

RELIABLE SECURE CONNECTIVITY

XTS8600 Series

IEC-61850-3 Industrial NTP Server Grandmaster Clock





XTS8600 Series

IEC-61850-3 Industrial NTP Server Grandmaster Clock



FEATURE HIGHLIGHTS

- IEC 61850-3 HV & IEEE 1613 Certified NTP Server & IEEE 1588 PTP Grandmaster
- -40 to +85 °C Operating Temperature, IP30 Protection, and Up to 5100 m Altitude
- MIL-STD-810F Certified for Environmental and Transportation Reliability
- Dual Power Inputs: DC (Built-in) or AC (via Adapter) with Wide Input Range
- Full Redundancy Across Power, System, Network, and Link Layers
- <40 ns PRTC-B/PTP, <50 μs NTP Accuracy, Calnex Verified
- Excellent Holdover Performance: <0.5 μs/8 Hours / <72 μs/7 Days
- Supports Power, Telecom, AVBTSN and Enterprise Profile
- Three Ethernet Ports: Two PTP-Capable Combo Ports, All Three NTP-Capable
- Supports Power, Telecom Profiles, AVBTSN and Media Broadcast Profiles
- Dual Media Combo Ports Enable Cost-Effective Copper/Fiber Deployment
- Supports Multi-Constellation GNSS with Anti-Jamming and Anti-Spoofing
- Antenna Fault Detection and Protection: Short Circuit and Disconnection
- Configurable IRIG-B (TTL, AM, RS-485), PPS, and 10 MHz Outputs



PRECISION TIMING

Precise time synchronization is essential for the safe and reliable operation of power systems. Network faults can occur at any time, but especially for critical utilities, fault detection and isolation need to be fast and accurate to minimize the risk of damage. Even under normal operation, the stability and control of power systems depend on coordination and synchronization of various devices and systems, such as generators, transformers, and switches.

Precise time synchronization allows for coordinated operation and control of these devices, ensuring grid stability and minimizing the risk of power outages. For renewable energy sources such as solar and wind power, where energy resources are often distributed, time synchronization is particularly important for coordination of multiple sources to maximize their contribution to the grid.

Monitoring and analysis of power grids also require precise time synchronization to accurately correlate data from various sources, such as sensors and meters. With event data in the correct sequence, managers can perform real-time and offline analysis of grid performance and faults.





PRODUCT DESCRIPTION



With an operating temperature range of -40 to $+85$ °C, and IEC 61850-3 HV and IEEE 1613 offering up to four times the EMC protection compared to rugged industrial-grade standards, the XTS8600 is engineered to operate reliably in environments exposed to electrical noise, temperature extremes, and radiated disturbances—ensuring uninterrupted performance and high system availability. The XTS8600 NTP Server and IEEE 1588 PTP Grandmaster is the world’s first solution fully certified to both IEC 61850-3 HV and IEEE 1613 standards, delivering exceptional resilience and precision in demanding applications such as power substations, telecommunications networks, automation systems, and enterprise infrastructure.



Rigorously tested by Calnex Solutions, a leader in network synchronization testing, the XTS8600 series delivers exceptional time precision, ensuring your power applications’ synchronization needs are met with the highest standards of accuracy. Featuring proven PRTC-B accuracy within 40 ns, IEEE 1588 PTP accuracy within 40 ns, and NTP accuracy within 50 μ s, this Grandmaster guarantees precise time distribution across your network.



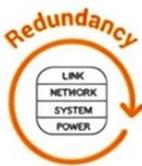
Holdover performance is critical to ensure uninterrupted and accurate time synchronization during loss of the primary time source. The XTS8600 series offers exceptional holdover stability, with a drift of less than 0.5 μ s over 8 hours, and approximately 72 μ s over 7 days, as validated by Calnex Solutions. When entering holdover mode, the system intelligently adjusts protocol attributes according to the active time profile (e.g., Power, Telecom) and proactively issues notifications via alarms and syslog to alert operators.



The Grandmaster supports a wide range of IEEE 1588 PTP profiles, making it suitable for deployment in power, telecom, AVB/TSN, and enterprise networks. For power utilities, it complies with IEEE C37.238-2011, C37.238-2017, and IEC/IEEE 61850-9-3:2016. Telecom synchronization is supported through ITU-T G.8265.1, G.8275.1, and G.8275.2 profiles. IEEE 802.1AS is also supported for time-sensitive networking in industrial and media environments. The Enterprise profile ensures interoperability across standard IT infrastructures. In addition, the Grandmaster supports SyncE for enhanced frequency stability in telecom applications.



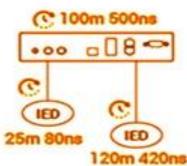
XTS8600 offers enhanced robustness and resilience against jamming and spoofing attacks. By receiving signals from multiple constellations for verification, the system can provide spoofing detection and enter holdover mode if necessary. The Grandmaster also features comprehensive antenna vulnerability mitigation, detecting short and disconnected antennas to maintain system integrity. For added protection, a surge protector is available for purchase, safeguarding your equipment from electrical surges and ensuring the reliability of your timing infrastructure.



System redundancy is guaranteed by clustering featuring IEC 62439-3 Parallel Redundancy Protocol (PRP) to ensure network redundancy without data loss or downtime. Link redundancy is achieved through bonding, providing resilient connectivity. Additionally, XTS8600 series offers power redundancy options, including dual DC inputs or a combination of one DC and an external HVAC/HVDC power supply, to safeguard against power failures.



Modulated IRIG-B is ideal for long-distance transmission due to its resistance to signal degradation and compatibility with legacy equipment. Demodulated IRIG-B, available in TTL or RS-485 formats, offers higher precision, with IRIG-B RS-485 supporting distances up to 1200 meters. PPS and 10MHz outputs are crucial timing signals in modern IEC 61850 power applications, providing precise synchronization essential for various grid operations. The XTS8600 series features up to six configurable outputs, including IRIG-B TTL, AM, RS-485, 1-PPS, and 10MHz waveform.



Compensation for antenna delay is essential because long antenna cables can introduce timing errors that affect the accuracy of synchronized operations. Similarly, output delay compensation for signals such as IRIG-B and PPS is vital, especially in systems with multiple IEDs connected. It is much easier and more efficient to compensate for cable delays at the Grandmaster level rather than at each individual IED, as not all IEDs support delay compensation. Handling these adjustments centrally at the Grandmaster guarantees that all connected devices operate in perfect sync, optimizing the performance and coordination of critical substation operations.

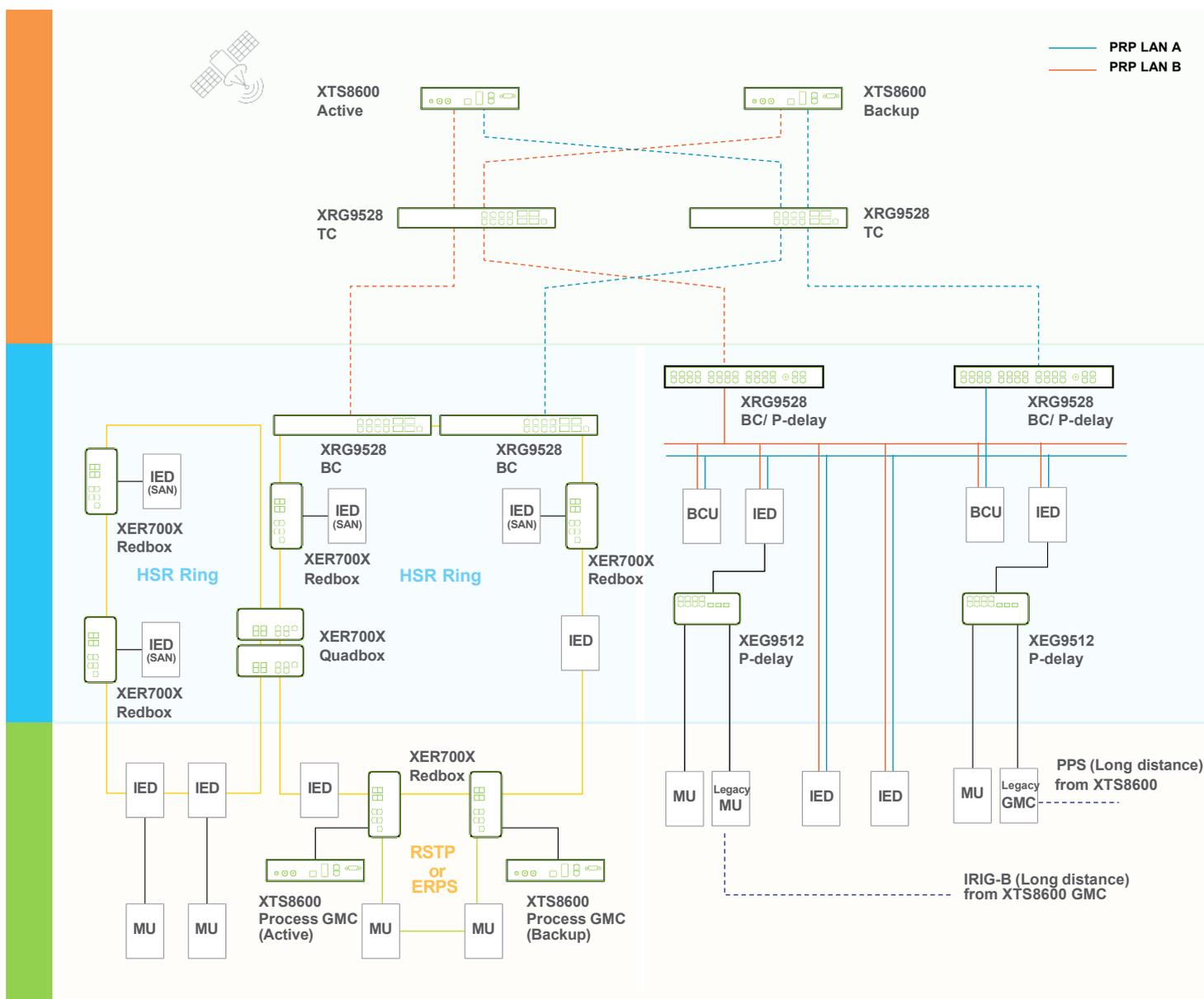


APPLICATION CASE

Two XTS8600 units in the station layer determine the Active and Backup GMC through BMCA. The Active GMC synchronizes to both GPS and GNSS satellite systems and transmits via IEC 62439-3 PRP to two power domains composed of PRP and HSR networks. According to IEC 61850-9-3 and IEEE C37.238-2017, the total end-to-end budget is 1 μ s, with GMC being 250ns. The XTS8600 achieves superior accuracy of <40ns, reserving more budget for other devices. For early MU devices that rely on 1PPS or IRIG-B for synchronization, the XTS8600 offers 1PPS, IRIG-TTL, IRIG-B AM, IRIG-B RS-485, and RS-485 to fiber-optics for long-distance transmission and delay compensation.

The HSR network provides zero-packet-loss redundancy but also increases latency. Devices in the process layer require more precise timing. When the end-to-end budget cannot be met, a GMC must be deployed to aid in accurate timing for critical devices. The XTS8600, certified to IEC61850-3 HV & IEEE 1613, operates reliably in harsh process layer environments, providing precise synchronization.

In addition to the XTS8600, our timing solution for power substations also includes BC or TC of XRG9528, P-Delay TC of XEG9512, HSR Redbox, and Quadbox of XER700X.





Technical Specifications	
Model Name	XTS8600/XTS8600I Series
GNSS Receiver Specifications	
GNSS Input ports	1x GNSS Input; SMA (F) - active Antenna
GNSS Module specific Information	<p>Multi-Constellation Supported: GPS L1, GLONASS L1, BeiDou B1, Galileo E1 Maximum Concurrent Constellations: 3</p> <p>Leap Second: Supported Sensitivity for GPS:</p> <ul style="list-style-type: none"> • Tracking: -166 dBm • Reacquisition: -160 dBm • Cold Start: -148 dBm • Hot Start: -160 dBm
Acquisition Times	<p>Cold Start: < 45 seconds</p> <p>Warm Start: < 7 seconds</p>
Antenna Requirements	<p>3.3 V, < 50 mA</p> <p>Minimum gain=5dB; Maximum gain + Cable Attenuation \leq 40dB</p>
GNSS Vulnerability Mitigation	<p>Jamming: Support Detection, Warning and Switch to OCXO Holdover</p> <p>Spoofing: Support Detection, Warning and Switch to OCXO Holdover (GNSS Antenna Only)</p>
Antenna Vulnerability Mitigation	<p>Antenna Cable Short: Support Detection, Warning and Switch to OCXO Holdover</p> <p>Antenna Disconnection: Support Detection, Warning and Switch to OCXO Holdover</p>
Antenna Specification (Accessories)	
GNSS Antenna	<p>GNSS receiver: GPS L1, GLONASS L1, BeiDou B1, Galileo E1 LNA Gain: 40dB min</p> <p>Weather-Proof Housing: IP69K</p> <p>Operating and Storage Temperature: -40°C ~85°C</p> <p>ESD: \pm15KV Air Discharge</p> <p>Mechanical size: 66.5 mm dia. x 21 mm H</p> <p>MIL-STD-810F</p> <p>Supply Voltage Range: 2.5 to 16VDC</p>
GPS Antenna	<p>GNSS receiver: GPS L1, Galileo</p> <p>Weather-Proof Housing: IP69K</p> <p>Operating and Storage Temperature: -40°C ~85°C</p> <p>ESD: \pm15KV Air Discharge</p> <p>Mechanical size: 66.5 mm dia. x 21 mm H</p> <p>MIL-STD-810F</p> <p>Supply Voltage Range: 2.5 to 16VDC</p>
Anti Jamming GNSS Antenna	<p>GNSS receiver: GPS L1, GLONASS L1, BeiDou B1, Galileo E1 LNA Gain: 40dB Typ.</p> <p>Weather-Proof Housing: IP69K</p> <p>Operating and Storage Temperature: -40°C ~85°C</p> <p>ESD: \pm15KV Air Discharge</p> <p>Mechanical size: 66.5 mm dia. x 21 mm H</p> <p>MIL-STD-810F</p> <p>Supply Voltage Range: 2.5 to 16VDC</p>
Max. Antenna Cable Length	<p>Antenna cable:</p> <p>Without amplifier:</p> <p>LMR-400: 150M CFD-200: 50M RG58A/U: 25M</p> <p>With Amplifier:</p> <p>LMR-400: 250M CFD-200: 80M RG58A/U: 50M</p>
Max. Sync-out Cable Length	<p>RG58 A/U Sync-Out cable:</p> <p>1PPS, 10MHz, IRIG-B TTL: 150M</p> <p>IRIG-B AM: 150M @1K impedance, 300M @10K impedance IRIG-B RS485: 1200M</p>

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) 2. 1PPS/PPM/PPH Output (Square Wave, configurable pulse width) 3. IRIG-B TTL (Support IEEE1344 and C37.118.1) 4. AFNOR French Time Code BCD, BJT, ST and ST Checksum (Contact sales for these timecodes)
Extend Sync-Out (NTS8600I) (Sync 3 ~ Sync 6)	Three extra configurable output channels (Sync 3 ~ Sync 5, coaxial BNC (F) connector): 1. 10MHz (Square Wave) 2. 1PPS/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) IRIG-B RS-485 B000~B007 (Support IEEE1344 and C37.118.1)
Relay-Alarm Contact	Rated Operational Voltage: 24 VDC Continuous carrier: 1A Normal Open Pickup time: 2.5ms Turn-off time: 1ms



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
RS-485 IRIG-B	±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	ITU-T G.8265.1 Frequency ITU-T G.8275.1 Phase/Time ITU-T 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 Moods	
GNSS Locked Mood	Synchronizes time with GNSS signals for high accuracy
Handover Mood	Maintains time using the OCXO clock after GNSS is unavailable
Free Run Mood	Operates independently using RTC as the time source along with the OCXO clock
Functions	
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
Events & Alarms	Event Log Syslog Relay & Alarm Management SNMP Trap



Physical Characteristics

Housing	SPCC w/Zinc Plated Body + Aluminum cover IP30 Metal Housing
Dimension (W x H x D)	252.8 x 220 x 44
Weight	2KG (AC + IRIG-B) / 1,9KG (DC + IRIG-B)
Installation	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)

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

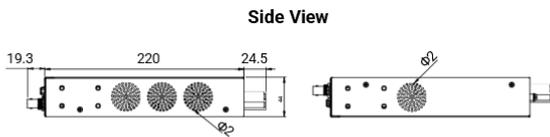
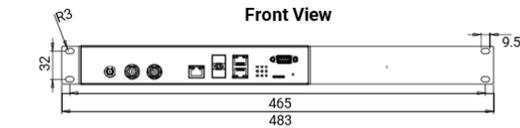
Test	Item	Value	Level
IEC 61000-4-2	ESD	Contact Discharge	±8KV
		Air Discharge	±15KV
IEC 61000-4-3	RS	Enclosure Port	10(V/m), 80-3000MHz 20(V/m), 80-1000MHz
IEC 61000-4-4	EFT	AC Power Port	±4.0KV
		DC Power Port	±4.0KV
		Signal Port	±2.0KV
IEC 61000-4-5	Surge	AC Power Port	4
		AC Power Port	Line-to Line±2.0kV Line-to
		DC Power Port	Earth±4.0kV Line-to Line±1.0kV Line-
		DC Power Port	to Earth±2.0kV Line-to Earth±4.0kV
		Signal Port	4
IEC 61000-4-6	CS	0.15-80MHz	10V rms 0.15-80MHz, 80% AM
IEC 61000-4-8	PFMF	(Enclosure)	100A/m continuous, 1000A/m (3s)
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	30V Continuous, 300V 1s
		Signal Port	300V 1s



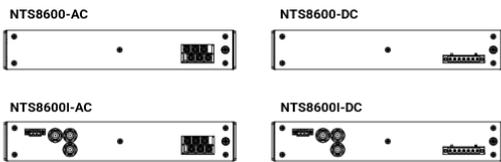
IEC 61000-4-17	Ripple	DC Input Port	10% of unit	3
IEC 61000-4-18	Damped Oscillatory	AC Power Port	2.5KV common, 1KV differential mode @ 1MHz	3
		Signal Port Telecommunication Port	2.5KV common, 1KV differential mode @ 1MHz	3
IEC 61000-4-29	DC Voltage Dips & Interruptions	DC Input Port	30% Reduction (Voltage 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			



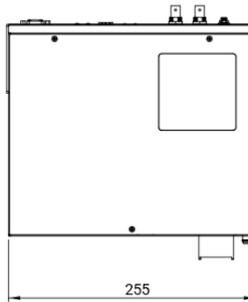
DIMENSIONS & ACCESSORIES



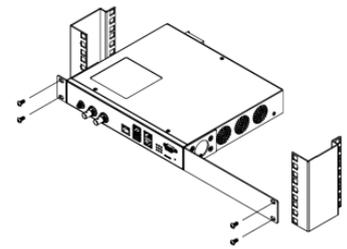
Back View



Top View



Rackmount Installation View

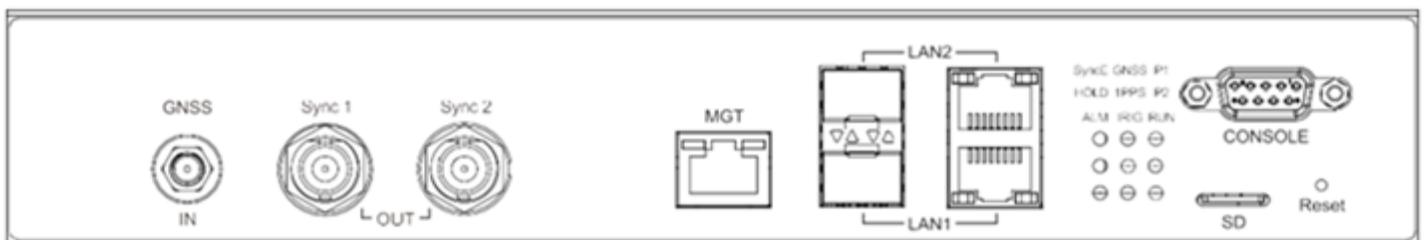


unit: mm



PRODUCT CONNECTIONS

Front View – XTS8600 (All models)



Back View – XTS8600-AC



Back View – XTS8600-AC



Back View – XTS8600I-DC



Back View – XTS8600I-AC



ORDER INFORMATION

Model	Technology	Ethernet	Ethernet/SFP	Sync-Out	Input Voltage
XTS8600-DC	GPS	1	2	2 channels	Dual 19-66 VDC
XTS8600-AC	GPS	1	2	2 channels	Single 85-264VAC or 88-300VDC
XTS8600I-DC	GPS	1	2	6 channels	Dual 19-66 VDC
XTS8600I-AC	GPS	1	2	6 channels	Single 85-264VAC or 88-300VDC



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.*

AGATEL LTD

1st Floor, Apex House
Calthorpe Road, Edgbaston
Birmingham B15 1TR
United Kingdom

Tel: +44 121 809 8855

Email: info@agatel.co.uk

Web: www.agatel.co.uk

