RHG9728/ RHG9828 Series

IEC61850-3 Certified Rack-Mount Managed Modular Gigabit PoE Switch - PTP Boundary Clock

FEATURED HIGHLIGHTS

- Hot swappable modular rackmount Gigabit switch
- IEC 61850-3 and IEEE 1613 certification
- Integrated IEEE 1588v2 hardware-based BC and TC
- Maximum 128Gbps switching capacity, 95.24Mpps throughput
- Rugged industrial design for harsh environments between -40 to +85°C (UL: +75°C)
- Flexible modular configuration, 3 module-dedicated slots
- Up to 24 Gigabit ports, and 4x10 Gigabit SFP Uplink slots
- ITU-T G.8032 ERPS Ring, RSTP, or MRP (Manager/Client) redundancy
- Compliance with IEC62443-4-1 development procedures
- IEEE802.3 af/at/bt support with maximum 90W per port and 720W total PoE power budget
- Supports over 2K routing entries (RHG9828)
- Partial TSN functionality support

PRODUCT DESCRIPTION

Flexibility: ATOP's high-density RHG9728-RHG9828 rack-mounted managed switch provides the flexibility needed for your application demands. Easily customize your device by choosing from among six different core versions based on power supply, uplink port configurations and embedded Hardware-Assisted Boundary Clock feature; three different 8-port modules; and three power modules with wide range power 12-380 VDC or 100-240 VAC.

Designed for substations: RHG9728-RHG9828 supports up to **24 Gigabit ports in any 8-port multiple configuration**. Specifically designed for IEC61850 substation backbone use, it is fully certified to meet all IEC61850-3 hardware requirements, such as EMC Level 3, 4 and 5 requirements, wide temperature range, and high availability.

Award-winning performance: RHG9728-RHG9828's IEEE1588v2 Hardware-PTP version received recognition for nanosecond-level accuracy, This makes RHG9728-RHG9828 one of the most reliable GMC backups. It is also embedded with Synchronous Ethernet and with full support for PTP profiles.

High-availability: RHG9728-RHG9828 supports hot-swappable modular power board and IO board , allowing replacement of modules without shutting down the whole system. It's high performance provides a network redundant self-recovery mechanism of under 20ms on full load. This enables you to build a reliable network through almost any redundant ring topology. RHG9728-RHG9828 supports ITU-T G.8032 ERPS Ring, IEEE802.1D-2004 RSTP, STP, MSTP, MRP (Manager/Client), and many other compatible ring protocols for network redundancy. Its multifunctional web dashboard offers intelligent features such as Quality of service (QoS), IGMP, port mirroring, and security. Additional 4 x 10 Gigabit uplink SFP slots allow RHG9728-RHG9828 to work as the backbone of a power substation.

Versatile power supply: RHG9728-RHG9828 is available in four power input variants: 12–48 VDC, 48–120 VDC, 120–380 VDC, and 100–240 VAC, covering a wide range of applications from low-voltage DC systems to high-voltage distribution grids.

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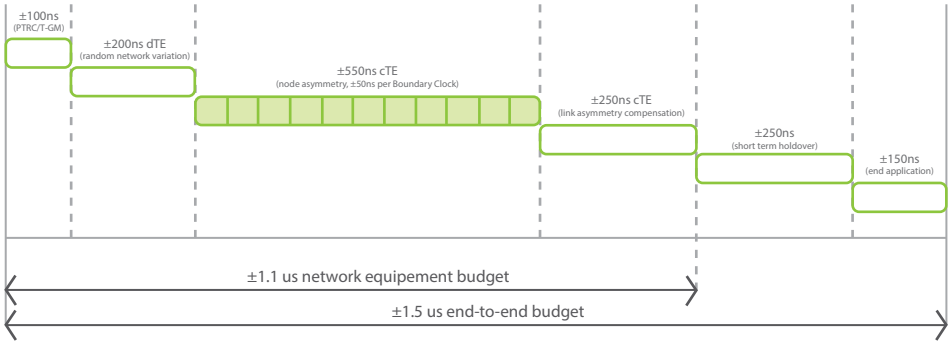
BOUNDARY CLOCK APPLICATION

High accuracy delivered, even in holdover mode

A boundary clock (BC), often incorporated in a network switch, is a time synchronization device that acts non-transparently to the slave clocks in the network. In large networks with thousands of slaves, the Grandmaster clock could become overloaded if all slaves are connected directly to it. So, a BC is needed to act as a slave towards the master, but as a master towards slaves.

The RHG9728-RHG9828 boundary clock, once synchronized, has a maximum 1.5 μs end-to-end time deviation budget from the GNSS to the end-application, up to 10 BC hierarchies.

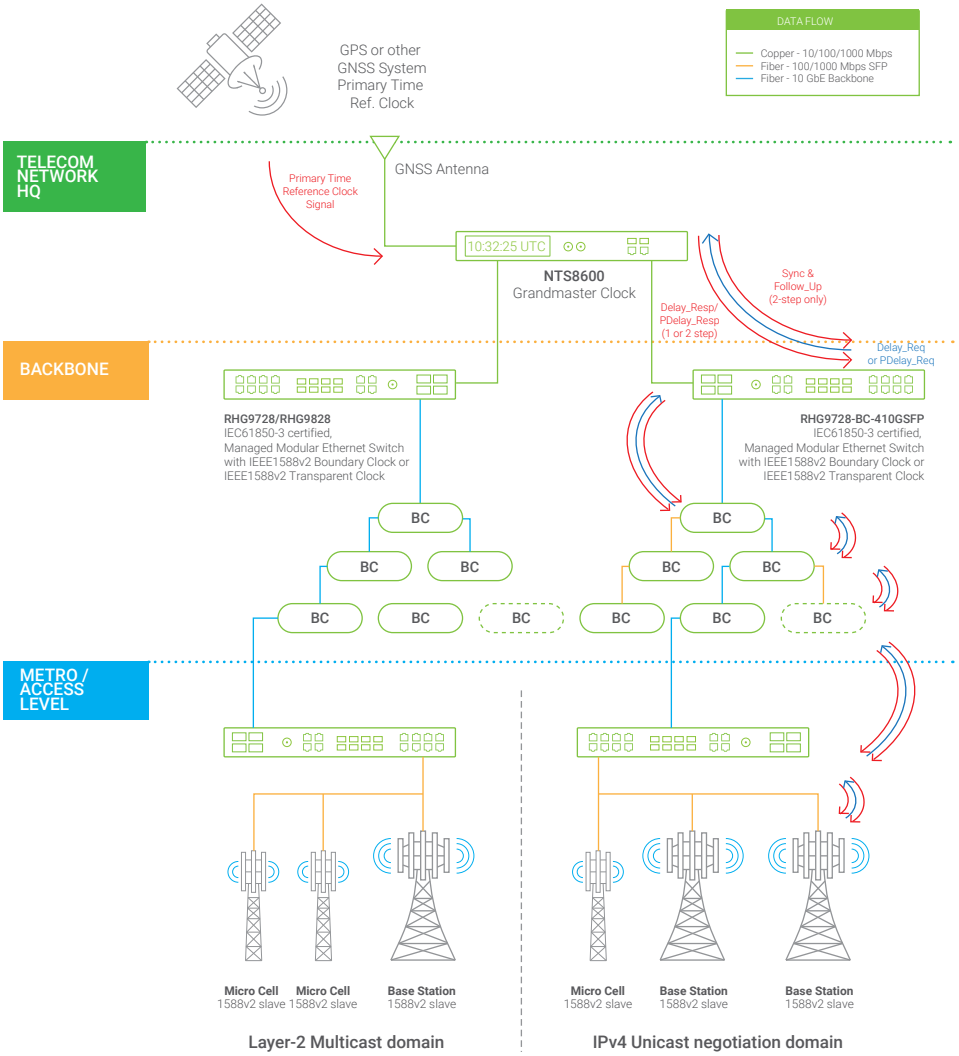


Application Example

The network diagram shows the use of ATOP's NTS8600 Grandmaster Clock and RHG9728-RHG9828 Boundary Clock.

RHG9728-RHG9828 can easily function as both an access/aggregation switch with up to 4x1/10Gbps SFP slots, and as a PTP boundary clock. Up to 28 ports can be individually configured to run different instances of IEEE1588v2.

A wide variety of settings are allowed within profiles – such as Power and Enterprise profiles. RHG9728-RHG9828-BS supports Synchronous Ethernet, allowing the transport of time and frequency, which is important for legacy networks such as SDH-SONET.



CONFIGURATION

RHG9728-RHG9828 is designed to meet the evolving needs of your application with its hot-swappable modular format. Easily configure and upgrade without disrupting existing network operations. Choose up to three different switch modules to connect different types of devices to the network. Power supply is also available in four different modules, with two slots for flexibility and redundancy. This modular approach makes the R28 Ethernet switch a cost-effective solution that can easily adapt to a wide range of requirements.

IEC61850-3 certified Layer-2 Managed Switch, with maximum 24 Gigabit ports, 4 x 10 Gigabit SFP uplinks, supporting IEEE1588v2 HW BC and Synchronous Ethernet.

Switch core

RHG9728-RHG9828-410SFP
Main unit with 4 x 1/10 Gbps SFP uplink slots, HW PTP BC/TC and SyncE.

Switch modules

Hotswap-8PoE
8 Port Gigabit RJ45 module supporting IEEE1588v2 Hardware BC/TC and IEEE802.3 af/at/bt.

Hotswap-8G
8 Port Gigabit RJ45 module supporting IEEE1588v2 Hardware BC/TC.

Hotswap-8SFP
8 port 100M/1G bps SFP module supporting IEEE1588v2 Hardware BC/TC.

Power modules

Hotswap-LVDC
Power module with 12-48 VDC.

Hotswap-DC
Power module with 48-120 VDC.

Hotswap-HV
Power module with 120-380 VDC.

Hotswap-AC
Power module with 100-240 VAC.

Hotswap-PoE
Power module with 48-57 VDC for PoE PD.

SPECIFICATIONS

Switch core		
Model Name	RHG9728-RHG9828	
Switch Properties		
Priority Queues	8	
VLAN Table	512	
MAC-Based VLAN	512	
VLAN ID Range	VID 1 to 4094	
Trunk Group	8	
Static IGMP Groups	128	
Dynamic IGMP Groups	256	
MAC Table Size	32k	
Packet Buffer Size	1.5 MB	
Jumbo Frame	10240Byte	
Switching Fabric Capacity	128 Gbps	
Maximum throughput	95.24 Mpps	
L3 IPv4 Routing Entries	Over 2K	
Ethernet		
Standards	IEEE 802.3 for 10BASE-T IEEE 802.3 af/ IEEE 802.3 at/ IEEE802.3 bt Power-over-Ethernet IEEE 802.3u for 100BASE-FX IEEE 802.3ab for 1000BASE-T(X) IEEE 802.3z for 1000BASE-X IEEE 802.3ae For 10 Gigabit Ethernet Fiber IEEE 802.3x for Flow Control, Backpressure Control IEEE 802.1w for Rapid Reconfiguration of Spanning Tree IEEE 802.1D-2004 for Rapid Spanning Tree Protocol IEEE 802.1s for Multiple Spanning Tree Protocol IEEE 802.1Q for VLAN Tagging IEEE 802.1p for Class of Service IEEE 8021X for Authentication IEEE 802.1AB Link Layer Discovery Protocol (LLDP) IEEE 802.1Q VLAN. IEEE 802.3ad for Port Trunk with LACP IEEE1588v2 PTP (Hardware-based) ITU-T G.8261 Synchronous Ethernet	
Protocols	IPv4, IPv6, IGMPv1/v2/v3, GMRP, GVRP, SNMPv1/v2c/v3, SNMP Inform, ICMP, Telnet, SSH, DHCP Server/Relay/Client, DHCP Option 66/67/82, BootP, TFTP, NTP Server/Client, SNTP, SMTP, RMON, HTTP, HTTPS, Telnet, Syslog, MRP (Manager/Client), ERPS, LLDP, IEEE 1588 PTP V2(Hw-based), 802.1x, RADIUS, TACACS+, SyncE, CFM, sFlow, RMON, Link OAM, Voice VLAN, UPnP, DDMI, SD backup, IPv4 Routing(Static Route, RIP, OSPF)(RHG9828 only)	
Redundancy	ITU-T G.8032 ERPS, STP, RSTP, MSTP, MRP (Manager/Client), Compatible Ring/Chain, U-Ring	
Automation Profiles	Modbus TCP	
MIB	MIB II, IF-MIB, SNMPv2 MIB, BRIDGE-MIB, RMON MIB Group 1,2,3,9	
Precision timing		
Time Synchronization	Network Time	NTP Server/Client, SNTP
	Precision Time Protocol	IEEE1588v2 BC (HW)-ns accuracy IEEE1588v2 TC (HW)-ns accuracy Synchronous Ethernet
	Holdover Accuracy	Boundary Clock/ SyncE: <30 ns/s (IEEE61850-9-3 compliant)
	PTP Mode	Layer-2: Multicast, E2E/P2P, two-steps Layer-3 (IPv4):Multicast,Unicast,Unicast Neg. (E2E/P2P)

Time Synchronization	Supported Profiles	C37.238 -2017 Power Profile IEC/ IEEE61850-9-3 Power Profile(2016) IEEE 802.1AS-2011 Time-Sensitive Networking (TSN) for time synchronization	
Power			
Hot-swappable modules	Rating power	LVDC: 12-48VDC DC: 24-120 VDC AC:100-240 VAC HV: 120-380 VDC PoE: 48-57 VDC	
	Input power	LVDC: 9.6VDC-52.8VDC DC: 19.2-144 VDC AC: 80-264 VAC HV: 96-456 VDC	
Input Current (Max)	LVDC: 12-48 VDC, 3.5A Max. DC: 24-120 VDC, 1.8A Max. AC/HV: 120~380 VDC, 0.5A Max.		
Power	LVDC: 12-48 VDC DC: 24-120 VDC AC/HV: 120~380 VDC / 100-240 VAC		
Reverse polarity Protection	Yes		
Relay Output	1 Relay Output (24V/1A)		
Connectors	AC: Barrier Terminal Block 4pin 9.52mm DC: Barrier Terminal Block 3Pin 13mm		
Physical Characteristics			
Housing Dimension (W x H x D) Weight Installation	IP30 SPCC metal housing 440 x 44x 355 mm (not including screws, terminal blocks and rack-mount kit) 5Kg (not including module but module cover only) 1U Rack-mount, Rack-mount kit included		
Environmental Limits			
Operating Temperature Storage Temperature Ambient Relative Humidity	-40°C to +85°C (-40°F to +185°F), UL certified to +75°C -40°C to +85°C (-40°F to +185°F) 5% to 95%, 55°C (Non-condensing)		
Modules			
Model Name	Hotswap-8PoE	Hotswap-8G	Hotswap-8SFP
Description	8-Port RJ45 module with PoE	8 Port RJ45 module	8 Port SFP module
Properties			
Port speed	10/100/1000 Mbps	10/100/1000 Mbps	100/1000 Mbps
Interface	RJ45	RJ45	SFP Slot
Dimensions	102 x 120 x 42 mm	102 x 120 x 42 mm	102 x 120 x 42 mm
Weight	550 g	550 g	500 g
Fixing	2 x quick-release screws (included)	2 x quick-release screws (included)	2 x quick-release screws (included)

Power Modules	
Model name	**Description**
RHG9X28 LV-DC	Power module with 12-48 VDC
RHG9X28 DC	Power module with 24-120 VDC
RHG9X28 AC/HV	Power module with 100-240 VAC, 120-380 VDC
RHG9X28 PSE	Power module with 48-57 VDC for PoE PD

REGULATORY APPROVALS

Regulatory Approvals				
Safety	LVD EN62368-1			
EMC	FCC Part 15, Subpart B, Class A, EN 55032, EN 55024, EN 61000-6-4:2007+A1 2011, EN 61000-3-2, EN 61000-3-3, EN 61000-6-2:2005			
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), 80-1000MHz, 80% AM, 1~3GHz	3
IEC 61000-4-4	EFT	AC Power Port DC Power Port Signal Port	±4.0kV @2.5kHz ±4.0kV @2.5kHz ±2.0KV @2.5kHz	4 4 4
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 3 3 4
IEC 61000-4-6	CS	AC Power Port DC Power Port Signal Port	10V rms 0.15-80MHz, 80% AM 10V rms 0.15-80MHz, 80% AM 10V rms 0.15-80MHz, 80% AM	3 3 3
IEC 61000-4-8	PFMF	(Enclosure)	100A/m continuous, 1000A/m (3s)	5
IEC 61000-4-10	Damped Osc. Magnetic Field	(Enclosure)	100A/m, 100kHz, 1MHz	5
IEC 61000-4-11	DIP	AC Power Port	Drop 70% 3 times/s (1period) Drop 40% 3 times/1ms (50 period) Drop 100% 3 times/50m(5-50per.)	-
IEC 61000-4-12	Damped Oscillatory	AC Power Port Signal Port	2.5kV common,1kV diff.mode 2.5kV common,1kV diff.mode	3 3
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	TBD			
Warranty	5 years			

ORDERING INFORMATION

Main Core Switch

Model name	Part Number	Description
RHG9728-4SFP	1P1RHG97280001G	4* 1/10G SFP
RHG9828-4SFP	1P1RHG98280001G	4* 1/10G SFP

Interface Modules

Model name	Part Number	Description
RHG9X28 RJ45	1P1RHG9X280005G	8P* 10/100/1000Mbps RJ45 Module
RHG9X28 RJ45+PSE	1P1RHG9X280006G	8P* 10/100/1000Mbps RJ45 Module with PoE
RHG9X28 SFP	1P1RHG9X280007G	100M/1G SFP

Power Modules

Model name	Part Number	Description
RHG9X28 LV-DC	1P1RHG9X280002G	Power module with 12-48 VDC
RHG9X28 DC	1P1RHG9X280001G	Power module with 24-120 VDC
RHG9X28 AC/HV	1P1RHG9X280003G	Power module with 100-240 VAC, 120-380 VDC
RHG9X28 PSE	1P1RHG9X280004G	Power module with 48-57 VDC for PoE PD

Optional Accessories

Model name	Part Number	Description
AC POWER CORD(US)	50892531G	RHG9X28 US AC Power CORD, 183cm
AC POWER CORD(EU)	50891751G	RHG9X28 EU AC Power CORD, 180cm
SDR-240-48	50502401480001G	DIN RAIL POWER SUPPLY / T, AC 100~240V to 48V~55V DC 5A, 240W
SDR-480-48	50504801480001G	DIN RAIL POWER SUPPLY / T, AC 100~240V to 48V~55V DC 10A, 480W
AXFD-1314-0523	522AXFD1314001G	SFP Transceiver, 155Mbps, Multi-mode,1310nm, 2km, -40°C to +85°C, DDMI
AXFD-1314-0553	522AXFD1314011G	SFP Transceiver, 155Mbps, Single-mode, 1310nm, 30km, -40°C to +85°C, DDMI
AXGD-5854-0513	522AXGD5854001G	SFP Transceiver, 1250Mbps, 850nm, Multi-mode, 550m, 3.3V, -40°C to +85°C, DDMI
AXGD-1354-0523	522AXGD1354001G	SFP Transceiver, 1250Mbps, 1310nm, Multi-mode, 2km, 3.3V, -40°C to +85°C, DDMI
AXGD-1354-0533	522AXGD1354011G	SFP Transceiver, 1250Mbps, 1310nm, Single-mode, 10km, 3.3V, -40°C to +85°C, DDMI
AXGD-3354-0593	522AXGD3354001G	SFP Transceiver, 1250Mbps, 1310nm, Single-mode, 40km, 3.3V, -40°C to +85°C, DDMI
AXXE-5886-05B3	522AXXE5886001G	SFP Transceiver, 10Gbps Multi, 850nm,300m, -40°C to +85°C