near the horizon. This setting prioritizes the use of cleaner, more reliable signals from satellites higher in the sky.

Survey-In Time Configuration:

What's Surve-In:

The GNSS receiver in the XTS8600 supports two operating modes: 3D Fixed Mode and Time Mode. Time Mode is a specialized mode used when the receiver's physical location is known and remains stationary. In this mode, the receiver focuses exclusively on time calculation using all visible satellites, enabling maximum timing accuracy. For timing-critical applications, such as those supported by the XTS8600, operating in Time Mode is strongly recommended.

Surve-In Operation:

Before entering Time Mode, the receiver must complete a process known as Survey-In. Survey-In determines the fixed position of the receiver by averaging multiple valid 3D position solutions. During this process, the receiver operates in 3D Fixed Mode and requires at least four visible satellites to compute a valid position. If fewer than four satellites are available, the Survey-In process will continue running until the configured Survey-In time expires. During this period, the receiver remains in 3D Fixed Mode.

Surve-In Time:

By default, the Survey-In duration is set to 3600 seconds (1 hour), which is typically sufficient for the receiver to transition into Time Mode. Upon power-up, the XTS8600 begins a self-survey, averaging position data over the configured duration. The Survey-In time is user-configurable and can be extended up to 259200 seconds (3 days) for improved positional accuracy. Recommended values include 14400 seconds (4 hours), 28800 seconds (8 hours), or 86400 seconds (24 hours) to allow satellite constellations to move further through their orbits and enhance position averaging.

Surve-In Data:

Once Survey-In completes successfully, the receiver automatically switches to Time Mode, using the averaged position for ongoing time synchronization. The result—whether successful or failed—is recorded in the event log. The result of Survey-In data is stored in GNSS receiver and is only preserved through following events such as

1. Reboot through Web interface
2. Pin hole reset (Item 8 in section Subsection 1.5)
3. GNSS receiver warm restart in subsection 5.3.1
4. XTS8600 cold start (power reset)

Following events or actions will clear the survey-in data

1. Change the setting of GNSS constellation in subsection 5.3.1
2. Change the setting of survey-in time in subsection 5.3.1
3. GNSS reset default in subsection 5.4.7
4. System reset to factory default in subsection 5.4.7
5. GNSS receiver cold restart in subsection 5.3.1

If the antenna location is changed, it is essential to reset the GNSS receiver to factory defaults to initiate a new Survey-In.

Survey-In Time:

Setting	Factory Default	Setting Explanation
60 ~ 259200 seconds	3600 seconds	The duration required to perform the Survey-In operation before entering Time Mode

5.3.2 System Time

Setup Current System Date, Time and Time Zone:

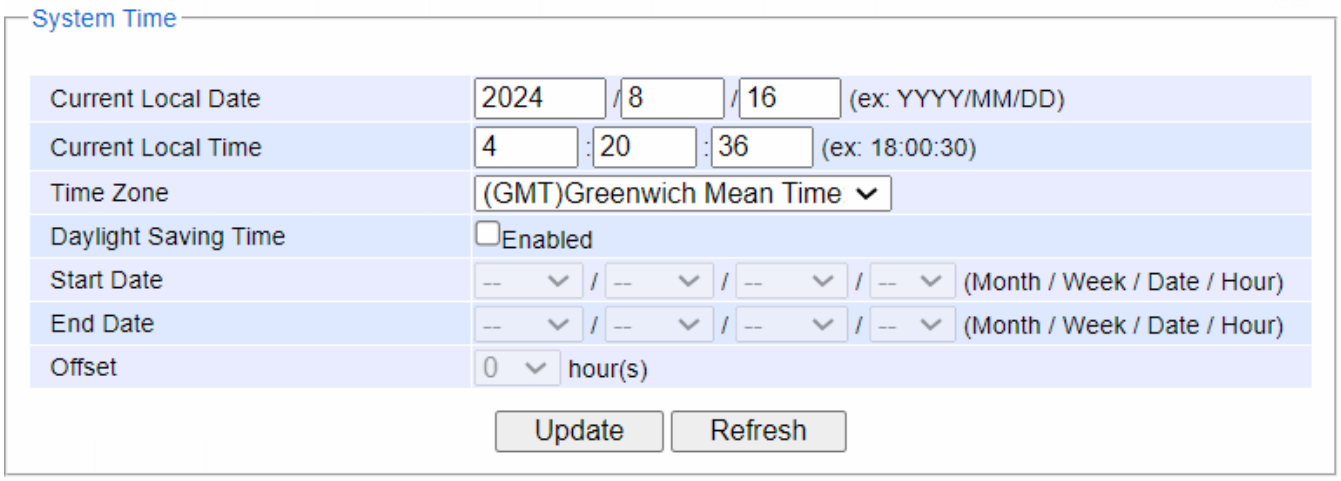


Figure 5-22 Time Synchronization -> System Time

Setup Current Local Date, Current Local Time and Time Zone:

Current Local Date:

Setting	Factory Default	Setting Explanation
Input the Current Local Date	None	Input the Current Local Date **/*Important Notice*/:** It is strongly recommended not to modify this setting when NTP/PTP operation is enabled in all **Clock Operation Modes**, as it may affect the NTP/PTP timestamps.

Current Local Time:

Setting	Factory Default	Setting Explanation
Input the Current Local Time	None	Input the Current Local Time */***Important Notice***/: It is strongly recommended not to modify this setting when NTP/PTP operation is enabled in all* **Clock Operation Modes**, *as it may affect the NTP/PTP timestamps.*

Note: **Current Local Date and Current Local Time**

*If the **Clock Operation Mode** is set to **Grandmaster** and GNSS is locked, the* **Current Local Time** and **Current Local Date***, along with the system time are synchronized by GNSS/GPS time every second as well as the system time. The* **Current Local Time** and **Current Local Date***, minus the time zone offset, represent the UTC time.*

*When **FreeRun** is selected as the **Clock Operation Mode**, all PTP/NTP/IRIG-B services and system time will use this time as the time source.*

The XTS8600 has an RTC that saves the **Current Local Date and Time***, allowing the system to retain its previous time after a temporary power loss.*

Time Zone:

Setting	Factory Default	Setting Explanation
Select from the drop-down list	GMT	Select the time zone used by the XTS8600. The local time information for PTP, IRIG-B, etc. is derived from this setting.

Daylight Saving Time: Daylight Saving Time (DST) is a practice used in many regions to make better use of daylight during the longer days of spring and summer. During DST, clocks are set forward by one hour in the spring ("spring forward") and then set back by one hour in the fall ("fall back") to return to standard time.

Daylight Saving Time Settings can be enabled when Enable Daylight Saving Time box is checked. When it is enabled, the user can select the detailed setting of the daylight-saving period, such as Start Date and End Date with Offset

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable the Daylight-Saving Time.
Unchecked		Disable the Daylight-Saving Time.

Start Date:

Setting	Factory Default	Setting Explanation
User-specify date	None	Input the date that Daylight-Saving Time begins

End Date:

Setting	Factory Default	Setting Explanation
User-specify date	None	Input the date that Daylight-Saving Time ends.

Offset:

Setting	Factory Default	Setting Explanation
0 ~ 12	0	Input the offset to use for the Daylight-Saving Time

5.3.3 PTP Settings

The PTP (Precision Time Protocol) configuration can be complex, so we have divided it into the following subsections for better understanding.

1. **PTP Common Setting**
2. **Profile-Specified Setting**
3. **BMCA-Related Status and Settings**
4. **Miscellaneous Setting**

PRP (Parallel Redundancy Protocol) is a network protocol that provides seamless redundancy by sending duplicate data packets over two independent networks, ensuring uninterrupted data transmission even if one network fails. The meaning of PRP interface status is the same with the PTP LAN interface 1 & 2 status. XTS8600 series supports one PRP, which can be enabled or disabled through “Network Settings → Bonding/PRP” and configured the PTP settings for the PRP interface through “Time Synchronization → PTP Settings”. Disabling PTP for PRP will change the PTP LAN Interface 1 & 2 status to "Not Operational."

LAN1, LAN2 and PRP PTP Common Settings:

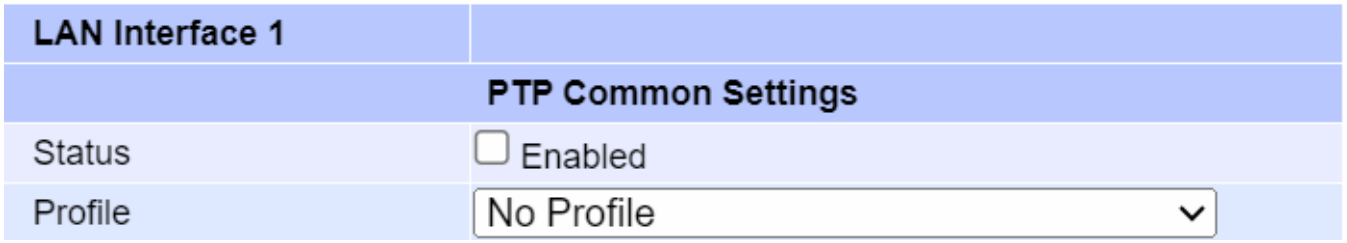


Figure 5-23 Time Synchronization -> PTP Settings -> PTP Common Settings

Status:

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable the PTP protocol on LAN1 or LAN2 or PRP
Unchecked		Disable the PTP protocol on LAN1 or LAN2 or PRP

Profile: IEEE1588v2 allows a wide range of settings to be made. Recommended settings for specific applications are called profiles. Each profile contains a recommendation of settings. XTS8600 supports following profiles.

Setting	Factory Default	Setting Explanation
No Profile	IEC/IEEE61850-9-3 Power Utility Profile	No Profile-Specified Settings. The customer should configure the setting according to their needs
Default P2P IEEE 1588-2008		Set the Profile-Specified Settings to Default P2P IEEE 1588-2008 profile settings.
Default E2E IEEE 1588-2008		Set the Profile-Specified Settings to Default E2E IEEE 1588-2008 profile settings.
IEC/IEEE61850-9-3 Power Utility Profile		Set the Profile-Specified Settings to IEC/IEEE61850-9-3 Power Utility Profile settings.

C37.238-2011 Power Profile		Set the Profile-Specified Settings to C37.238-2011 Power Profile settings.
C37.238-2017 Power Profile		Set the Profile-Specified Settings to C37.238-2017 Power Profile.
ITUT-G.8265.1 Frequency		Set the Profile-Specified Settings to ITUT-G.8265.1 Frequency.
ITUT-G.8275.1 Phase/Time		Set the Profile-Specified Settings to ITUT-G.8275.1 Phase/Time.
ITUT-G.8275.2 Phase/Time		Set the Profile-Specified Settings to ITUT-G.8275.2 Phase/Time.
802.1AS Profile		Set the Profile-Specified Settings to 802.1AS Profile.
Enterprise Profile		Set the Profile-Specified Settings to Enterprise Profile.

Note: **Profile**

Followings list the detail setting of each profile that XTS8600 supports now. In the near future, TSN and Telecom Profile will be supported as well.

1. *Default P2P IEEE 1588-2008*

Table 5-3 Default P2P IEEE 1588-2008

Profile-Specified Web Settings	*Acceptable Value or Range of Profile*
Transport	*IPV-4-Multicast (Default value)* *IPV6-Multicast*
Path Delay Measurement	*Peer-to-Peer*
Synchronization Mode	*One-Step-Clock or Two-Step-Clock (Default value)*
Domain	*0-255 (Default value of profile is 0)*
Announce Interval	*1 (1/2s)*
Announce Timeout	*2-10 receptions timeout (Default value is 3)*
Sync Interval	*0 (1/s)*
P2P/E2E Delay request Interval	*0-7 (1/s ~ 1/128s) (Default value is 1 second)*
ATOI TLV	*Disabled*

2. *Default E2E IEEE 1588-2008*

Table 5-4 Default E2E IEEE 1588-2008

Profile-Specified Web Settings	*Acceptable Value or Range of Profile*
Transport	*IPV4-Multicast (Default value)* *IPV6-Multicast*
Path Delay Measurement	*End-to-End*
Synchronization Mode	*One-Step-Clock or Two-Step-Clock (Default value)*
Domain	*0-255 (Default value of profile is 0)*

Announce Interval	*1 (1/2s)*
Announce Timeout	*2~10 receptions timeout (Default value is 3)*
Sync Interval	*0 (1/s)*
P2P/E2E Delay request Interval	*0-7 (1/s~1/128s) (Default value is 1 second)*
ATOI TLV	*Disabled*

3. *IEC/IEEE 61850-9-3 Power Utility Profile*

Table 5-5 IEC/IEEE 61850-9-3 Power Utility Profile

Profile-Specified Web Settings	*Acceptable Value or Range of Profile*
Transport	*L2-Multicast*
Path Delay Measurement	*Peer-to-Peer*
Synchronization Mode	*One-Step-Clock or Two-Step-Clock (Default value)*
Domain	*0~255* *(Default value of profile is 0, Recommended: 93)*
Announce Interval	*0 (1/s)*
Announce Timeout	*3 receptions timeout*
Sync Interval	*0 (1/s)*
P2P/E2E Delay request Interval	*0 (1/s)*
ATOI TLV	*Disabled*

4. *C37.238-2011 Power Profile:*

All IEEE C37.238 messages must be encapsulated in IEEE 802.1Q-tagged Ethernet frames. This means VLAN is mandatory to C37.238-2011.These frames allow for configurable priority and VLAN ID settings. The default priority is set at 4, while the default VLAN ID (VID) is 0. To configure VLAN, navigating to "Network Settings → VLAN Settings".

Table 5-6 C37.238-2011 Power Profile

Profile-Specified Web Settings	*Acceptable Value or Range of Profile*
Transport	*L2-Multicast*
Path Delay Measurement	*Peer-to-Peer*
Synchronization Mode	*One-Step-Clock or Two-Step-Clock (Default value)*
Domain	*0~255 (Default value of profile is 0)*
Announce Interval	*0 (1/s)*
Announce Timeout	*2~3 receptions timeout (Default value is 3)*
Sync Interval	*0 (1/s)*
P2P/E2E Delay request Interval	*0 (1/s)*

Grandmaster ID (8-bits)	*0003~00FE hex* *Most significant byte is reserved and shall be 0. Other values are invalid and indicate that Grandmaster ID is not configured.*
ATOI TLV	*Enabled*

5. *C37.238-2017 Power Profile*

Table 5-7 C37.238-2017 Power Profile

Profile-Specified Web Settings	*Acceptable Value or Range of Profile*
Transport	*L2-Multicast*
Path Delay Measurement	*Peer-to-Peer*
Synchronization Mode	*One-Step-Clock or Two-Step-Clock (Default value)*
Domain	*0~127, + 254*
Announce Interval	*0 (1/s)*
Announce Timeout	*3 receptions timeout*
Sync Interval	*0 (1/s)*
P2P/E2E Delay request Interval	*0 (1/s)*
Grandmaster ID (16-bits)	*0000~FFFF* *if not used, the value is 0000 hex*
ATOI TLV	*Enabled*

6. *ITUT-G.8265.1 Frequency*

Table 5-8 ITUT-G.8265.1 Frequency Profile

Profile-Specified Web Settings	*Acceptable Value or Range of Profile*
Transport	*IPV4-Unicast (Default value)* *IPV6- Unicast*
Path Delay Measurement	*End-to-End*
Synchronization Mode	*One-Step-Clock (Default value) or Two-Step-Clock*
Domain	*4~23, Default value of profile is 4*
Announce Interval	*-3 ~ 4 (8/s ~ 1/16s)* *Default Announce Interval of profile is 1 (1/2s)*
Announce Timeout	*2 receptions timeout*
Sync Interval	*-7 ~ 4 (128/s ~ 1/16s)* *Default value is -4 (16/s)*
P2P/E2E Delay request Interval	*-7 ~ 4 (128/s ~ 1/16s)*

	Default value is -4 (16/s)
Grandmaster ID (16-bits)	*Not used*
ATOI TLV	*Disabled*

7. ITUT-G.8275.1 Phase/Time

Table 5-9 ITUT-G.8275.1 Phase/Time Profile

Profile-Specified Web Settings	*Acceptable Value or Range of Profile*
Transport	*L2-Multicast*
Path Delay Measurement	*End-to-End*
Synchronization Mode	*One-Step-Clock (Default value) or Two-Step-Clock*
Domain	*24~43, Default value of profile is 24*
Announce Interval	*-3 (8/s)*
Announce Timeout	*3 receptions timeout*
Sync Interval	*-4 (16/s)*
P2P/E2E Delay request Interval	*-4 (16/s)*
Grandmaster ID (16-bits)	*Not Used*
ATOI TLV	*Disabled*

8. ITUT-G.8275.2 Phase/Time

Table 5-10 ITUT-G.8275.2 Phase/Time Profile

Profile-Specified Web Settings	*Acceptable Value or Range of Profile*
Transport	*IPV4-Unicast (Default value)* *IPV6- Unicast*
Path Delay Measurement	*End-to-End*
Synchronization Mode	*One-Step-Clock (Default value) or Two-Step-Clock*
Domain	*44~63, Default value of profile is 44*
Announce Interval	*-3 ~ 0 (8/s ~ 1/s)* *Default Announce Interval of profile is 0 (1/s)*
Announce Timeout	*2 receptions timeout*
Sync Interval	*-7 ~ 0 (128/s ~ 1/s)* *Default value is -4 (16/s)*
P2P/E2E Delay request Interval	*-7 ~ 0 (128/s ~ 1/s)* *Default value is -4 (16/s)*
Grandmaster ID (16-bits)	*Not used*

ATOI TLV	*Disabled*

9. 802.1AS (gPTP)

Table 5-11 802.1AS (gPTP) Profile

Profile-Specified Web Settings	*Acceptable Value or Range of Profile*
Transport	*L2-Multicast*
Path Delay Measurement	*Peer-to-Peer*
Synchronization Mode	*Two-Step-Clock*
Domain	*0~127, Default value of profile is 0*
Announce Interval	*-3 ~ 4 (8/s ~ 1/16s)* *Default Announce Interval of profile is 0 (1/s)*
Announce Timeout	*3 receptions timeout*
Sync Interval	*-6 ~ 4 (64/s ~ 1/16s)* *Default value is -3 (8/s)*
P2P/E2E Delay request Interval	*-6 ~ 4 (64/s ~ 1/16s)* *Default value is 0 (1/s)*
Grandmaster ID (16-bits)	*Not used*
ATOI TLV	*Disabled*

10. Enterprise

Table 5-12 Enterprise Profile

Profile-Specified Web Settings	*Acceptable Value or Range of Profile*
Transport	*IPV4-Hybrid (Default value)* *IPV6- Hybrid*
Path Delay Measurement	*End-to-End*
Synchronization Mode	*One-Step-Clock (Default value) or Two-Step-Clock*
Domain	*0~255, Default value of profile is 0*
Announce Interval	*1 (1/2s)* *Default Announce Interval of profile is 1 (1/2s)*
Announce Timeout	*3 receptions timeout*
Sync Interval	*-7 ~ 7 (128/s ~ 1/128s)* *Default value is 0 (1/s)*

P2P/E2E Delay request Interval	*-7 ~ 7 (128/s ~ 1/128s)* *Default value is 0 (1/s)*
Grandmaster ID (16-bits)	*Not used*
ATOI TLV	*Disabled*

LAN1, LAN2 and PRP Profile-Specified Settings:

The following settings are Profile-Specified Settings, meaning you must refer to the values or ranges specified by each profile. The purpose of the 1588 profile is to enhance interoperability with other PTP devices. Arbitrarily changing the settings may result in unsuccessful time synchronization and could even affect the entire PTP network.

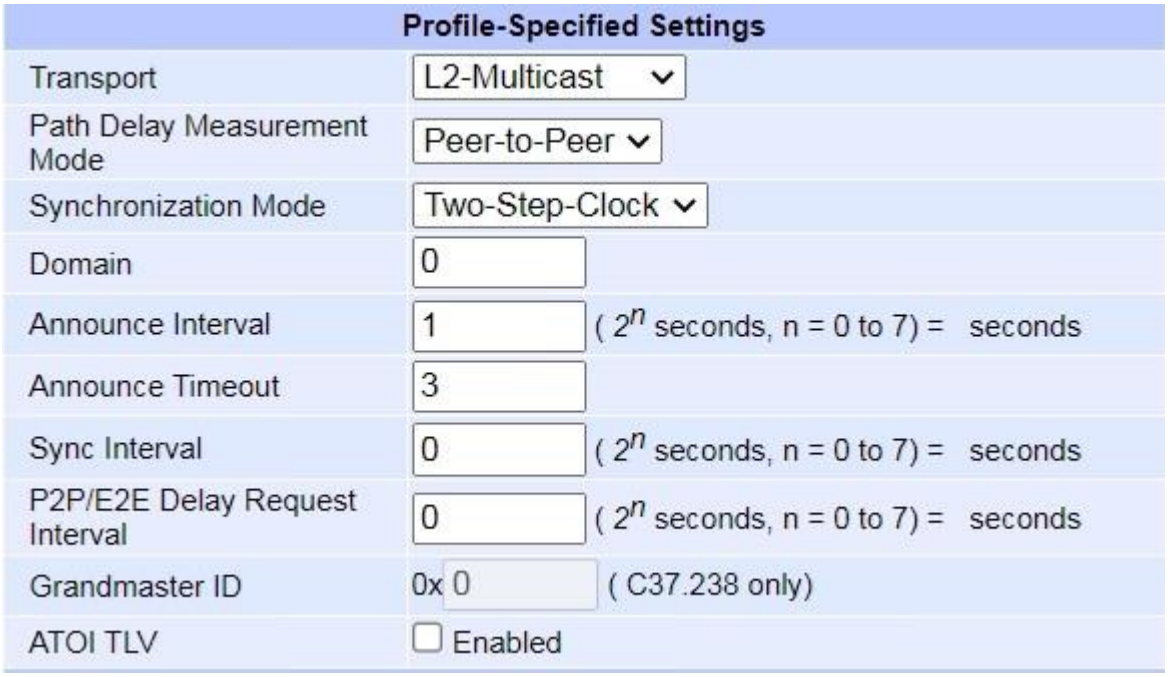


Figure 5-24 Time Synchronization -> PTP Settings -> Profile-Specified Settings

Transport: This setting in the web interface determines the method used for IEEE 1588 communications. This setting provides several options; each tailored to different network requirements. They are profile-specified, and for example, this means you shouldn't select IPv4-Multicast in the C37.238-2017 Power Profile.

Setting	Factory Default	Setting Explanation
L2-Multicast	L2-Multicast	Set the PTP transport of LAN1 or LAN2 or PRP to L2-Multicast.
IPV4-Multicast		Set the PTP transport of LAN1 or LAN2 or PRP to IPV4-Multicast.
IPV6- Multicast		Set the PTP transport of LAN1 or LAN2 or PRP to IPV6-Multicast.
IPV4-Unicast		Set the PTP transport of LAN1 or LAN2 or PRP to IPV4-Unicast.

IPV6-Unicast		Set the PTP transport of LAN1 or LAN2 or PRP to IPV6-Unicast.
IPV4-Hybrid		Set the PTP transport of LAN1 or LAN2 or PRP to IPV4-Hybrid. The term Hybrid means
IPV6-Hybrid		Set the PTP transport of LAN1 or LAN2 or PRP to IPV6-Hybrid.

Note: **IPV4-Hybrid and IPV6-Hybrid: Hybrid Transmission Mode**

- In the Enterprise Profile, Hybrid refers to the use of different transmission methods depending on the message type:
  - Sync and Announce Messages: Transmitted using Multicast, allowing the master to notify all slaves simultaneously.
  - Delay_Request and Delay_Response Messages: Transmitted using Unicast. A slave sends its Delay_Request via unicast, and the master replies in the same transmission mode (i.e., if the request is unicast, the response is also unicast).

Path Delay Measurement: This setting in the web interface specifies the method used to measure the delay in the transmission path for Precision Time Protocol (PTP) messages. This setting is critical for ensuring accurate time synchronization across network devices. They are profile-specified and for example, this means you shouldn't select End-to-End in the IEC/IEEE 61850-9-3 Power Utility Profile. There are two options available.

Setting	Factory Default	Setting Explanation
End-to-End	Peer-to-Peer	Set the path delay measurement to End-to-End, which measures the delay between the master and slave devices over the entire path.
Peer-to-Peer		Set the path delay measurement to Peer-to-Peer, which *measures the delay on each network segment between adjacent devices*.

Synchronization Mode: When the One-Step-Clock setting is enabled, PTP event messages include an accurate timestamp directly within the message. Conversely, if the Two-Step-Clock setting is selected, the accurate timestamp is transmitted in a subsequent message. It's allowed to change this setting in the above profiles.

Setting	Factory Default	Setting Explanation
One-Step-Clock	Two-Step-Clock	Set the **Synchronization Mode** to One-Step-Clock.
Two-Step-Clock		Set the **Synchronization Mode** to Two-Step-Clock.

Note: **Synchronization Mode: One-Step-Clock or Two-Step-Clock**
Conclusion: The devices in a PTP (IEEE 1588-2008) network can handle either one-step or two-step clocks, and it's not necessary for all devices in the chain from master to slave to use the same type.

1. ***Compatibility**: All slaves are designed to work with both one-step and two-step clocks, as per the IEEE 1588-2008 standard. It's more difficult to send one-step messages but receiving them isn't a challenge.*
2. ***Two-step master with one-step transparent clock**: No issues arise in this scenario. The transparent wclock ill update the correction field in the sync message and pass the follow-up message unchanged. The slave then combines the correction fields from both messages.*

3. ***One-step master with two-step transparent clock****: This also works fine but requires more effort from the transparent clock, which will need to set the sync flag to two-step and generate a follow-up message.*

Domain: This domain number assigns a unique identifier to this Grandmaster clock on the network. Only devices that share the same domain number can communicate with each other in PTP Network. This is also a profile-specified setting. You can change the domain number, but it needs to be within the range specified by the profile.

Setting	Factory Default	Setting Explanation
0 ~ 255	0	Set the domain number to PTP transport

Announce Interval: Announce messages are used to share information about the clock's status and hierarchy within the network, helping devices determine the Best Master Clock. This is a profile-specified setting. Some values are fixed and cannot be changed, while others can be adjusted but must remain within a specified range.

Setting	Factory Default	Setting Explanation
Minimum is -3	0	Set the **Announce Interval** to *determines how frequently the PTP sends announce messages.* *The minimum will be the minus number when the XTS8600 announces support for the Telecom Profile.*

Note: **Announce Interval**
The value 0 (2^0 = 1) defines 1 Announce message per second. The value 2 (2^2 = 4) defines 1 Announce message every four seconds. The value -2 (2^-2 = 1/4) defines 4 Announce message every second.

Announce Timeout:

The Announce Timeout is typically set in multiples of the announce interval. For example, if the announce interval is 2 seconds and the timeout is set to 3, the device will wait 6 seconds (2 x 3) before determining that the Grandmaster is no longer available. This is a profile-specified setting. Some values are fixed and cannot be changed, while others can be adjusted but must remain within a specified range.

Setting	Factory Default	Setting Explanation
Multiples of the announce interval	3	Set the **Announce Timeout** to *determine whether the Grandmaster is no longer available.*

Sync Interval: This setting controls the frequency at which the 1588 Grandmaster sends synchronization messages to other devices in the PTP network. This is a profile-specified setting and shouldn't be changed.

Setting	Factory Default	Setting Explanation
Minimum is -7	0	Set the **Sync Interval** to *determines how frequently the PTP sends Sync messages.* *The minimum will be the minus number when the XTS8600 announces support for the Telecom Profile.*

Note: **Sync Interval**
The value 0 (2^0 = 1) defines 1 Sync message per second. The value 2 (2^2 = 4) defines 1 Sync message every four seconds. The value -2 (2^-2 = 1/4) defines 4 Sync message every second.

P2P/E2E Delay Request Interval: This setting controls the interval for sending delay request messages, which are crucial for measuring the time it takes for packets to travel between devices. This is a profile-specified setting. Some values are fixed and cannot be changed, while others can be adjusted but must remain within a specified range.

Setting	Factory Default	Setting Explanation
Minimum is -7	0	Set the **P2P/E2E Delay Request Interval** to *determines how frequently the PTP sends delay request messages..*

Note: **P2P/E2E Delay Request Interval**
The value 0 (2^0 = 1) defines 1 delay request message per second. The value 2 (2^2 = 4) defines 1 delay request message every four seconds. The value -2 (2^-2 = 1/4) defines 4 delay request message every second.

Grandmaster ID: The IEEE C37.238 profile-specific TLV includes an optional 16-bit Grandmaster identifier, supplementing the 64-bit **Clock Identity** in the Announce message. In the 2011 version, this field was 8 bits, but it was expanded to 16 bits in the 2017 version to accommodate larger systems.

Setting	Factory Default	Setting Explanation
0003 ~ 00FE for C37.238-2011 0000 ~ FFFF for C37.238-2017	0	Set the **Grandmaster ID** for *supplementing the 64-bit* **Clock Identity.**

ATOI TLV: The ATOI TLV (Alternate Time Offset Indicator Type-Length-Value) is an optional extension defined in the IEEE C37.238-2011 and 2017 Power Profiles. It adds context to PTP Announce messages by conveying additional timing information, including the current UTC offset, upcoming leap second event, leap second direction, and any alternate time offset. This enables downstream devices to anticipate and adjust for time shifts such as UTC corrections, improving synchronization accuracy in power system networks. The ATOI TLV is enabled by default when operating under the C37.238-2011 or 2017 profiles, as it is required for full compliance and interoperability.

Setting	Factory Default	Setting Explanation
Checked for C37.238-2011 or C37.238-2017 profile Unchecked for other profiles	Unchecked	Enable or Disable the addition of **ATOI** information to PTP Announce messages.

LAN1, LAN2 and PRP BMCA-Related Status and Settings:

This subsection shows the BMCA-Related Status and Settings in the configuration interface. The two key fields that users can modify are Priority1 and Priority2, both set to 128 by default. These values influence the BMCA in selecting the Grandmaster clock. Other parameters like Clock Class, Clock Accuracy, Clock Variance, and Clock Identity are displayed but not currently adjustable in this view, indicating they may be automatically assigned based on the clock's status.

The Status-Only setting cannot be changed; the Clock Class and Accuracy will change as the XTS8600 switches between Locked and Holdover. The Clock Variance is a statistical value. This subsection only displays the status and cannot be configured; its purpose is to help you set other fields of the BMCA.

BMCA-Related Status and Settings	
Priority1	128
Clock Class	6
Clock Accuracy	0x21
Clock Variance	0x4e5d
Priority2	128
Clock Identity	0060e9.fffe.35a9f6
Port Identity	0060e9.fffe.35a9f6-0

Figure 5-25 Time Synchronization -> PTP Settings -> BMCA Related Status and Settings

What is BMCA:

The Best Master Clock Algorithm (BMCA) in IEEE 1588 assesses and compares various attributes of two clocks, referred to as Clock A and Clock B, to decide which should act as the master clock. The decision process involves a sequential comparison of key attributes, progressing from following item 1 (Priority 1) to item 7 (Port Identity) and stopping when one clock is determined to be superior.

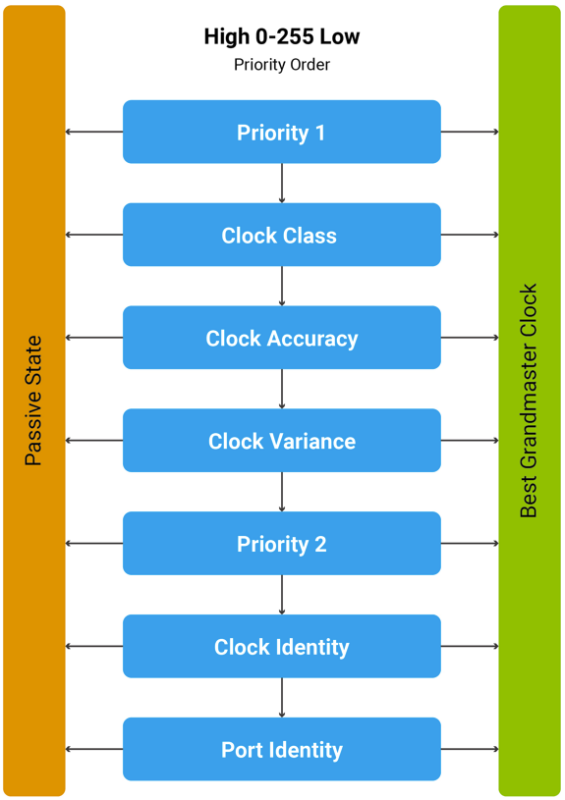


Figure 5-26 PTP - BMCA

Priority 1: The PTP BMCA uses this field to choose the grandmaster. Generally, devices intended to function as master clocks have a default setting of 128, while those that are solely slaves use 255. You can modify this value to set priorities among several master clocks if desired. The smaller the number, the higher the priority.

Setting	Factory Default	Setting Explanation
0 ~ 255	128	Set the **Priority 1** for *determining the priority during the BMCA process.*

Clock Class (Status-Only):

Status	Status Explanation
6	XTS8600 is locked to the GNSS/GPS primary time source.
7	*The XTS8600 was locked to the GNSS/GPS, but it has now entered holdover mode with an estimated accuracy deviation of less than 250 ns.*
13	*When XTS8600 is in* **FreeRun** *of* **Clock Operation Mode***, the time source is RTC, maintaining the accuracy by its internal clock.*
52	*The XTS8600 was locked to the GNSS/GPS, but it has now entered holdover mode with an estimated accuracy deviation greater than 250 ns but less than 1 µs.*
187	*The XTS8600 was locked to the GNSS/GPS, but it has now entered holdover mode with an estimated accuracy deviation greater than 1 µs.*
248	*Before the first GNSS lock is obtained, the XTS8600 will display this Class*

Note: **Clock Class – Power Profiles**
In C37.238 2011 and 2017 Power Profile, the master in the network is GNSS synchronized. When the GNSS is disconnected from the active master, the clock class degrades from 6 to 7, and then returns to 6 when GNSS is restored.

In the 61850-9-3 Utility Power Profile, the clock class changes from 6 to 7 when GNSS is disconnected. If the inaccuracy exceeds ±250 ns, the clock class changes from 7 to 52. If the inaccuracy exceeds ±1 µs, the clock class changes from 52 to 187. The clock class returns to 6 when GNSS is restored.

Clock Accuracy (Status-Only)*:*

Table 5-13 PTP Clock Accuracy

Status	Status Explanation
< 25 ns	The accuracy of XTS8600 is within 25 ns.
< 100 ns	The accuracy of XTS8600 is within 100 ns.
< 250 ns	The accuracy of XTS8600 is within 250 ns.
< 1 µs	The accuracy of XTS8600 is within 1 *µs*.
< 2.5 µs	The accuracy of XTS8600 is within 2.5 *µs*.
< 10 µs	The accuracy of XTS8600 is within 10 *µs*.
< 25 µs	The accuracy of XTS8600 is within 25 *µs*.
< 100 µs	The accuracy of XTS8600 is within 100 *µs*.
< 250 µs	The accuracy of XTS8600 is within 250 *µs*.

< 1 ms	The accuracy of XTS8600 is within 1 ms.
< 2.5 ms	The accuracy of XTS8600 is within 2.5 ms.
< 10 ms	The accuracy of XTS8600 is within 10 ms.
< 25 ms	The accuracy of XTS8600 is within 25 ms.
< 100 ms	The accuracy of XTS8600 is within 100 ms.
< 250 ms	The accuracy of XTS8600 is within 250 ms.
< 1 s	The accuracy of XTS8600 is within 1 s.
< 10 s	The accuracy of XTS8600 is within 10 s.
More than 10 s	The accuracy of XTS8600 is larger than 10 s.

Clock Variance (Status-Only)*:*

Status	Status Explanation
Variance of XTS8600	*This statistic quantifies the variations in clock jitter and wander occurring between intervals of two synchronization messages*

Priority 2: This setting defines its priority level as a candidate for the master clock role. However, this value is usually ignored if the PTP BMCA can be determined through Clock Priority 1, Clock Class, Clock Accuracy, and Clock Variance. Typically, Priority 2 is used for backup or redundant master clocks.

Setting	Factory Default	Setting Explanation
0 ~ 255	128	Set the **Priority 2** for *determining the priority during the BMCA process.*

Clock Identity (Status-Only)*:*

Status	Status Explanation
Deriving from MAC address of LAN 1/LAN2/PRP	*The local clock's unique ID is a 64-bit Extended Unique Identifier (EUI-64), typically derived from the XTS8600 MAC address.*

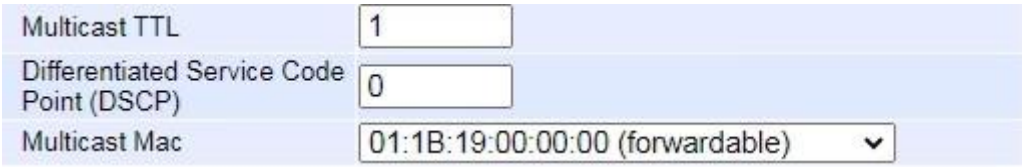
Note: **Clock Identity**
The clock identity is used as a tie-breaker between different clocks.

Port Identity (Status-Only)*:*

Status	Status Explanation
Deriving from MAC address of LAN 1/LAN2/PRP	*The local clock's unique ID is a 64-bit Extended Unique Identifier (EUI-64), typically derived from the network XTS8600 MAC address.*

Note: **Clock Identity**
The port identity is used as a tie-breaker between different ports on the same clock.

LAN1, LAN2 and PRP Miscellaneous Settings:



Multicast TTL: Since TTL is a Layer 3 (IP) concept, it only affects IP multicast traffic that needs to traverse routers. It is not applicable to Layer 2 Ethernet frames, which do not have a TTL field. The range is from 0 to 255. In other words, this setting is only applicable for Default E2E IEEE 1588-2008 and Default P2P IEEE 1588-2008 profiles as they support layer 3 transportation.

Setting	Factory Default	Setting Explanation
0 ~ 255	1	Set the **Multicast TTL** value.

Note: **Multicast TTL – General Recommendation**
For LANs, set a TTL between 1 and 2.

For multi-hop networks with more intermediate devices (routers/switches), determine the number of hops and add a small buffer (e.g., set TTL to 10 if you expect 6 or 7 hops).

DSCP Class: DSCP setting is used to mark packets with a specific priority level, helping network devices manage and prioritize layer 3 IP traffic. This setting is only applicable for Default E2E IEEE 1588-2008 and Default P2P IEEE 1588-2008 profiles as they support layer 3 transportation.

Setting	Factory Default	Setting Explanation
0 ~ 63	0	Set the **DSCP Class** value. *The larger the number, the higher the priority.*

Multicast MAC: In the G.8275.1 telecom profile, the multicast MAC address used for PTP message transmission can be selected to match the desired forwarding behavior in the network. Two options are available:

1. 01:1B:19:00:00:00: This is a forwardable multicast address as defined by IEEE 1588. It allows PTP messages to be forwarded across Layer 2 switches, enabling distribution across multiple network segments. In practice, this is the commonly used multicast MAC address.
2. 01:80:C2:00:00:0E: This is a non-forwardable (link-local) multicast address reserved for PTP. Frames sent to this address are typically not forwarded by Layer 2 switches, ensuring that timing traffic remains confined to the local segment.

The choice of address depends on the network design and timing distribution requirements. This setting is only applicable when operating in the G.8275.1 profile.

Setting	Factory Default	Setting Explanation
01:1B:19:00:00:00 or 01:80:C2:00:00:0E	01:1B:19:00:00:00	Set forwardable or non-forwardable Multicast MAC address

Note: **Multicast MAC – How to Choose the Appropriate Multicast MAC Address**

If the network requires PTP messages to traverse across multiple Layer 2 domains or pass through Layer2 switches, the user should select 01:1B:19:00:00:00, which is a forwardable multicast address compliant with IEEE 1588. This ensures that PTP messages can propagate through the switching infrastructure. On the other hand, if the timing traffic must be restricted to a local segment—such as within a single switch or point-to-point link—the user should select 01:80:C2:00:00:0E, a non-forwardable address, which most switches treat as link- local and block from being forwarded.

5.3.4 NTP Settings

XTS8600 NTP Settings:

NTP operates in three main roles: primary server, secondary server, and client. A primary server is directly synchronized to an authoritative time source, such as a GNSS receiver, and serves as the root of the timing hierarchy. A client synchronizes its time with one or more upstream servers but does not provide synchronization to other devices. A secondary server, however, plays a dual role: it synchronizes with upstream servers for accurate time and then distributes this time to downstream servers or clients. The XTS8600 is designed to function as a primary server which is stratum 1, directly syncing with a reference clock to ensure precise time distribution across your network.

The XTS8600 can serve NTP across up to three Ethernet ports: the MGT port, LAN 1, and LAN 2. It adheres to the NTP v4 standard (RFC 5905) to ensure accurate time synchronization. The XTS8600 can distribute NTP time via unicast, multicast, or broadcast messages across all three Ethernet ports simultaneously. Additionally, for enhanced security, the XTS8600 supports symmetric key encryption using MD5, SHA-1, SHA-256, and SHA-512 to protect NTP messages from tampering or unauthorized access.

NTP Settings:

Figure 5-27 Time Synchronization -> NTP Settings

Server Enable – LAN1, LAN2 or MGT interface*:*

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable the XTS8600 NTP server on the LAN1, LAN2, or MGT interface. This setting is for enabling the NTP server with unicast transmission.
Unchecked		Disable the XTS8600 NTP server on the LAN1, LAN2, or MGT interface. This setting will stop all NTP server transmissions, including unicast, broadcast and multicast.

Broadcast Enable - LAN1, LAN2 or MGT interface*:*

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable the Broadcast of XTS8600 NTP server on the LAN1, LAN2, or MGT interfaces. This option is editable only when the NTP server is enabled.
Unchecked		Disable the Broadcast of XTS8600 NTP server on the LAN1, LAN2, or MGT interfaces

Multicast Enable - LAN1, LAN2 or MGT interface*:*

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable the Multicast of XTS8600 NTP server on the LAN1, LAN2, or MGT interfaces. This option is editable only when the NTP server is enabled.
Unchecked		Disable the Multicast of XTS8600 NTP server on the LAN1, LAN2, or MGT interfaces

XTS8600 NTP Broadcast Settings:

Interval – NTP Broadcast*:*

Setting	Factory Default	Setting Explanation
16 ~ 131072 secs	64	*Select the interval from the drop-down list. This setting controls how frequently the XTS8600 sends NTP broadcast messages.* *The interval can be set to specific values, starting at 16 seconds and doubling at each step, up to a maximum of 131,072 seconds.*

Trust Key Index – NTP Broadcast*:*

Setting	Factory Default	Setting Explanation
1 ~10	1	*Choose an index from 1 to 10, corresponding to the pre-configured keys in the NTP Authentication subsection of XTS8600 NTP settings.* This option is editable only when the **Authentication** of NTP server is enabled.

		Supported cryptographic hash algorithms include MD5, SHA-1, SHA-256, and SHA-512.

XTS8600 NTP Multicast Settings:

When configuring NTP multicast on the XTS8600, there are three key settings you need to understand: Multicast IP Address, Interval, and Trust Key Index.

IP – NTP Multicast IP Address*:*

Setting	Factory Default	Setting Explanation
224.0.0.0 ~ 239.255.255.255	224.0.1.1	*This setting specifies the IP address used for the NTP multicast communication.*

Interval – NTP Multicast*:*

Setting	Factory Default	Setting Explanation
16 ~ 131072 secs	64	*Select the interval from the drop-down list. This setting controls how frequently the XTS8600 sends NTP multicast messages.* *The interval can be set to specific values, starting at 16 seconds and doubling at each step, up to a maximum of 131,072 seconds.*

Trust Key Index – NTP Multicast*:*

Setting	Factory Default	Setting Explanation
1 ~10	1	*Choose an index from 1 to 10, corresponding to the pre-configured keys in the NTP Authentication subsection of XTS8600 NTP settings.* This option is editable only when the **Authentication** of NTP server is enabled. *Supported cryptographic hash algorithms include MD5, SHA-1, SHA-256, and SHA-512.*

NTP Authentication:

Authentication:

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable authentication of XTS8600 NTP server with a symmetric key. This option is editable only when the NTP server is enabled.
Unchecked		Disable the Authentication of XTS8600 NTP server.

NTP Authentication -Symmetric Key:

This subsection of the NTP Authentication interface allows users to configure symmetric keys to secure NTP messages. It supports multiple encryption algorithms, including MD5, SHA-1, SHA-256, and SHA-512, to protect against tampering or unauthorized access. Users can enable specific keys and generate new ones using the

"Regenerate" button. In this example, three keys are active with SHA-256 encryption selected. These keys are used to authenticate NTP clients and servers, ensuring that only trusted sources are communicating within the network.

Figure 5-28 Time Synchronization -> NTP Settings -> NTP Authentication

Key Enable – Key1 to Key 10*:*

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable the symmetric key for corresponding key number.
Unchecked		Disable the symmetric key for corresponding key number.

Regenerate Button – Key1 to Key 10*:*

Setting	Factory Default	Setting Explanation
None	None	Click for regenerating the symmetric key.

XTS8600 Leap Seconds: The NTP Leap Seconds settings on the XTS8600 allow you to manage how the system handles leap seconds, which are occasionally added to keep it in sync with the Earth's rotation (UTC Time). The NTP leap seconds list is a file that contains all the dates when leap seconds have been added or are scheduled to be added in the future. By keeping this list updated, your system will know exactly when to apply these leap seconds, maintaining precise time synchronization

Figure 5-29 Time Synchronization -> NTP Settings -> NTP Leap Seconds

Expire Date:

Status	Status Explanation
Date	This setting displays the **Expire Date** of the current leap seconds list. After this date, the NTP leap second list may no longer be accurate, and an update will be necessary.

Update:

Setting	Factory Default	Setting Explanation
Local	Local	This radio button allows you to update the leap seconds list from a local file.
Web		This radio button allows you to update the leap seconds list from directly from the web.

Web:

Setting	Factory Default	Setting Explanation
Web Address	https://.obspm.fr/ierhpierss/bul/bulc/ntp/leap-seconds.list	*This setting provides an interface where you can input a web address to download the latest NTP leap seconds list.*

5.3.5 Sync-Out Modules

The XTS8600 is equipped with two Sync-Out channels, designated as Sync-Out 1 and Sync-Out 2. The XTS8600I model includes these two channels and an additional four Sync-Out channels, numbered Sync-Out 3 through Sync- Out 6. For the physical locations of Sync-Out Channels 1 through 6, please refer to the "Connectors" subsection in 1.3. The following tables show the permitted configurations for each channel. For details on default values, see Appendix A.

/*Important Notice*/: IRIG-AM can be configured on Sync-Out channels 3 to 5. However, when configuring two or more IRIG-AM channels, they will share the settings of the first configured IRIG-AM channel, including the IRIG-B format, time reference, parity, and cable latency. For example, if Sync-Out channels 3 and 5 are both set to IRIG-B AM, Sync-Out Channel 5 will inherit all the settings from Channel 3.

Table 5-14 Sync-Out Modules Specifications

<table>
<tr><th>Sync-Out Channel</th><th>Sync-Out Configuration</th><th>IRIG-B Format</th><th>Time Reference</th><th>Parity</th></tr>
<tr><td>Sync Out 1</td><td rowspan="2">1. Disabled
2. PPS Out
3. 10 MHZ
4. IRIG-B TTL
5. Disabled</td><td rowspan="2">IRIG-B TTL:
■ IRIG-B000 to IRIG-B007</td><td rowspan="4">1. UTC Time
2. Local Time</td><td rowspan="4">1. Even
2. Odd</td></tr>
<tr><td>Sync Out 2</td></tr>
<tr><td>Sync Out 3
Sync Out 4
Sync Out 5</td><td>1. Disabled
2. PPS Out
3. 10 MHZ
4. IRIG-B TTL
5. IRIG-B AM</td><td>IRIG-B TTL:
■ IRIG-B000 to IRIG-B007

IRIG-B AM:
■ IRIG-B120 to IRIG-B127</td></tr>
<tr><td>Sync Out 6</td><td>1. Disabled
2. IRIG-B RS-485</td><td>IRIG-B RS-485:
■ IRIG-B000 to IRIG-B007</td></tr>
</table>

Sync-Out Output Spec:

According to the table above, different Sync-Out channels can be configured with various settings. A maximum of six output configurations can be applied.

- **10MHZ**: The fixed frequency of 10MHz output from XTS8600 series provides a highly stable and precise frequency signal that can be used to synchronize other devices in your network.
  - **The Electric Output Driver Level**: 5VDC TTL compliant / 2.4VDC @ 50 Ohm impedance.
- **PPS Out**: 1PPS is a signal that precisely marks the start of each second with a pulse.
  - **Accuracy**: ±40 ns Peak (XTS8600 locked to satellites for at least 24 hours)
  - **The Electric Output Driver Level**: 5VDC TTL compliant
- **IRIG-B TTL, IRIG-B AM and IRIG-B RS-485**: IRIG-B is the most common version used within the Power, industrial automation and control industries. There are three modulation types that XTS8600 series support which are IRIG-B TTL, IRIG-B AM and IRIG-B RS-485.
  - **IRIG-B TTL**:
    - **The Electric Output Driver Level**: 5VDC TTL compliant

- **Accuracy**: ±40 ns Peak (XTS8600 locked to satellites for at least 24 hours)
- **Maximum Transmission Distance**: 150M with RG58 A/U cable
- **Applicable IRIG-B Format**: B000 to B007

◆ **IRIG-B AM**:

- **The Electric Output Driver Level**: 5Vp-p, 3:1 ratio, AM, Sinewave
- **Accuracy**: ±1 μs Peak (XTS8600 locked to satellites for at least 24 hours)
- **Maximum Transmission Distance**: 150M @ 1K impedance, 300M @ 10K impedance RG58 A/U cable.
- **Applicable IRIG-B Format**: B120 to B127

◆ **IRIG-B RS-485**:

- **The Electric Output Driver Level**: ±5VDC
- **Accuracy**: ±100 ns Peak (XTS8600 locked to satellites for at least 24 hours)
- **Maximum Transmission Distance**: For IRIG-B RS485 communication, a twisted-pair cable is recommended for transmission distances up to 1200 meters. Shielding is strongly advised to protect against electromagnetic interference.
- **IRIG-B RS-485 to Fiber Optic**: The IRIG-B RS485 output on the XTS8600I can be connected to an AGATEL SF63 Industrial Serial to Fiber Media Converter for Fiber optic connections. To extend the transmission range, you can use a pair of SF63 converters, which will increase the range from 2 km using multi-mode Fiber to up to 30 km using single-mode Fiber.
- **Applicable IRIG-B Format**: B000 to B007

Sync-Out Configuration:

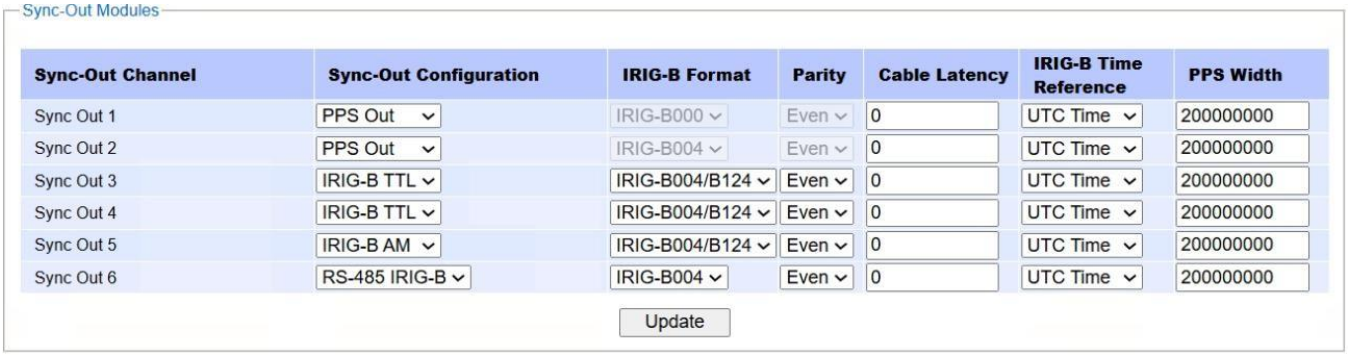


Figure 5-30 Time Synchronization -> Sync-Out Module

Sync-Out Configuration – Sync-Out 1:

Setting	Factory Default	Setting Explanation
10 MHZ	PPS	Set Sync-Out 1 to 10 MHZ output.
PPS Out		Set Sync-Out 1 to PPS output.
IRIG-B TTL		Set Sync-Out 1 to IRIG-B TTL.
Disabled		Disable Sync-Out 1 output.

Sync-Out Configuration – Sync-Out 2:

Setting	Factory Default	Setting Explanation
10 MHZ	IRIG-B TTL	Set Sync-Out 2 to 10 MHZ output.
PPS Out		Set Sync-Out 2 to PPS output.
IRIG-B TTL		Set Sync-Out 2 to IRIG-B TTL.
Disabled		Disable Sync-Out 2 output.

Sync-Out Configuration – Sync-Out 3:

Setting	Factory Default	Setting Explanation
10 MHZ	IRIG-B TTL	Set Sync-Out 3 to 10 MHZ output.
PPS Out		Set Sync-Out 3 to PPS output.
IRIG-B TTL		Set Sync-Out 3 to IRIG-B TTL.
IRIG-B AM		Set Sync-Out 3 to IRIG-B AM.
Disabled		Disable Sync-Out 3 output.

Sync-Out Configuration – Sync-Out 4:

Setting	Factory Default	Setting Explanation
10 MHZ	IRIG-B TTL	Set Sync-Out 4 to 10 MHZ output.
PPS Out		Set Sync-Out 4 to PPS output.
IRIG-B TTL		Set Sync-Out 4 to IRIG-B TTL.
IRIG-B AM		Set Sync-Out 4 to IRIG-B AM.
Disabled		Disable Sync-Out 4 output.

Sync-Out Configuration – Sync-Out 5:

Setting	Factory Default	Setting Explanation
10 MHZ	IRIG-B AM	Set Sync-Out 5 to 10 MHZ output.
PPS Out		Set Sync-Out 5 to PPS output.
IRIG-B TTL		Set Sync-Out 5 to IRIG-B TTL.
IRIG-B AM		Set Sync-Out 5 to IRIG-B AM.
Disabled		Disable Sync-Out 5 output.

Sync-Out Configuration – Sync-Out 6:

Setting	Factory Default	Setting Explanation
IRIG-B RS485	IRIG-B RS-485	Set Sync-Out 6 to 10 MHZ output.
Disabled		Disable Sync-Out 6 output.

IRIG-B Format: The IRIG-B format consists of eight data formats. IRIG-B TTL and RS-485 correspond to formats B000 through B007, while IRIG-B AM corresponds to formats B120 through B127. Despite the different naming conventions, the underlying data format remains the same. For example, B000 and B120 share the same data format, and this applies similarly to the other formats.

The table below lists the eight IRIG-B data formats. Among these, the fields for seconds, minutes, hours, Day of Year, and Year are straightforward and intuitive. **SBS** (Straight Binary Seconds) tracks the number of seconds from 0 to 86,399, representing the total seconds elapsed in a day. This count can be used to determine the time of day and is occasionally employed as a verification measure.

Control Function (CF) was defined in the IEEE1344 and C37.118.1 standard. The CF within IRIG-B provides additional information about the quality and status of the time signal. This includes data such as time synchronization accuracy, leap second announcements, and Daylight-Saving Time adjustments. These control functions are useful. For example, since IRIG-B operates as a one-way signal with no feedback from the slave to the clock, it was necessary to include additional fields in the IRIG-B code. These fields enable slave devices to assess whether the timing source meets their accuracy requirements and to stop operating if the reported accuracy falls below acceptable levels.

For a more detailed understanding, users are encouraged to refer to the IEEE 1344 or C37.118.1 standard.

Table 5-15 IRIG-B Format

IRIG-B Format	Details of IRIG-B Data
B000 & B120	Seconds, Minutes, Hours, Day of Year, Control functions & SBS
B001 & B121	Seconds, Minutes, Hours, Day of Year & Control functions
B000 & B122	Seconds, Minutes, Hours & Day of Year
B000 & B123	Seconds, Minutes, Hours, Day of Year, & Straight binary seconds
B000 & B124	Seconds, Minutes, Hours, Day of Year, Year, Control functions & Straight binary seconds
B000 & B125	Seconds, Minutes, Hours, Day of Year, Year & Control functions
B000 & B126	Seconds, Minutes, Hours, Day of Year & Year
B000 & B127	Seconds, Minutes, Hours, Day of Year, Year & Straight binary seconds

IRIG-B Format – Sync-Out 1:

Setting	Factory Default	Setting Explanation
IRIG-B000 ~ IRIG-B007	IRIG-B000	Set Sync-Out 1 IRIG-B format.

IRIG-B Format – Sync-Out 2:

Setting	Factory Default	Setting Explanation
IRIG-B000 ~ IRIG-B007	IRIG-B004	Set Sync-Out 2 IRIG-B format.

IRIG-B Format – Sync-Out 3:

Setting	Factory Default	Setting Explanation
IRIG-B000/B120 ~ IRIG-B007/B127	IRIG-B004/B124	Set Sync-Out 3 IRIG-B format.

IRIG-B Format – Sync-Out 4:

Setting	Factory Default	Setting Explanation
IRIG-B000/B120 ~ IRIG-B007/B127	IRIG-B004/B124	Set Sync-Out 4 IRIG-B format.

IRIG-B Format – Sync-Out 5:

Setting	Factory Default	Setting Explanation
IRIG-B000/B120 ~ IRIG-B007/B127	IRIG-B004/B124	Set Sync-Out 5 IRIG-B format.

IRIG-B Format – Sync-Out 6:

Setting	Factory Default	Setting Explanation
IRIG-B000 ~ IRIG-B007	IRIG-B004	Set Sync-Out 6 IRIG-B format.

Note: **IRIG-B Format – Best Practice**
IRIG-B 004 or IRIG-B 124 is the most commonly used option for communicating with the downstream devices, as it includes all the necessary timing information and control fields. This ensures that any device can receive the data it needs to synchronize with the master clock. Devices that do not require the additional information should simply disregard it.

Parity – Sync-Out 1 to Sync-Out 6:

Setting	Factory Default	Setting Explanation
Odd	Even	Set IRIG-B Odd **Parity** for the selected Sync-Out channel.
Even		Set IRIG-B Even **Parity** for the selected Sync-Out channel.

Note: **IRIG-B Format – Parity**
*Depending on the configuration, IRIG-B signals with Control Function can use even or odd parity. The downstream devices must be configured to match the parity scheme used by the IRIG-B signal. The common setting that downstream devices used are **Even Parity**.*

Cable Latency – Sync-Out 1 to Sync-Out 6:

Setting	Factory Default	Setting Explanation
Refer to the value from **Cable Latency Calculation**	0	*Enter the cable latency compensation in nanoseconds (ns).* *Cable latency compensation is essential for ensuring accurate timing in high-precision systems, such as those using IRIG-B ,and PPS.*

Note: **Cable Latency**
*The XTS8600 provides a calculation interface (see **Cable Latency Calculation**) to input and adjust for this latency. To accurately estimate the latency, it is crucial to know the type and length of the cables used. By selecting the*

appropriate cable type (RG-58 A/U or RS-485) and specifying the cable length within the interface, the system ill wcalculate the estimated latency, ensuring precise timing synchronization.

IRIG-B Time Reference – Sync-Out 1 to Sync-Out 6:
Users have two options for setting the time: UTC or Local Time. These settings are crucial for ensuring compliance with the control functions outlined in the IEEE 1344 or C37.118.1 standards. Because some downstream IRIG-B devices may require local time, it's important to understand their specific time reference needs and configure the system accordingly

Setting	Factory Default	Setting Explanation
UTC Time	UTC Time	Set UTC Time as the **IRIG-B Time Reference** for the selected Sync-Out channel.
Local Time		Set Local Time as the **IRIG-B Time Reference** for the selected Sync-Out channel.

Note: **IRIG-B Time Reference**

- ***UTC Time****: UTC is the global time standard that includes leap seconds to stay synchronized with the Earth's rotation. When the Clock Operation Mode is set to GNSS, the XTS8600 derives UTC from GNSS time and automatically manages all leap second adjustments. If the Clock Operation Mode is set to FreeRun, UTC is determined by the settings for Current Date and Current Time under "Time Synchronization → System Time".*
- ***Local Time****: Local time is the time specific to a particular region or location, adjusted from UTC Time by the time zone offset. Local time also accounts for daylight saving time (DST). Time Zone and DST could be set under "Time Synchronization → System Time".*

PPS Width – Sync-Out 1 to Sync-Out 6:

Setting	Factory Default	Setting Explanation
0 ns to 900000000 ns (900 ms)	200000000 ns (200 ms)	*Defines the pulse duration (in nanoseconds) of the Pulse Per Second (PPS) signal output.* *A typical PPS signal is a square wave that transitions high once per second to mark the precise beginning of each new second. This field allows users to configure how long the PPS signal remains in the high state before returning low.* *For example, a value of 200000000 represents a pulse width of 200 milliseconds.*

Note: Why Adjust **PPS Width**?
The PPS Width setting defines ho long the PPS (Pulse Per Second) signal remains in the high state after each rising edge. While the rising edge marks the precise start of each second, some IEDs (Intelligent Electronic Devices) also rely on the duration of the pulse to detect and validate the signal.

Different IEDs use different methods for PPS detection:

1. *Some detect the rising edge only, requiring minimal width (e.g., 1–5 ms).*
2. *Others expect a specific minimum pulse duration (e.g., 10–500 ms) to confirm validity.*
3. *If the pulse is too short or too long, the device may fail to detect it or treat it as an error.*

To ensure broad compatibility, the default PPS Width is set to 200,000,000 nanoseconds (200 ms). This default accommodates the detection thresholds of most industrial and substation IEDs. However, users may adjust the value as needed to meet the specific timing requirements of their connected devices.

Cable Latency Calculation:

The XTS8600 provides a calculation interface (see **Cable Latency Calculation**) to input and adjust for this latency. To accurately estimate the latency, it is crucial to know the type and length of the cables used. By selecting the appropriate cable type (RG-58 A/U or RS-485) and specifying the cable length within the interface, the system will calculate the estimated latency, ensuring precise timing synchronization

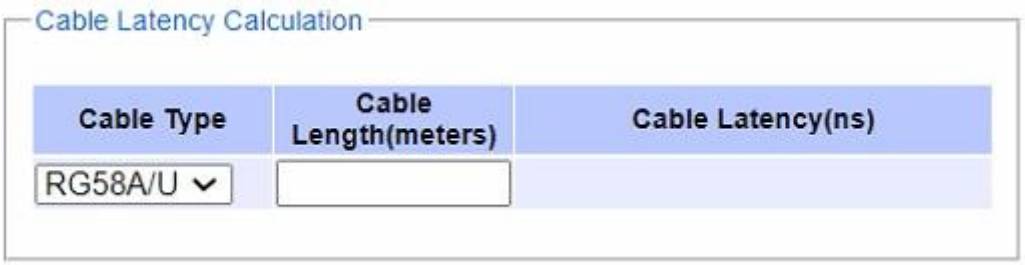


Figure 5-31 Time Synchronization -> Sync-Out Module -> Cable Latency Calculation

Cable Type:

Setting	Factory Default	Setting Explanation
RG58 A/U	RG58 A/U	Select the RG58 A/U as the type of Sync-Out cable for calculating the cable latency.
RS485		Select the RS485 as the type of Sync-Out cable for calculating the cable latency.

Cable Length:

Setting	Factory Default	Setting Explanation
The length in meters	0	Input the length of Sync-Out cable for calculating the cable latency

5.4 System Settings

System Settings provides various configuration options for managing the XTS8600:

- Backup / Restore Config: Allows you to back up the current configuration or restore a previous one.
- Firmware Update: Provides options to update the XTS8600 firmware.
- Admin Settings: Lets you configure the login username and password for administrative access.
- Alarm Settings: Allows you to set and manage alarm triggers and notifications.
- Console Port: Provides settings for configuring the console port.
- Factory Default: Resets the XTS8600 to its factory default settings.
- Reboot: Restarts the XTS8600.

Figure 5-32 System Settings

5.4.1 Backup/Restore Config

Backup XTS8600 Configuration:

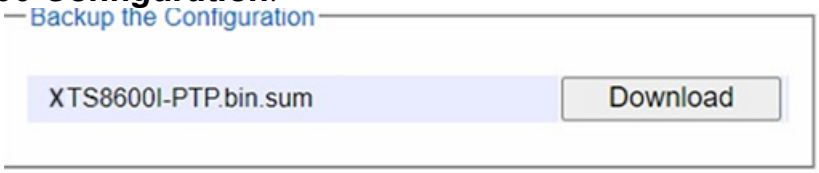


Figure 5-33 System Settings -> Backup/Restore Config ->Back Config

- Backup the Configuration: This feature allows you to save a copy of the current configuration settings of your XTS8600. It's useful for creating a backup before making significant changes or as a precaution against accidental misconfigurations.

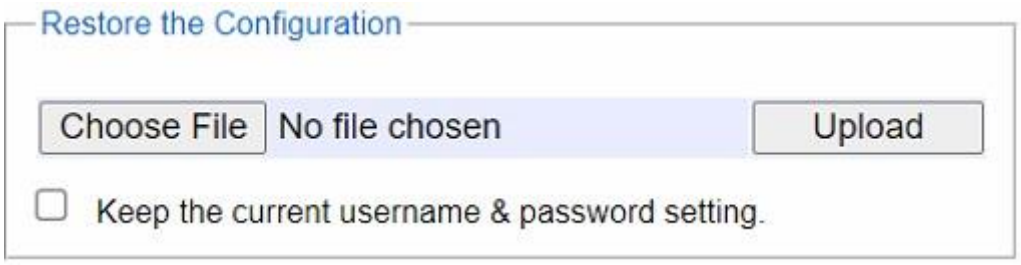


Figure 5-34 System Settings -> Backup/Restore Config -> Restore Config

Restore XTS8600 Configuration:

- **Restore the Configuration**: This option allows you to upload a previously saved configuration file to the XTS8600, effectively restoring the XTS8600 to the state it was in when the backup was made.
  - **Choose File**: Click the **"Choose File"** button to browse your computer and select the configuration file you want to restore.
  - **Upload**: Once you've selected the file, click the Upload button to begin the restoration process. The XTS8600 will apply the settings from the uploaded configuration file.
- **Keep the Current Username & Password Setting**: If you check this box, the XTS8600 will retain the current username and password, even if the uploaded configuration file contains different credentials. This is useful if you want to restore settings without changing your login information.

5.4.2 Firmware Update

Update Firmware from Web Interface:

To update the firmware, the users can download a new firmware from AGATEL's website and save it in a local computer. Then, the users can click "**Choose File**" button and choose the firmware file that is already downloaded. The XTS8600 firmware typically has a ".dld" extension such as XTS8600-K103A103.dld. After that, the users can click Update button and wait for the update process to be done. Alternatively, the firmware update can also be performed using the Device Management Utility.

/*Important Notice*/: Please make sure that the XTS8600 is plug-in all the time during the firmware upgrade. After updating, the XTS8600 will restart.

Figure 5-35 System Settings -> Firmware Update

Update Firmware from Device Management Utility:

If you haven't install AGATEL Device Management Utility, please refer to the subsection 4.3.4 Web connection for installing procedure.

To update the firmware using the Device Management Utility, start by selecting the MGT IP of XTS8600 device you wish to update from the list. Click on the **Firmware** tab, highlighted in yellow in the toolbar. This will open the **Download Firmware from Disk** window. In this window, choose the **AP firmware** to download from your local files. Use the file selection button (highlighted) to browse and select the appropriate firmware file. Once selected, click **Upgrade** (also highlighted) to start the update process. Ensure that you have the correct firmware version for the device model before proceeding.

/*Important Notice*/: Do not restart or power off the XTS8600 during the firmware update. Once it's complete, you will hear a rebooting buzzer sound.

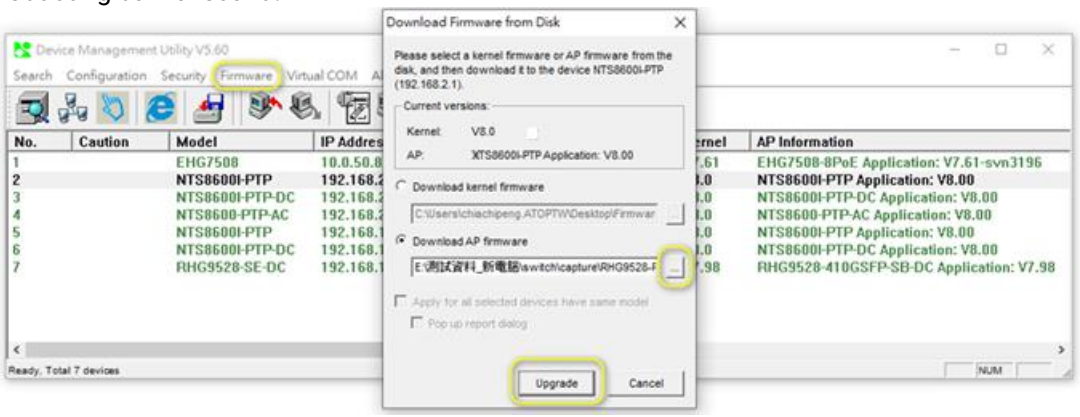


Figure 5-36 System Settings -> FW Update - Device Management Utility

5.4.3 Password

The user name and password set here are applied to all types of access to AGATEL's GM: web management user interface, SSH, Telnet and CLI. Please click on the "Save & Apply" button to update the user name and password information on the device.

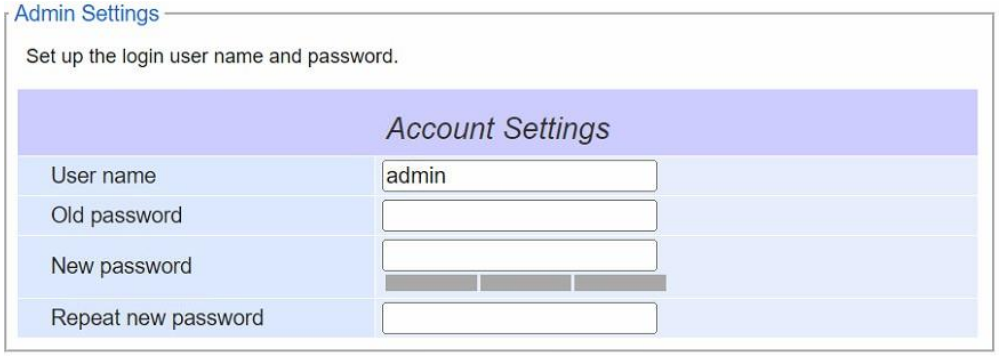


Figure 5-37 System Settings -> Password

User Name:

Setting	Factory Default	Setting Explanation
4 to 32 characters	admin	Input the username for administering the XTS8600.

Note: **User Name – Creating Rule**
A username that starts with a number or contains spaces is not allo□edw

Old Password:

Setting	Factory Default	Setting Explanation
8 to 32 characters	default	Enter the old password for the account created in the **User Name**.

New Password:

Setting	Factory Default	Setting Explanation
8 to 32 characters	None	Enter the new password for the account created in the **User Name**.

Note: **New Password – Creating Rule**
The password contains at least 8 characters and a combination of at least four-character sets, including lowercase, uppercase, numeric digit and special characters (e.g. % and $).

Repeat New Password:

Setting	Factory Default	Setting Explanation
8 to 32 characters	None	Repeat the new password for the account created in the **User Name**.

5.4.4 Alarm Settings

The Alarm Settings interface allows users to configure how different system events and alarms are handled. For each alarm, you can choose how it triggers actions across three categories. For example, if the system detects a Power Lost (DC version), the relay and trap are activated, and the alarm LED will display as the Alarm LED Behaviours of "Emergency."

- Relay: Activates the relay output when the corresponding alarm is triggered.
- Trap: Sends the SNMP trap when the alarm is triggered.
- Alarm LED: Configures the alarm's severity as displayed on the XTS8600 alarm LED, with options such as below table.

Figure 5-38 System Settings -> Alarm Settings

/*Important Notice*/: While alarm occurs, the system log will also send to Syslog Server which can be set under “Network Settings → System Log”. Meanwhile, the corresponding event log will be recorded, and you can browse under “System Status → Event Log”.

/*Important Notice*/: When multiple alarms (Emergency, Alert, and Error) occur, the Alarm LED will follow the higher severity level of Alarm. In this case, the LED will stay solid for an emergency alarm. Once the Emergency alarm clears, the Alarm LED will flash twice per second for an Alert. After the Alert clears, it will flash once every two seconds for an Error.

Alarms:

Table 5-16 Alarm Description

Alarm	Alarm Description
Power Lost (For DC version)	One of the DC power inputs was present, but it is now lost.
Holdover Alert	The XTS8600 has lost satellite lock and is operating in holdover mode.
GNS Spoofing	A spoofing attack has been detected.
GNSS Antenna Absent	The antenna isn't installed or detected
GNSS Antenna Shorted	The antenna cable is shorted
System Warm Start	System warm restart
System Cold Start	System warm restart
System Reset Pinhole	System warm restart through Pinhole button
LAN1 Link Down	The LAN 1 port link has changed from up to down
LAN2 Link Down	The LAN 2 port link has changed from up to down
MGT Link Down	The MGT port link has changed from up to down
Time Quality	Estimated Time Quality is larger than the user-input threshold in **GNSS Alarm Settings**.

Alarm LED Behaviors with Alarm Severity:

Table 5-17 Alarm LED Behaviors with Alarm Severity

Level	Alarm Severity	Alarm LED Behaviors
0	Emergency	Always on
1	Alert	The LED blinks twice per second
2	Critical	The LED blinks once per second
3	Error	The LED blinks once every two seconds
4	Warning	
5	Notice	Keep status of Alarm LED (No action to Alarm LED)
6	Informational	
7	Debug	

Alarm Settings – Factory Default

Table 5-18 Alarm Settings – Factory Default

Alarms	Relay – Enable/Disable	Trap – Enable/Disable	Alarm LED
Power Lost (For DC version)	Checked	Checked	Emergency
Holdover Alert	Unchecked	Unchecked	Alert
GNS Spoofing	Unchecked	Unchecked	Alert
GNSS Antenna Absent	Unchecked	Unchecked	Alert

GNSS Antenna Shorted	Checked	Checked	Emergency
System Warm Start	NULL	Unchecked	NULL
System Cold Start	NULL	Unchecked	NULL
System Reset Pinhole	NULL	Unchecked	NULL
LAN1 Link Down	Unchecked	Unchecked	Notice
LAN2 Link Down	Unchecked	Unchecked	Notice
MGT Link Down	Unchecked	Unchecked	Warning
Time Quality	Unchecked	Unchecked	Warning

GNSS Alarm Settings:

Figure 5-39 System Settings -> Alarm Settings -> GNSS Alarm Settings

Holdover Pickup Delay:

Setting	Factory Default	Setting Explanation
0 ~ 120 mins	30 mins	Input the delay time in minutes to determine the occurrence of a holdover alarm.

Note: **Holdover Pickup Delay**
Holdover Pickup delay is the amount of time that elapses between the occurrence of an alarm condition and the initiation of the alarm signal. In simpler terms, it's the delay between when something goes wrong and when the alarm actually starts sounding. When the reception of the GNSS signal is unstable, the holdover and locked states may change frequently. Setting an appropriate value for the Holdover Pickup Delay can help avoid unnecessary interruptions of holdover alarm.

Time Quality Alarm:

Setting	Factory Default	Setting Explanation
50 ~ 1000 ns	250 ns	Input the allowable time deviation in nanoseconds and trigger a Time Quality Alarm if the estimated accuracy exceeds this value.

Note: **Time Quality Alarm**

The Time Quality Alarm setting allows you to define the maximum allowable deviation in nanoseconds for time accuracy. When the time deviation exceeds this value, the system triggers an alarm, SNMP trap, or activates the alarm LED, indicating that the time quality has fallen below acceptable standards. This is often applied to a Grandmaster or Timeserver that enters holdover mode.

5.4.5 Console Port

The console port of the XTS8600 is primarily used to access the CLI, which is an alternative method for managing the XTS8600 besides the Web management interface. Please refer to subsection 1.5 to locate the position of the Console port on the front panel of the XTS8600.

Console Port - Baud Rate Configuration:

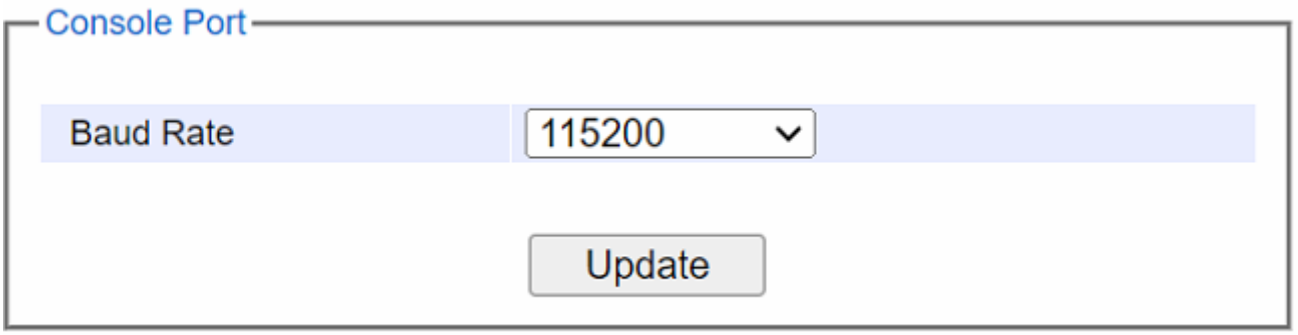


Figure 5-40 System Settings -> Console Port

Baud Rate: After selecting the desired baud rate, click the Update button to apply the new setting. The device will then use this baud rate for all future console communications.

Setting	Factory Default	Setting Explanation
9600 ~ 115200 bps	115200	Select the Baud Rate of Console Port from the drop-down list.

5.4.6 Interface Management

This is the Interface Management settings, where users can enable or disable web access protocols for device configuration. Two interface options are available: HTTPS and HTTP. For secure communication, HTTPS is enabled by default, while HTTP is disabled to enhance security by preventing unencrypted access. Users can update the settings by selecting their preferred interface and clicking the Update button.

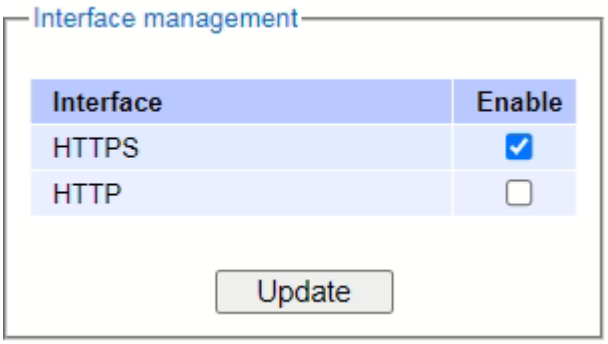


Figure 5-41 System Settings -> Interface Management

HTTPS interface*:*

Setting	Factory Default	Setting Explanation
Checked	Checked	Enable HTTPS interface for web service
Unchecked		Disable HTTPS interface for web service

HTTP interface*:*

Setting	Factory Default	Setting Explanation
Checked	Unchecked	Enable HTTP interface for web service
Unchecked		Disable HTTP interface for web service

5.4.7 Factory Default Setting

- **Factory Default**: Clicking the Reset button will initiate the process of restoring the XTS8600 to its original factory settings. This means all the custom settings, configurations, and changes you have made will be removed, and the XTS8600 will revert to its default settings.
- **Factory Default from pinhole of XTS8600 front panel**: Press and hold the Pinhole button for more than five seconds to reset the XTS8600 to factory default settings.

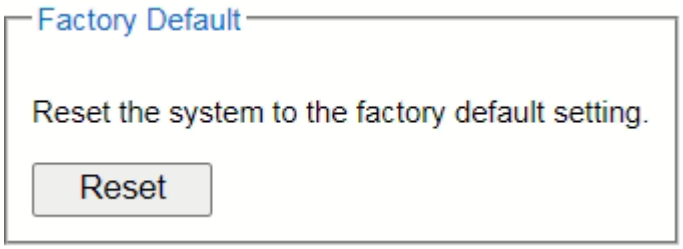


Figure 5-42 System Settings -> Factory Default

- **GNSS Reset Default**: Clicking the Reset button will initiate the process of restoring the XTS8600 GNSS receiver to its original factory settings. Users should reset the GNSS receiver to default only if suggested by AGATEL FAE.

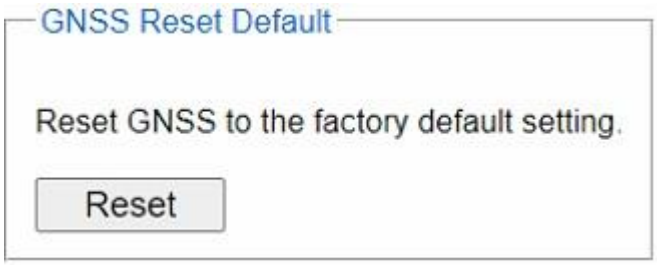


Figure 5-43 System Settings -> GNSS Reset Default

5.4.8 Reboot

- **Reboot**: To restart the XTS8600, simply click the Reboot button. This action will power cycle the XTS8600, meaning it will temporarily shut down and then restart.
- **Reboot from pinhole of XTS8600 front panel**: Click the Pinhole button for 5 seconds to reset the XTS8600.

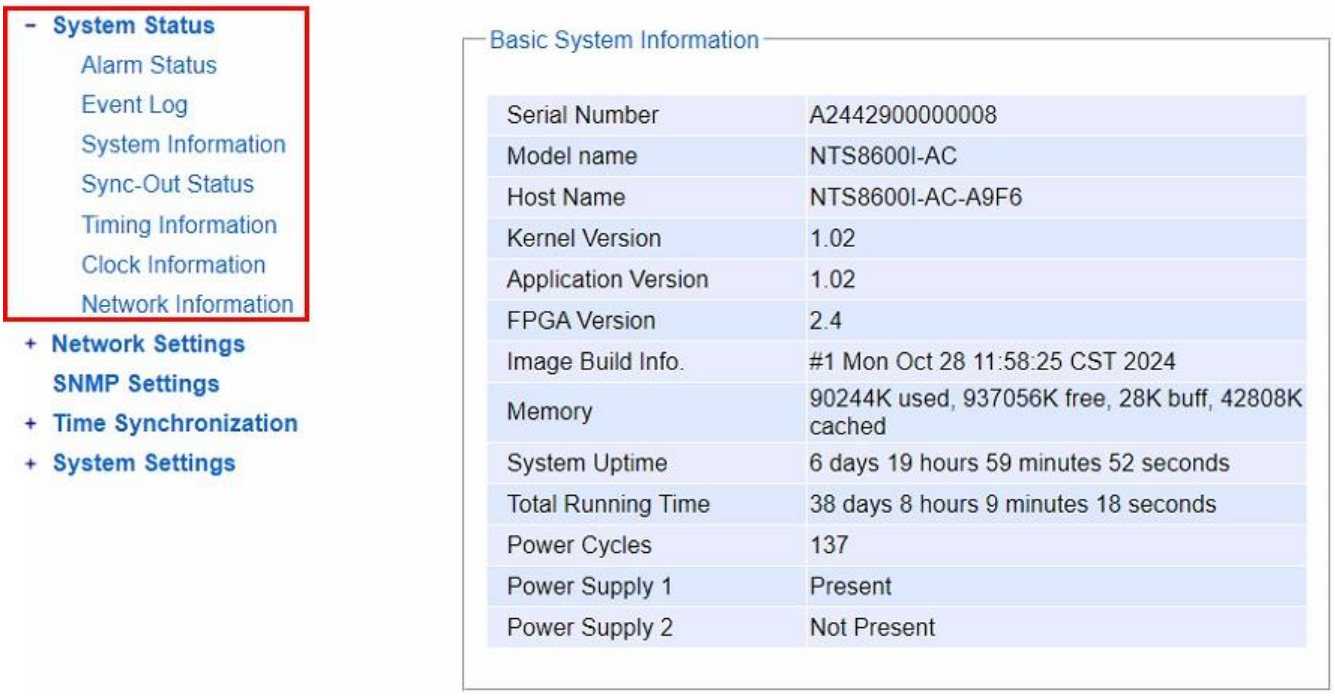
Figure 5-44 System Settings -> Reboot

6 Web Interface – Status

System Status provides various options for monitoring and reviewing the system's operational details on the XTS8600:

- Alarm Status: Displays current alarms that are triggered by system events.
- Event Log: Logs and records all system events for troubleshooting and auditing purposes.
- System Information: Shows essential information about the XTS8600, such as model, serial number, firmware versions, and uptime (as displayed in the right-hand panel).
- Sync-Out Status: Monitors the status of Sync-Out channels, indicating whether they are functioning properly.
- Timing Information: Displays PTP and NTP time synchronization status, such as time offsets and sync accuracy.
- Clock Information: Provides detailed information about the system's internal clock and its configuration.
- Network Information: Shows the current network settings and interface statuses, such as IP addresses and link status.

Figure 6-1 System Status



6.1 Alarm Status

The **Alarm Status** page provides a list of alarm statuses, levels, relay trigger settings, and relay status. To access this tab, select "System Status → Alarm Status".

Alarm Status

Alarms	Alarm Level	Alarm Status	Relay Setting	Relay Status
Power Lost (For DC version)	Emergency	Clear	Enabled	
Holdover Alert	Alert	Set	Disabled	
GNSS Spoofing	Alert	Clear	Disabled	
GNSS Antenna Absent	Alert	Set	Disabled	
GNSS Antenna Shorted	Emergency	Clear	Enabled	OPEN
LAN1 Link Down	Notice	Clear	Disabled	
LAN2 Link Down	Notice	Clear	Disabled	
MGMT Link Down	Warning	Clear	Disabled	
Time Quality	Warning	Set	Disabled	

Figure 6-2 System Status -> Alarm Status

Alarms:

Table 6-1 Description of Alarm Status

Alarm	Alarm Description
Power Lost (For DC version)	One of the DC power inputs was present, but it is now lost.
Holdover Alert	The XTS8600 has lost satellite lock and is operating in holdover mode.
GNS Spoofing	A spoofing attack has been detected.
GNSS Antenna Absent	The antenna isn't installed or detected
GNSS Antenna Shorted	The antenna cable is shorted.
System Warm Start	System warm restart.
System Cold Start	System warm restart.
System Reset Pinhole	System warm restart through Pinhole button.
LAN1 Link Down	The LAN 1 port link has changed from up to down.
LAN2 Link Down	The LAN 2 port link has changed from up to down.
MGT Link Down	The MGT port link has changed from up to down.
Time Quality	Estimated Time Quality is larger than the user-input threshold in **GNSS Alarm Settings**.

Alarm Level:

The alarm level shows the importance and urgency of the alarm events. The smaller the level number, the more important and urgent it is. Different alarm levels will have different LED behaviours. Users can watch the alarm LED on the front panel to understand the importance and urgency of alarm events. The alarm level can be changed through “System Settings → Alarm Settings”.

Table 6-2 Alarm LED Behaviors

Level	Alarm Severity	Alarm LED Behaviors
0	Emergency	Always on
1	Alert	The LED blinks twice per second
2	Critical	The LED blinks once per second
3	Error	The LED blinks once every two seconds
4	Warning	
5	Notice	Keep status of Alarm LED (No action to Alarm LED)
6	Informational	
7	Debug	

Alarm Status:

Alarm status will list all the active or inactive status of each alarm.

Status	Status Explanation
Clear	It means that corresponding Alarm is in inactive status.
Set	It means that corresponding Alarm is in active status.

Relay Setting:

The XTS8600 Series supports a relay with a normally open state. There are nine alarms that can trigger this relay to switch from open to closed. Users can enable or disable these triggers through "System Settings → Alarm Settings”.

Status	Status Explanation
Enabled	The setting of corresponding Alarm is enabled.
Disabled	The setting of corresponding Alarm is disabled.

Relay Status:

The relay status indicates whether it is in an open or closed state. If no enabled alarms are triggered, the relay status will display as "OPEN." When any of the enabled alarms are triggered, the relay status will change to "CLOSED". When multiple enabled alarms are triggered, the relay will remain in the closed state until all enabled alarms are cleared. The relay status will not change back to the open state until this condition is met.

Status	Status Explanation
OPEN	The XTS8600 relay contact is in the OPEN state, which is the default state. This means no enabled alarm has been triggered
CLOSED	The XTS8600 relay contact is in the CLOSED state. This means at least one of the enabled alarms has been triggered.

Note: **Relay Status**

*Users can determine the relay status based on the combination of two fields: **Alarm Status** and **Relay Setting**. When the **Relay Setting** is enabled and the **Alarm Status** is active (indicating an active alarm), the relay will trigger accordingly. For example, when the **Power Lost** alarm occurs, with the **Relay Setting** enabled, the relay status shows "CLOSED." Conversely, if the **Relay Setting** is disabled, regardless of the **Alarm Status**, the relay status will show "OPEN".*

6.2 Event Log

The **Event Log** page shows the list of system events with the corresponding tag, occurred date and time. The XTS8600 defines a list of events. To access this page, select “System Status → Event Log". For details on the all events, please refer to Appendix C.

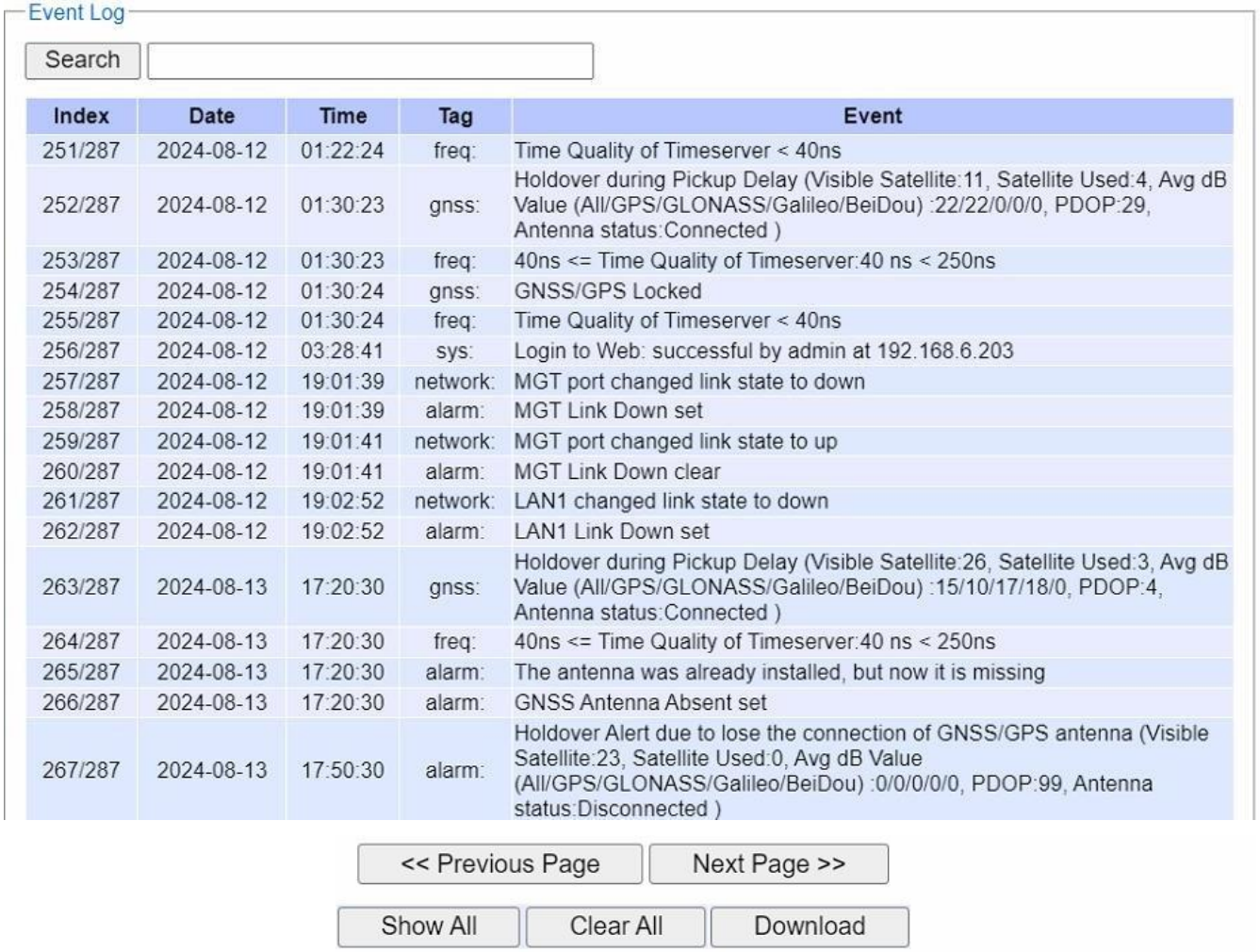


Figure 6-3 System Status -> Event Log

Table of Event Log:

Index*:* The index is the identifier for events in the event log and indicates the total number of events. A larger index number means the event occurred more recently.

Date and Time*:* Date and Time indicate when the event occurred, with the date and time shown in local time.

Tag*:* Tag refers to the categorization of events, and these categories can be used to filter and search for specific types of events. The available categories are as follows: ***sys, cfg, alarm, gnss, network, timeSync.*** Refer to Appendix B for the mapping between events and tags***.***

Event: This column describes what the event is.

Browsing Event Log:

Use the "Previous Page" and "Next Page" buttons to navigate through the event list. Select "Show All" to display all events. Pressing "Clear All" will prompt the system to ask for confirmation; once confirmed, all events will be cleared.

Searching Event Log:

Users can search for events using various criteria, including date, time, tags, and keywords from event messages. Here are some examples:

- To find events that occurred on a specific date, such as June 30, 2024, enter the date as "2024-06-30."
- To find events that occurred at a specific time, enter that particular time.
- To list all events with the same tag, enter the desired tag.
- To filter events based on specific keywords, enter the relevant keyword or string.

Downloading Event Log:

After pressing the "**Download**" button, the system will save the Event Log using your login IP address as the file name.

6.3 System Information

This page displays the system information. This information is quite important when there is an FAE request or RMA event. To access this page, select “System Status → System Information".

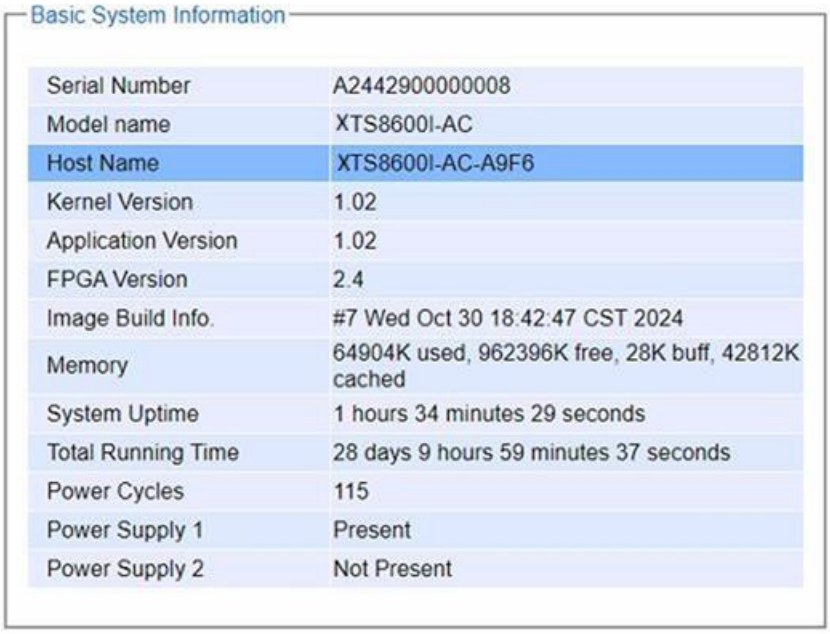


Figure 6-4 System Status -> System Information

Serial Number:

Status	Status Explanation
Serial Number	This is a unique identifier assigned to each XTS8600, used for tracking and support purposes. This should match the serial number label on the XTS8600 as the below picture.

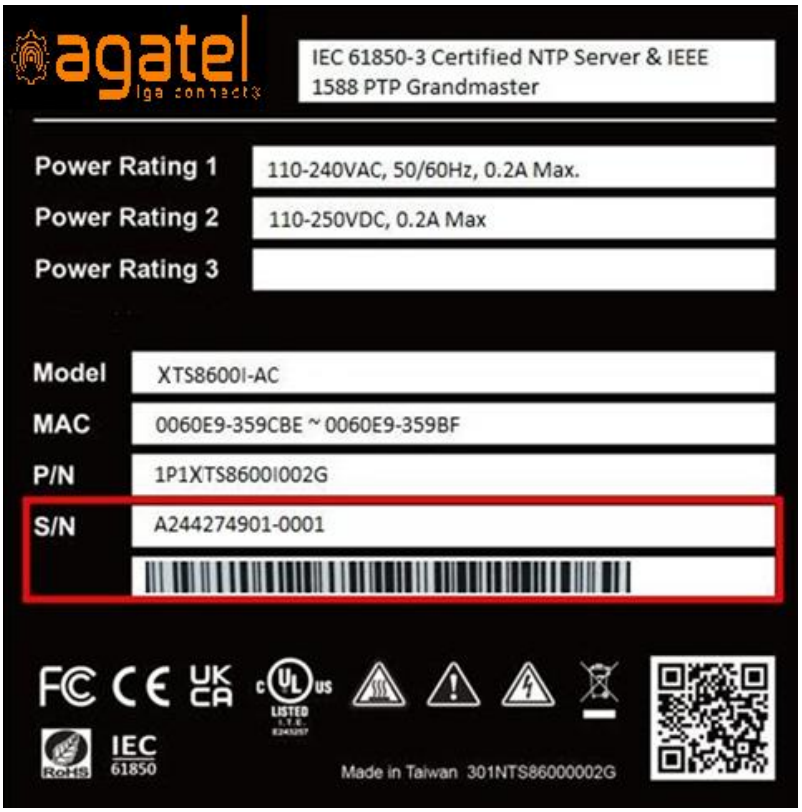


Figure 6-5 Label of Serial Number

Model Name:

Table 6-3 XTS8600 Models

Model Name	Ethernet Port	Sync-Out	Input Voltage Range
XTS8600-DC	1 x 10/100 MGMT RJ45 and 2 x 10/100/1000 RJ45/SFP combo ports	Standard Sync-Out Total 2 Channels	Dual 19-66 VDC
XTS8600-AC			Single 85-264 VAC or 88-300 VDC
XTS8600I-DC		Extend Sync-Out Total 6 Channels	Dual 19-66 VDC
XTS8600I-AC			Single 85-264 VAC or 88-300 VDC

Host Name:

Status	Status Explanation
Host Name	The name assigned to the XTS8600 on a network, used for identifying and accessing it.

Note: **Host Name – Naming Rule**

*The naming rule will be the '**Model Name**' appended with the last four bytes of the first MAC address. For example, in the case of the above picture, the **Host Name** will be XTS8600I-AC-9CBE.*

Kernel Version:

Status	Status Explanation
Kernel version	The version number of the XTS8600 software application.

Application Version:

Status	Status Explanation
Application version	The version number of the XTS8600 software application.

FPGA Version:

Status	Status Explanation
FPGA version	The version number of the XTS8600 FPGA firmware.

Image Build Info.

Status	Status Explanation
Image Build Info.	Information about the specific build of the system image, including build number and date.

Memory

Status	Status Explanation
Available Memory	The amount of RAM available and the memory usage on the XTS8600 are critical for optimal performance.

System Uptime

Status	Status Explanation
Days, Minutes, Seconds	The total time the XTS8600 has been running since it was last powered on or rebooted.

Total Running Time

Status	Status Explanation
Days, Hours, Minutes, Seconds	The cumulative time the XTS8600 has been operational since its first use.

Power Cycles

Status	Status Explanation
Power Cycles	The number of times the XTS8600 has been powered on and off.

Power Supply 1:

Status	Status Explanation
Presence of Power Supply 1	The presence of power supply 1.

Power Supply 2:

Status	Status Explanation
Presence of Power Supply 2	The presence of power supply 2.

FAE Debug Log:

The FAE Debug Log feature provides a convenient way to collect diagnostic information from the device. When troubleshooting is required, users can navigate to System Status → System Information → FAE Debug Log and click the Download button to export the log file. This file contains detailed system-level logs and internal diagnostics that are essential for technical support. Please send the downloaded log to our support team for analysis. It allows our FAE team to efficiently identify and resolve potential issues based on the collected data.

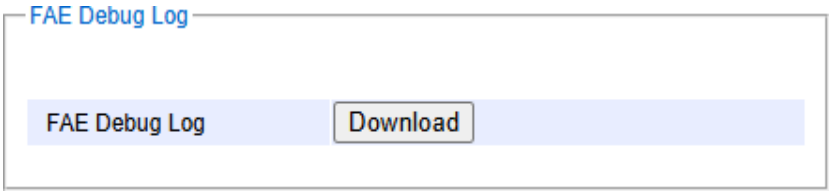


Figure 6-6 System Status-> System Information -> FAE Debug Log

6.4 Sync Out Status

The Sync-Out status page displays the configuration status, time reference, IRIG-B time format, IRIG-B parity, and cable delay compensation. To access this page, select “System Status → Sync-Out Status". To configure the Sync- Out settings, select “Time Synchronization → Sync-Out Settings".

Sync-Out Status:

Sync-Out Status

Sync-Out Status					
Sync-Out Channel	**Sync-Out Configuration**	**Time Reference**	**IRIG-B Format**	**Parity**	**Cable Latency**
Sync Out 1	PPS out	UTC	-	-	0 ns
Sync Out 2	IRIG-B TTL	UTC	IRIG-B004	Odd	0 ns
Sync Out 3	IRIG-B TTL	UTC	IRIG-B004	Odd	0 ns
Sync Out 4	IRIG-B TTL	UTC	IRIG-B004	Odd	0 ns
Sync Out 5	IRIG-B AM	UTC	IRIG-B124	Odd	0 ns
Sync Out 6	IRIG-B RS-485	UTC	IRIG-B004	Odd	0 ns

Figure 6-7 System Status -> Sync-Out Status

Sync-Out Channel: The XTS8600 series includes two Sync-Out channels. The XTS8600I model, in addition to these two channels, features four additional Sync-Out channels. The XTS8600I is the only model that supports IRIG-B AM and IRIG-B RS-485.

Configuration: There are five configuration types available for Sync-Out. Sync-Out 1 and 2 can be configured with the first three types, Sync-Out 3, 4 and 5 can be configured with the first four types, and Sync-Out 6 can only be configured with the fifth type. Notably, while up to three IRIG-AM configurations are possible, their time reference, format, parity, and cable latency settings are shared with the first configuration.

1. 10 MHZ
2. PPS Out
3. IRIG-B TTL
4. IRIG-B AM
5. IRIG-B RS-485

Time Reference: This value affects the Time Offset in IRIG-B IEEE1344 and C37.118.1. The Time Reference setting is valid only when the configuration is set to IRIG-B. You can choose between UTC and Local Time for the time zone, which Time Zone can be configured under "Time Synchronization -> System Time."

Parity: This value affects the Parity in IRIG-B IEEE1344 and C37.118.1 configurations. The parity setting is applicable only when the configuration is set to IRIG-B. Typically, the parity is set to ODD, but it may need to be adjusted based on the parity settings of downstream devices.

Cable Delay: Sync-Out cables are typically used for long-distance connections, and the signal delay during transmission can affect time accuracy. This delay is directly related to the length of the cable. Cable latency compensation can be applied to all five configuration types to ensure precise timing.

6.5 Timing Information

The **Timing Information** page shows the status of the NTP server, the configuration settings for the PTP LAN1 and LAN2 interfaces, and the PRP status. To access this page, navigate to "System Status → Sync-Out Status". For details on configuring these settings, refer to the descriptions of each item below.

PRP (Parallel Redundancy Protocol) is a network protocol that provides seamless redundancy by sending duplicate data packets over two independent networks, ensuring uninterrupted data transmission even if one network fails. The meaning of PRP interface status is the same with the PTP LAN interface 1 & 2 status. XTS8600 series supports one PRP, which can be enabled or disabled through “Network Settings → Bonding/PRP” and configured the PTP settings for the PRP interface through “Time Synchronization → PTP Settings”. "

NTP Server Status	
NTP Server	Enable Statistic
PTP LAN Interface 1 Status	
PTP Profile	C37.238-2011 Power Profile
Status	MASTER
PTP Clock ID	0060e9:fffe:35a9f6
PTP Clock Class	6
PTP Clock Accuracy	0x21
Clock Variance	0x4e5d
UTC Offset	37
Time Traceable	True
Frequency Traceable	True
PTP Timescale	True
Announcement of Leap59	False
Announcement of Leap61	False
Clock Operational Mode	Grandmaster

Figure 6-8 System Status -> Timing Information

NTP Server Status*:*

The enable/disable status is displayed here. To enable or disable the NTP server or configure additional settings, navigate to "Time Synchronization → NTP Settings".

Status	Status Explanation
Enable	NTP Server is enabled.
Disable	NTP Server is disabled.

NTP Statistic*:*

In the XTS8600 Grandmaster, users can view the NTP Client List by clicking the **Statistic** button. This list displays key details for each NTP client, including the Index, Date and Time of the last request, Count (total requests), and IP Address. Users can search by IP, navigate pages with **Previous Page** and **Next Page**, or download the information by clicking **Download**.

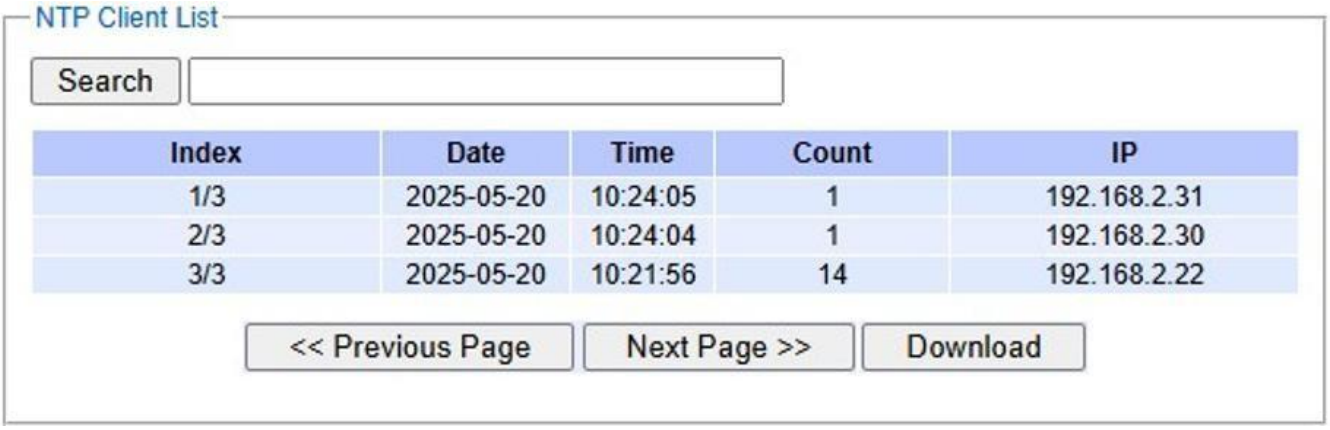


Figure 6-9 System Status -> Timing Information -> NTP Client List

PTP LAN 1 & 2 interface and PRP Status:

PTP Profile:

Status	Status Explanation
Configured Profile	Display the configured PTP Profile. To change the profile, navigate to "Time Synchronization → PTP Settings".

PTP Status:

Status	Status Explanation
Grandmaster/Master	The PTP function is enabled. This LAN of Grandmaster/Master clock was selected as the Master role through the IEEE 1588 BMCA. The master clock is the device selected to provide the most accurate time across the network. It actively sends synchronization messages to other devices.
Passive	This LAN of PTP clock was selected as the Passive role through the 1588 BMCA. The passive role is assigned to devices that were potential masters but were not selected as the master clock by the BMCA. Passive clocks listen to the synchronization messages from the master but do not send any time information themselves
No Physical Connection	The PTP function is enabled, but there is no physical connection to the corresponding LAN.
Not Operational	The PTP function isn't enabled.

PTP Clock ID:

Status	Status Explanation
Clock ID	The Grandmaster clock's unique ID is a 64-bit Extended Unique Identifier (EUI-64) typically derived from the MAC address of the network device.

PTP Clock Class:

Status	Status Explanation
6	XTS8600 is locked to the GNSS/GPS primary time source.
7	The XTS8600 was locked to the GNSS/GPS, but it has now entered holdover mode with an estimated accuracy deviation of less than 250 ns.
13	When XTS8600 is in **FreeRun** of **Clock Operation Mode**, the time source is RTC, maintaining the accuracy by its internal clock.
52	The XTS8600 was locked to the GNSS/GPS, but it has now entered holdover mode with an estimated accuracy deviation greater than 250 ns but less than 1 µs.
187	The XTS8600 was locked to the GNSS/GPS, but it has now entered holdover mode with an estimated accuracy deviation greater than 1 µs.
248	Before the first GNSS lock is obtained, the XTS8600 will display this Class

Note: **PTP Clock Class**

The Clock Class attribute, established by IEEE 1588-2008 and various PTP profiles, represents the synchronization status of the local clock. Typically, a lower-class value indicates a higher-quality master clock.

In C37.238 2011 and 2017 Power Profile, the master in the network is GNSS synchronized. When the GNSS is disconnected from the active master, the clock class degrades from 6 to 7, and then returns to 6 when GNSS is restored.

In the 61850-9-3 Utility Power Profile, the clock class changes from 6 to 7 when GNSS is disconnected. If the inaccuracy exceeds ±250 ns, the clock class changes from 7 to 52. If the inaccuracy exceeds ±1 µs, the clock class changes from 52 to 187. The clock class returns to 6 when GNSS is restored.

PTP Clock Accuracy*:*

Status	Status Explanation
< 25 ns	The accuracy of XTS8600 is within 25 ns.
< 100 ns	The accuracy of XTS8600 is within 100 ns.
< 250 ns	The accuracy of XTS8600 is within 250 ns.
< 1 µs	The accuracy of XTS8600 is within 1 µs.
< 2.5 µs	The accuracy of XTS8600 is within 2.5 µs.
< 10 µs	The accuracy of XTS8600 is within 10 µs.
< 25 µs	The accuracy of XTS8600 is within 25 µs.
< 100 µs	The accuracy of XTS8600 is within 100 µs.
< 250 µs	The accuracy of XTS8600 is within 250 µs.
< 1 ms	The accuracy of XTS8600 is within 1 ms.
< 2.5 ms	The accuracy of XTS8600 is within 2.5 ms.
< 10 ms	The accuracy of XTS8600 is within 10 ms.
< 25 ms	The accuracy of XTS8600 is within 25 ms.
< 100 ms	The accuracy of XTS8600 is within 100 ms.
< 250 ms	The accuracy of XTS8600 is within 250 ms.
< 1 s	The accuracy of XTS8600 is within 1 s.
< 10 s	The accuracy of XTS8600 is within 10 s.
More than 10 s	The accuracy of XTS8600 is larger than 10 s.

Clock Variance*:*

Status	Status Explanation
Variance of XTS8600	This statistic quantifies the variations in clock jitter and wander occurring between intervals of two synchronization messages

UTC Offset:

Status	Status Explanation
37 seconds (For now)	The PTP UTC Offset field indicates the difference, in seconds, between Coordinated Universal Time (UTC) and International Atomic Time (TAI). This offset accounts for the introduction of leap seconds to synchronize UTC with the Earth's rotation.

Note: **PTP UTC Offset**

As of now, the UTC offset is 37 seconds. This means UTC is 37 seconds behind TAI. When reviewing the PTP status, users will see this value in the UTC Offset field, ensuring that the PTP system accurately accounts for this difference during time synchronization.

The UTC offset changes when a leap second is introduced. Leap seconds are added to adjust for the Earth's slowing rotation and are typically inserted either at the end of June or December. The decision to add a leap second is made by the International Earth Rotation and Reference Systems Service (IERS), and it's announced several months in advance.

Time Traceable*:*

Status	Status Explanation
True	The XTS8600 is synchronized to a UTC-traceable source.
False	The XTS8600 is not synchronized to a UTC-traceable source. This could happen in cases where the XTS8600 has lost connection to its reference source (e.g., GNSS) and has switched to holdover mode, or XTS8600 is in **FreeRun** mode.

Note: **PTP Time Traceable**

The Time Traceable flag in PTP (Precision Time Protocol) indicates whether the Grandmaster clock's time is traceable to Coordinated Universal Time (UTC) or another recognized time standard. When this flag is set to TRUE, it means that the current time provided by the Grandmaster is derived from and aligned with a reliable, traceable source, such as GNSS (Global Navigation Satellite Systems) like GPS.

Frequency Traceable*:*

Status	Status Explanation
True	The frequency distributed by the Grandmaster is traceable to a reliable reference, typically a GPS or GNSS system.
False	The frequency distributed by the Grandmaster is not traceable to a reliable reference, typically a GPS or GNSS system. This could happen in cases where the XTS8600 has lost connection to its reference source (e.g., GNSS) and has switched to holdover mode, or XTS8600 is in **FreeRun** mode

Note: **PTP Frequency Traceable**

The Frequency Traceable flag provides assurance that the frequency distributed by the Grandmaster is accurate and synchronized with a trusted external reference. When this flag is set to TRUE, users can be confident that their systems are synchronized to a reliable source. When set to FALSE, users should be aware that the frequency accuracy may degrade over time without external reference synchronization.

PTP Timescale*:*

Status	Status Explanation
True (TAI)	Based on International Atomic Time (TAI), which is continuous and does not account for leap seconds. When XTS8600 **Clock Operation Mode** is set to **Grandmaster** mode, it's Timescale will be PTP.
False (ARB)	The Arbitrary Timescale is a custom or system-defined timescale that does not necessarily follow any recognized global time standard like UTC or TAI. When XTS8600 **Clock Operation Mode** is set to **FreeRun** mode, it's Timescale will be ARB.

Note: **PTP Timescale**
ARB Timescale is often used when synchronization is needed within a specific system or network, but alignment with TAI or UTC is not required. The ARB timescale can be used for isolated systems that do not need to align with any external time sources.

Announcement of Leap 59*:*

Status	Status Explanation
True	Indicate that the last minute of the current UTC days contain 59 seconds.
False	Indicate that the last minute of the current UTC days contain 60 seconds.

Announcement of Leap 61*:*

Status	Status Explanation
True	Indicate that the last minute of the current UTC days contain 61 seconds.
False	Indicate that the last minute of the current UTC days contain 60 seconds.

Note: **Announcement of Leap 59 and 61**
This value is inherited from the Pending Leap status of GNSS which shall show the value of -1, 0 or 1. Navigate to "System Status → Clock Information" for the Pending Leap status of GNSS.

Clock Operation Mode*:*

Status	Status Explanation
Grandmaster	The time source is GNSS. The XTS8600 system connects to a GNSS/GPS antenna to correctly initiate NTP/PTP operation as a mandatory Grandmaster function.
FreeRun	The time source is the Real Time Clock (RTC). In **FreeRun** mode, NTP/PTP operation is immediately enabled without requiring a GNSS antenna connection or a locked condition. The NTP/PTP protocol activates as soon as the system starts, even without GNSS signal.

6.6 Clock Information

The **Clock Information** page displays the status of the GNSS, antenna, and settings that may influence the time source clock. To access this page, navigate to "System Status → Clock Information". For details on these statuses, refer to the descriptions of each item below.

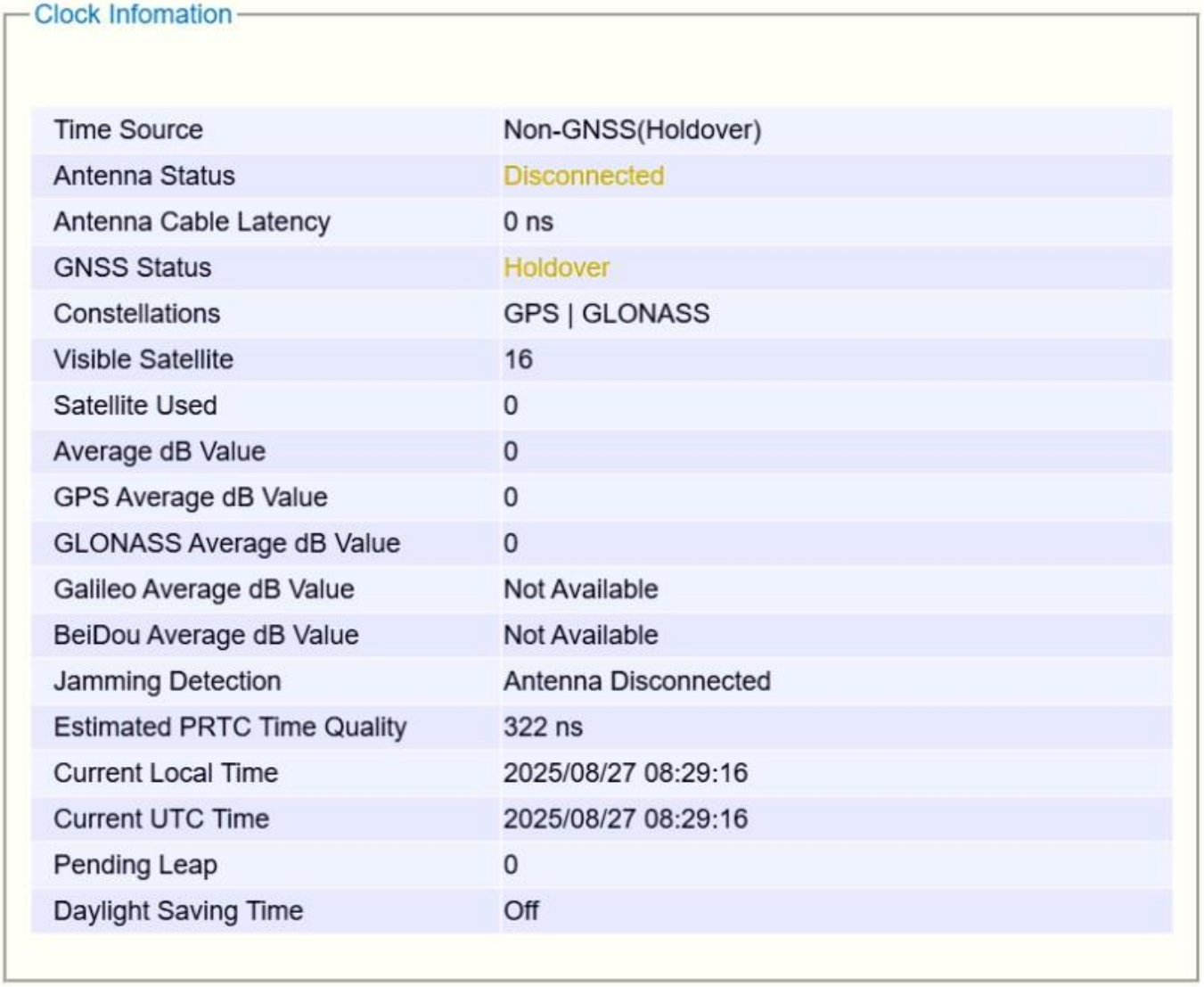


Figure 6-10 System Status -> Clock Information

Description of Clock Information:

Time Source: The Time Source field indicates the current time source used by XTS8600 series. This field can display the following values:

Time Source:

Status	Status Explanation

GNSS	This value indicates that the XTS8600 is using the Global Navigation Satellite System (GNSS) as its primary time source. GNSS provides highly accurate and reliable timing information by utilizing signals from multiple satellites.
PTP Input	It indicates that the XTS8600 will use PTP as a time source. The XTS8600 will act as a Boundary Clock. Once GNSS reception is lost, the time source will switch to PTP input.
Non-GNSS (Holdover)	The XTS8600 maintains its internal clock (OCXO) based on the last known good time source. It is used when GNSS signals are temporarily unavailable, allowing the XTS8600 to continue operating with a stable time reference.
Non-GNSS (FreeRun)	The XTS8600 relies solely on RTC as the Time Source and maintains its internal clock (OCXO) without external synchronization. This mode is less accurate over time and is used when no external time source is available.

Antenna Status: The Antenna Status field indicates the current connection status of the antenna. This field can display the following values:

Status	Status Explanation
Connected	This status indicates that the antenna is properly connected and functioning correctly. The XTS8600 is receiving signals from the antenna, which is essential for accurate time synchronization and GNSS data reception.
Disconnected	This status means that the antenna is not connected to the XTS8600. Without the antenna connection, the XTS8600 will not receive GNSS signals, which can affect time accuracy.
Shorted	This status indicates that there is a short circuit in the antenna connection. Possible causes of a shorted status include damaged cables, incorrect connections, or a fault in the antenna itself. **/*Important Notice*/** This issue can prevent the XTS8600 from receiving signals and require immediate attention to fix the connection or replace the antenna

Note: **Antenna Status**
When the Antenna status changes from **Connected** to **Disconnected** or **Shorted**, local events and syslog entries will be saved and issued. Meanwhile, the system can be configured to issue an SNMP Trap, trigger an alarm, and set the LED blinking frequency. These settings are enabled by default. To change the settings, navigate to "System Settings → Alarm Settings".

Since the detection of antenna status relies heavily on the impedance match between the XTS8600 and the antenna, it is strongly recommended to use an AGATEL-verified antenna from the provided accessories list. If a third-party antenna is used, proper operation of this function cannot be guaranteed.

Antenna Cable Latency:

Status	Status Explanation
Latency in nanoseconds	Represents the setting value of **Antenna Cable Latency** in “Time Synchronization → GNSS Settings”. This latency introduced by the antenna cable, measured in nanoseconds (ns). This value is used to compensate for the time it takes for the signal to travel through the cable, ensuring accurate timing

GNSS Status: The GNSS Status field indicates the current state of the GNSS receiver. It can display the following values:

Status	Status Explanation
Locked	The XTS8600 is successfully acquiring satellite signals, providing accurate timing and positioning.
Holdover	The XTS8600 has temporarily lost satellite signals and is using its internal clock based on the last known time source. This may occur due to obstructions or jamming, and accuracy may degrade until signals are restored.
Spoofing	The receiver has detected potential spoofing, where false signals are being used to deceive the system. This can lead to incorrect timing, and XTS8600 will alert the user through alarm, SNMP trap and LED. These settings are enabled by default. To change the settings, navigate to "System Settings → Alarm Settings"

Constellations:

Status	Status Explanation
GPS, GALIEO, BEIDOU or GLONASS (Single or Multiple constellations)	Lists the satellite constellations being utilized by the XTS8600 for time synchronization, such as **GPS**, **GALILEO**, **BEIDOU**, or **GLONASS**. The status is related to the setting value of **Primary GNSS Constellation** in "Time Synchronization → GNSS Settings".

Visible Satellites:

Status	Status Explanation
Number of satellites	Indicates the number of satellites currently visible to the XTS8600, which can be used for determining accurate time and position.

Satellites Used:

Status	Status Explanation
Number of satellites in using	Shows the number of satellites actively being used by the XTS8600 to obtain accurate timing information. To reach the locked status, at least 4 satellites are needed. A higher number generally improves accuracy.

Average dB Value:

Status	Status Explanation
Values in DB	This status indicates the average signal strength of the satellites used for time synchronization. It reflects the overall quality of the satellite signals received by the GNSS module.

Note: **Antenna DB Value**
In the XTS8600, users can monitor this value to ensure that the GNSS module is receiving adequate signal strength for optimal performance. In an outdoor environment, the recommended signal strength for good satellite quality is typically around 32 dB or higher. A value below 28 dB is considered weak and may cause performance issues or loss of synchronization.

See the **Troubleshooting** subsection for steps to follow if the antenna DB value falls below 28 dB.

GPS Average dB Value:

Status	Status Explanation
Values in DB	This status indicates the average signal strength of the **GPS** satellites used for time synchronization.

GLONASS Average dB Value:

Status	Status Explanation
Values in DB	This status indicates the average signal strength of the **GLONASS** satellites used for time synchronization.

Galileo Average dB Value:

Status	Status Explanation
Values in DB	This status indicates the average signal strength of the **Galileo** satellites used for time synchronization.

BeiDou Average dB Value:

Status	Status Explanation
Values in DB	This status indicates the average signal strength of the **BeiDou** satellites used for time synchronization.

Estimated PRTC Time Quality:

Status	Status Explanation
Estimated Time Accuracy	Provides an estimate of the time accuracy of XTS8600 Primary Reference Time Clock (PRTC), including PPS and PTP, measured in nanoseconds.

Current Local Time:

Status	Status Explanation
Current Local Time	Displays the **Current Local Date** and **Time** according to the XTS8600 time zone settings, reflecting any adjustments for time zones or daylight-saving time. The **Current Local Time** is related to the setting value of **Current Local Date, Current Time, Time Zone and Daylight Saving Time** in "Time Synchronization → GNSS Settings".

Current UTC Time:

Status	Status Explanation
Current UTC Time	Shows the current Coordinated Universal Time (UTC), which is the global standard time used across different regions for synchronization. The **Current UTC Time** is related to the setting value of **Current Date, Current Time** in "Time Synchronization → GNSS Settings".

Pending Leap:

Indicates whether there are any pending leap seconds, which are occasionally added to account for irregularities in the Earth's rotation and keep atomic time in sync with solar time. The RTC, NTP server, PTP, and IRIG-B of XTS8600 will also respond to leap second adjustments

Status	Status Explanation
Zero (0)	This value means there are no pending leap second adjustments. The current UTC is accurate, and no leap second will be added or subtracted in the immediate future.
Minus One (-1)	This value indicates that a leap second will be subtracted from UTC. While subtracting leap seconds is extremely rare, this field will reflect such an event should it occur. Example: If the current time is 23:59:59, and a leap second is to be subtracted, the clock will jump from 23:59:58 to 00:00:00, skipping one second.
One (1)	This value signifies that a leap second will be added to UTC. Example: If the current time is 23:59:59, and a leap second is to be added, the clock will show 23:59:60 before moving to 00:00:00.

Daylight Saving Time:

Shows whether Daylight Saving Time (DST) is currently active or inactive, affecting the local time displayed. To enable or configure DST, navigate to "Time Synchronization → System Time."

Status	Status Explanation
On	**Daylight Saving Time** is enabled.
Off	**Daylight Saving Time** is disabled.

6.7 Network Information

The Network Information page displays the network settings for PRP/Bonding, as well as for LAN1, LAN2, and the Management port. To configure the IPV4 or IPV6 network settings of LAN 1, LAN2 and Management Port, navigate to "Network Settings → IP Settings" or "Network Settings → IPV6 Settings".

Bonding/PRP Network Information: Bonding or PRP can be activated, but only one at a time. When PRP is enabled, the Bonding/PRP Status will display the PRP network information. When Bonding is enabled, the Bonding/PRP Status will display the Bonding network information. To configure PRP or Bonding settings, navigate to "Network Settings → Bonding/PRP".

Bonding/PRP Status	
PRP	Enabled
PRP IPv4 Address	192.168.100.1
PRP IPv4 Netmask	255.255.255.0
PRP IPv4 Gateway	192.168.100.253
Bonding	Disabled

PRP: Inactive or Active status of PRP.

Status	Status Explanation
Enabled	**PRP** is enabled.
Disabled	**PRP** is disabled.

PRP IPV4 Address:

Status	Status Explanation
IPV4 Address	IPV4 address of **PRP** interface being used.

PRP IPV4 Netmask:

Status	Status Explanation
Netmask	**PRP** subnet mask being used.

PRP IPV4 Gateway:

Status	Status Explanation
Gateway Address	**PRP** default gateway being used.

Bonding/PRP Status	
PRP	Disabled
Bonding	Active-Backup
Bonding IPv4 Address	192.168.100.1
Bonding IPv4 Netmask	255.255.255.0
Bonding IPv4 Gateway	192.168.100.253

Figure 6-11 System Status -> Network Information -> Bonding/PRP Status

Bonding: Inactive or configuration of Bonding. Refer to **Bonding/PRP** subsection for the detail explanation of Active-Backup and LACP mode.

Status	Status Explanation
Disabled	**Bonding** is disabled.
Active-Backup	**Bonding** is enabled and Active-Backup mode is set.
LACP	**Bonding** is enabled and LACP mode is set.

Bonding IPV4 Address:

Status	Status Explanation
IPV4 Address	IPV4 address of **Bonding** interface being used.

Bonding IPV4 Netmask:

Status	Status Explanation
Netmask	**Bonding** subnet mask being used.

Bonding IPV4 Gateway:

Status	Status Explanation
Gateway Address	**Bonding** default gateway being used.

Cluster Network Information:

Cluster Status	
Cluster Option	Enable
Cluster Virtual IP Address	192.168.8.128
Cluster Running State	Backup

Figure 6-12 System Status -> Network Information -> Cluster Status

Cluster Option: Inactive or Active status of Clustering.

Status	Status Explanation
Enabled	**Cluster** is enabled.
Disabled	**Cluster** is disabled.

Cluster Virtual IPV4 Address:

Status	Status Explanation
IPV4 Address	Virtual IPV4 address of **Cluster** interface being used.

Running State:

The Running State shows the status of the cluster configuration. Three states are available.

Status	Status Explanation
Disabled	It means that cluster function isn't enabled
Master	Cluster is enabled and the current XTS8600 is the clustering Master
Backup	Cluster is enabled and the current XTS8600 is the clustering Backup

LAN 1 Network Information:

LAN 1	
MAC address 1	00:60:E9:35:A9:F6
Connection Status	down
IPv4 Address	10.0.50.1
IPv4 Netmask	255.255.0.0
IPv4 Gateway	N/A
IPv6 Address	N/A
IPv6 Prefix	0
IPv6 Gateway	N/A
VLAN	-

Figure 6-13 System Status -> Network Information -> LAN1

MAC Address 1:

Status	Status Explanation
MAC Address	**MAC** address of LAN1 interface.

Connection Status:

Status	Status Explanation
Up	LAN 1 interface is connected, and the link is up.
Down	LAN 1 interface isn't connected, and the link is up.

IPV4 Address – LAN 1:

Status	Status Explanation
IPV4 Address	IPV4 address of **LAN 1** interface being used.

IPV4 Netmask – LAN 1:

Status	Status Explanation
Netmask	**LAN 1** subnet mask being used.

IPV4 Gateway – LAN 1:

Status	Status Explanation
Gateway Address	**LAN 1** default gateway being used.

IPV6 Address – LAN 1:

Status	Status Explanation
IPV6 Address	IPV6 address of **LAN 1** interface being used.

IPV6 Prefix – LAN 1:

Status	Status Explanation
Netmask	**LAN 1** IPV6 prefix being used.

IPV6 Gateway – LAN 1:

Status	Status Explanation
Gateway Address	**LAN 1** IPV6 default gateway being used.

VLAN – LAN 1:

Status	Status Explanation
VLAN ID	**LAN 1** VLAN ID if VLAN is enabled

PRP – LAN 1 & LAN2:

Status	Status Explanation
PRP Enabled	Indicate that the PRP status is enabled
PRP Disabled	Indicate that the PRP status is disabled

LAN 2 Network Information: All the status explanation could refer to LAN 1Network information.

LAN 2	
MAC address 2	00:60:E9:35:A9:F7
Connection Status	down
IPv4 Address	192.168.1.1
IPv4 Netmask	255.255.255.0
IPv4 Gateway	N/A
IPv6 Address	N/A
IPv6 Prefix	0
IPv6 Gateway	N/A
VLAN	-

Figure 6-14 System Status -> Network Information > LAN2

MGT Network Information: All the status explanation could refer to LAN 1Network Information.

Management Port	
MAC address 3	00:60:E9:35:A9:F8
Connection Status	up
IPv4 Address	192.168.6.187
IPv4 Netmask	255.255.255.0
IPv4 Gateway	N/A
IPv6 Address	fe80::260:e9ff:fe35:a9f8
IPv6 Prefix	64
IPv6 Gateway	N/A
VLAN	-

Figure 6-15 System Status -> Network Information -> MGT

7 Appendix A: Firmware and User Manual Revision History

To check the XTS8600 firmware version, please refer to section 6.3, System Information. The table below lists all the revisions of XTS8600 Firmware.

Date	Version	FPGA	Summary of FW Revisions
2024/11/11	1.03	2.7	Initial Release
2025/03/21	1.04	2.7	[SNMP] Add XTS8600 Proprietary SNMP MIB [System] Add FAE Debug Log in System Information Page [Network] Support Bonding mode in Clustering [PTP] Optimize PTP Capacity [GNSS] Using Surve-in mode for GNSS Locked operation [PTP] Add ATOI TLV Support [Bug Fixed] ■ [IP] Setting check for IP 0.0.0.0 and 255.255.255.255 ■ [Management] Device Manager cannot display the MGT IP after configuring to bonding mode ■ [PTP] Display wrong value of Clock Variance ■ [PTP] Wrong current offset value when switching between Grandmaster to Free Run mode ■ [PTP]the PTP_UTC_Reasonable should display False when GNSS is unlocked on Grandmaster mode ■ [Network] IPV6 address/gateway display inconsistently when link changes from up to down or down to up ■ [Management] Device Manager shouldn't change the IP successfully when the User Name is different ■ [Console]The console shouldn't log in successfully when the baud rate is different ■ [Management]The MGT IP address can't be changed successfully via Device Manager in bonding/PRP mode ■ [SNMP]The SNMP test fail if the password include space and \
2025/04/21	1.05	2.7	[PTP] Added support for PTP Telecom Profiles, including G.8265.1 Option 1, G.8275.1, and G.8275.2. [Time Sync] Added support for SyncE and ESMC functionalities. [NTP] Improved NTP synchronization accuracy to less than 50 µs. [Security] HTTPS is used as the default protocol for web communication.. [Security] Added Interface Management settings to enable or disable HTTP/HTTPS access. [PTP] Fixed the default PTP profile transport mode to IPv4 Multicast with Two-Step Clock. [Network] Added SyncE Enable/Disable Setting. [Bug Fixed] ■ [PTP] Unicast synchronization fails to resume after unplugging and reconnecting the network cable. ■ [Network] SyncE LED should be aligned with the enable/disable setting

			■ [PTP] Clock variance display incorrectly when GNSS is unlocked/locked ■ [Web] The webpage must be refreshed after enable/disable HTTPS/HTTP
2025/05/23 & 2025/06/11	1.06 & 1.07	2.7	[SNMP] Add SNMP MIB support for Survey-in, Reset Default and Interface Management and Telecom profile (Need to update to MIB V1.01) [PTP] Add Path Delay Optimization for PPS Accuracy. [GNSS] Saving Surve-in data even after device cold-start. [PTP] PTP Transaction shall start after 1st GNSS lock. [NTP] NTP Transaction shall start after 1st GNSS lock. [Sync-Out] IRIG-B Transaction shall start after 1st GNSS lock [Sync-Out] Add support for the adjustment of PPS. [Bug Fixed] ■ [PTP] Add the related PTP value of Timing Information in FreeRun mode. ■ [NTP] Fix the issue where NTP with bonding does not work. ■ [PTP] Fix clock class error of Telecom Profile
2025/08/28	1.08	2.7	[PTP] Add support of 802.1AS and Enterprise Profile

The table below lists all the revisions of XTS8600 user manual

Date	Version	Summary of User Manual Revisions
2024/11/11	1.00	Initial Release
2025/04/21	1.01	1.1 Product Overview ■ Update the product overview based on the new features of FW 1.05 and datasheet v1.5 1.2 Product Specifications ■ Update the product specifications based on the XTS8600 datasheet 1.5 1.3 Regulatory Approval ■ Update the regulatory approval based on the XTS8600 datasheet 1.5 1.6.2 LAN LED Indicators ■ Update Figure 1-8 ■ Update Table 1-19 2.3 Surge Protectors ■ Update description 3.2 Antenna Selection ■ Update the description of using non-AGATEL verified antenna 3.2 Cable Selection ■ Add CFD-200 4.3.4 Web Connection – MGT Interface ■ Update Table 4-4 4.3.7 LAN1/LAN2 Connection ■ Update Table 4-8 5.2 SNMP Settings ■ Add SNMP MIB Description 5.3.1 GNSS Settings ■ Add Survey-In Time and the explanation of Survey-In 5.3.2 System Time ■ Update description of Local Time

		5.3.3 PTP Settings ■ Add Telecom Profile ■ Add ATOI TLV 5.4 System Settings ■ Add 5.4.6 Interface Management 5.4.7 Factory Default ■ Update Figure 5-42 6.3 System Information ■ Add FAE Debug Log 6.6 Clock Information ■ Update Figure 6-10 7. Appendix A: Firmware and User Manual Revision List ■ Add Appendix A: Firmware and User Manual Revision List 9. Appendix C: Syslog and Event Logs ■ Add Surve-In log
2025/06/13	1.02	5.2 SNMP Settings ■ Update Current Web Functions Not Supported by SNMP MIB Objects 5.3.1 GNSS Settings ■ Update Survey-In Time and the explanation of Survey-In 5.3.5 Sync-Out Modules ■ Add PPS Width 6.6 Clock Information ■ Update Figure 6-10
2025/08/28	1.03	1.2 Product Specification ■ Align with XTS8600 Datasheet V1.6 5.3.3 PTP Settings ■ Add 802.1AS and Enterprise profile 6.5 Timing Information ■ Add 802.1AS and Enterprise profile 7 Appendix C ■ Add interface management log

8 Appendix B: Abbreviation List

AC	Alternating Current	NTPD	Network Time Protocol
AFNOR	Association Francaise de Normalisation	OCXO	Oven Controlled Crystal Oscillator
ALM	Alarm	OOB	Out-Of-Band
AM	Amplitude Modulated	P2P	Peer-to-Peer
BMCA	Best Master Clock Algorithm	PDOP	Position Dilution of Precision
BNC	Bayonet Neill–Concelman Connector	PRP	Parallel Redundancy Protocol
bps	Bits Per Second	ppb	parts per billion
CLI	Command Line Interface	PPS	Pulse per Second
C/NO	Carrier-to-Noise power ratio	PTP	Precision Time Protocol
DB9	D-Subminiature 9-pin	RADIUS	Remote Authentication Dial-In User Service
DC	Direct Current	RF	Radio Frequency
DHCP	Dynamic Host Configuration Protocol	RMA	Return Merchandise Authorization
DNS	Domain Name Server	RoHS	Restriction of Hazardous Substances Directive
DSCP	Differentiated Services Code Points	RTC	Real Time Protocol
DST	Daylight Saving Time	SAW	Surface Acoustic Wave
E2E	End-to-End	SFP	Small Form-factor Pluggable
ESMC	Ethernet Synchronization Message Channel	SMA	SubMiniature version A
ESD	Electro Static Discharge	SNMP	Simple Network Management Protocol
FW	Firmware	SSH	Secure Shell protocol
GE / GbE	Gigabit Ethernet	SYSLOG	System Log
GLONASS	Globalnaya Navigatsionnaya Sputnikovaya Sistema	SyncE	Synchronous Ethernet
GND	Ground	TACACS	Terminal Access Controller Access-Control System
GNSS	Global Navigation Satellite System	TNC	Threaded Neill Concelman
GPS	Global Positioning System	TPM	Trusted Platform Module
IEC	International Electrotechnical Commission	TTL	Transistor–transistor Logic
ESMC	Ethernet Synchronization Message Channel	VLAN	Virtual Local Area Network

ESD	Electro Static Discharge
FW	Firmware
GE / GbE	Gigabit Ethernet
GLONASS	Globalnaya Navigatsionnaya Sputnikovaya Sistema
GND	Ground
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
IEC	International Electrotechnical Commission
IED	Intelligent Electronic Devices
IEEE	Institute of Electric and Electronic Engineers
IP	Internet Protocol
IP65	Ingress Protection Rating 65
IRIG	Inter-Range Instrumentation Group
ITU-T	International Telecommunications Union
L2	Layer 2
LACP	Link Aggregation Protocol
LED	Light-Emitting Diode
LNA	Low Noise Amplifier
MAC	Media Access Control
MD5	Message-Digest Algorithm 5
MIB	Management Information Base
MGT	Management
MTBF	Mean Time Between Failures
VSWR	Voltage Standing Wave Ratio

9 Appendix C: Syslog and Event Logs

The XTS8600 captures and timestamps every event in Syslog format, following the specifications outlined in RFC 3164. The table below lists all events logged by the GMC, along with the corresponding record for each event.

The XTS8600 Event Log is the same with syslog which is comply with RFC 3164. However the timestamp format will extend to Year-Month-Day Hour : Min : Sec.

Syslog/Event Log Messages	Tag	Severity	Facility
The device reset due to cold start	*sys*	*Notice*	*System*
Device rebooted by pinhole button	*sys*	*Notice*	*System*
Device reboot initiated by {username} at {user_ip} through {Web/SSH/Console}	*sys*	*Notice*	*System*
Device factory reset initiated through pinhole button	*cfg*	*Notice*	*System*
Device factory reset initiated by {username} at {user_ip} through {Web/SSH/Console}	*cfg*	*Notice*	*System*
DC Power supply {P1/ P2} was already installed, but now it is missing.	*sys*	*Emergency*	*System*
Firmware update failed: {the cause of error }	*sys*	*Error*	*System*
Holdover Alert due to lose the connection of GNSS/GPS antenna (Visible Satellite:{num}, Satellite Used:{num}, Avg dB Value (All/GPS/Glonass/Galileo/BeiDou) :{val}/{val}/{val}/{val}/{val}, PDOP:{val}, Antenna status:{Init/Unknown/ /Connected/Short-Circuit/Disconnected})	*alarm*	*Alert*	*Clock*
Holdover Alert due to lose the satellites (Visible Satellite:{num}, Satellite Used:{num}, Avg dB Value (All/GPS/Glonass/Galileo/BeiDou) :{val}/{val}/{val}/{val}/{val}, PDOP:{val}, Antenna status:{Init/Unknown/ /Connected/Short-Circuit/Disconnected})	*alarm*	*Alert*	*Clock*
Holdover Alert due to spoofing detection	*alarm*	*Alert*	*Clock*
Holdover alert clear	*alarm*	*Alert*	*Clock*
Holdover Event during Pickup Delay (Visible Satellite:{num}, Satellite Used:{num}, Avg dB Value (All/GPS/Glonass/Galileo/BeiDou) :{val}/{val}/{val}/{val}/{val}, PDOP:{val}, Antenna status:{Init/Unknown/ /Connected/Short-Circuit/Disconnected})	*gnss*	*Informational*	*Clock*
GNSS/GPS Locked	*gnss*	*Informational*	*Clock*
Jamming Detected, Unable to lock	*gnss*	*Informational*	*Clock*
Survey-in has finished successfully	*gnss*	*Informational*	*Clock*
Survey-in failed	*gnss*	*Informational*	*Clock*
Spoofing Alert	*alarm*	*Alert*	*Clock*
Spoofing alert clear	*alarm*	*Alert*	*Clock*
The antenna was already installed, but now it is missing.	*alarm*	*Alert*	*Clock*
Antenna Absent Alert clear	*alarm*	*Alert*	*Clock*
The antenna cable is detected as shorted	*alarm*	*Emergency*	*Clock*

Antenna Shorted Alert clear	*alarm*	*Alert*	*Clock*
LAN {1/2} changed link state to down	*network*	*Notice*	*System*
LAN {1/2} changed link state to up	*network*	*Notice*	*System*
The LAN 1, and LAN 2 are within the same subnet	*network*	*Error*	*System*
MGT port changed link state to down	*network*	*Warning*	*System*
MGT port changed link state to up	*network*	*Notice*	*System*
The {Model name} {Device name} initialization is completed.	*sys*	*Informational*	*System*
NTP authenticated fail for client's IP address	*timesync*	*Error*	*Clock*
1588 PTP synced to client {Client IP} successfully with {Using Profile}	*timesync*	*Informational*	*Clock*
Lost 1588 PTP synchronization of client {Client IP} successfully with {Using Profile}	*timesync*	*Error*	*Clock*
{Device name} PRP function has been activated	*network*	*Informational*	*System*
{Device name} PRP function has been inactivated	*network*	*Notice*	*System*
{Device name} Bonding function has been activated	*network*	*Informational*	*System*
{Device name} Bonding function has been inactivated	*network*	*Notice*	*System*
{Device name} LACP function has been activated	*network*	*Informational*	*System*
{Device name} LACP function has been inactivated	*network*	*Notice*	*System*
{Device name} Running state change of Clustering from Master to slave	*network*	*Notice*	*System*
{Device name} Running state change of Clustering from Slave to Master	*network*	*Notice*	*System*
Time Quality of Timeserver < 40ns (Record an event log the first time a satellite lock occurs or when transitioning from holdover back to satellite lock.)	*freq*	*Informational*	*Clock*
40ns <= Time Quality of Timeserver: {accuracy} ns < 250ns (Record an event log only at the first time)	*freq*	*Warning*	*Clock*
250 ns <= Time Quality of Timeserver: {accuracy} ns < 1μs (Record an event log only at the first time)	*freq*	*Warning*	*Clock*
Time Quality of Timeserver: {accuracy} ns > 1 μs (Record an event log only at the first time)	*freq*	*Warning*	*Clock*
Time Quality of Timeserver Alert > {Time Quality Alarm settings} ns	*alarm*	*Alert*	*Clock*
Time Quality of Timeserver Alert clear	*alarm*	*Alert*	*Clock*
Login to {Web/SSH/Console}: failed by {username} at {user_ip}	*sys*	*Warning*	*Security*
Login to {Web/SSH/Console}: successful by {username} at {user_ip}	*sys*	*Informational*	*Security*
IP setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
IPV6 setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
VLAN setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
Bonding/PRP setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
Clustering setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
Syslog setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
SNMP setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*

GNSS setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
System Time setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
PTP setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
NTP setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
Output Modules setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
Interface management changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
Alarm configuration setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
Console setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
Firmware upgrade setting: Changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
User account setting changed by {username} at {user_ip}	*cfg*	*Informational*	*User*
Init GNSS config failed (show gnss init failed item : open serial failed/set rate to 200ms/Enable UBX-NAV-PVT/Enable UBX-NAV-TIMELS/Enable UBX-NAV-TIMEUTC/Enable UBX-NAV-SAT/Enable UBX-CFG-ANT/Enable UBX-CFG-ITFM/Enable UBX-MON-HW/Enable UBX-NAV-STATUS/Set GNSS Constellation or Lock Condition failed)	*gnss*	*Informational*	*Clock*

WHO WE ARE

Built on 20 years of experience in designing and manufacturing industrial networking products, **Agatel** *was established from the UK to serve the infrastructure and industrial sectors in EMEA markets with reliable connectivity for mission-critical systems in demanding environments.*

Experienced in hardware and software design and integration, we produce high-quality yet cost-effective industrial networking and communication products with great customization capabilities and robust implementations, equipping our customers for reliable secure industrial networks.

WHAT WE OFFER

The needs of our customers' industry are different from those of corporate IT environments – industrial operating environments are tough and the impact of failure in the field can lead to business threatening situations, hence our products will have lifetimes in excess of 20 years.

From entry-level to high-performance industry-certified hardware, **Agatel** *offers a full solution spectrum to suit our customers' budgets and application requirements, with features such as industrial-grade reliability, integrated security, network redundancy, and advanced performance.*

Our product solution profile includes industrial Ethernet switches, network time servers, media converters, industrial wireless devices, and serial device servers, covering a wide array of mission-critical applications such as automation, security, transport, water, oil and gas, and power grids.

WHY CHOOSE US

We help our customers reduce downtime and operational costs of their industrial applications in harsh environments. Leading system integrators in EMEA rely on our niche technical expertise and product quality to increase their applications' robustness, revenues, and competitive differentiation.

Agatel *ruggedized high-quality solutions are designed to deliver zero-network-downtime for harsh project demands, allowing for reliable connectivity to keep people and assets safe and secure in harsh and hazardous environments, and allowing customers to focus on growing their business.*

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