

Rackmount Ruggedized 28 GbE Switch with Cyber Security for Critical Applications

RS428 Series

Industrial 28G L2+ Rackmount Managed Ethernet Switch

The rackmount 28 Port Gigabit L2+ Managed Switch RS428 with 20 Giga copper ports, four Giga combo ports and four Giga fiber SFP slots supports critical cyber security features such as Port Based Security- IEEE802.1x MAB (MAC Authentication Bypass), Access Control List (ACL, MAC/IP/ARP filter), DHCP Snooping, IP Source Guard, Dynamic ARP Inspection as well as advanced redundancy features such as WoMaster ERPSv2 Plus and eRSTP. The rugged design and high EMC immunity design makes the new RS428 an ideal solution for power substation, industrial control room, roadside traffic control, and industrial Surveillance applications.



ViewMaster
NetMaster
ThingsMaster
ThingsMaster OTA



Features & Benefits

High Throughput Ethernet Switching

- 28-port GbE: 20 GbE RJ45 ports, 4 GbE RJ45/SFP Combo ports, and 4 100M/1G SFP fiber ports.
- Up to 24 GbE copper RJ-45 ports
- Up to 8 100M/1G fiber ports for fiber links to field switches
- DDM function for high quality fiber connectivity monitoring
- Powerful 1.2GHz ARM Cortex-A9 processor
- Energy-Efficient Ethernet for power saving
- Non-blocking switch fabric design
- 8 flexible Class of Service(CoS) queues and 512 L2 Multicast Groups for video applications
- 16K MAC address table and 9Kb Jumbo Frame

WoMaster ERPSv2 PLUS Ring Technology

- Apply Broadcom® CFM Technology for overcoming GbE copper physical limitation and providing minimum 20ms recovery time, seamless restoration time
- Inter-Operability with 3rd party ITU-T G.8032 v1/v2 ERPS switch and still remain fast recovery time
- Replace legacy Ring + Chain + Dual Homing

Enhanced RSTP(eRSTP)

- Enhance the RSTP fault recovery time performance
- Enhance RSTP performance for large ring network topologies with up to 80 switches

IEC62443-4-2 Level 3 / 4 Cyber Security

- L2-L7 IPv4/IPv6* Access Control List (ACL)
- DHCP Snooping, IP Source Guard, Dynamic ARP Inspection
- 802.1Q VLAN, Private VLAN, Advanced Port Security
- Multi-Level user passwords
- HTTPS/SSH/SFTP, 256-bit encryption
- 802.1X MAB for non-802.1X compliant end devices
- RADIUS/TACACS+ centralized password authentication

Industrial IoT LAN & Cloud Management

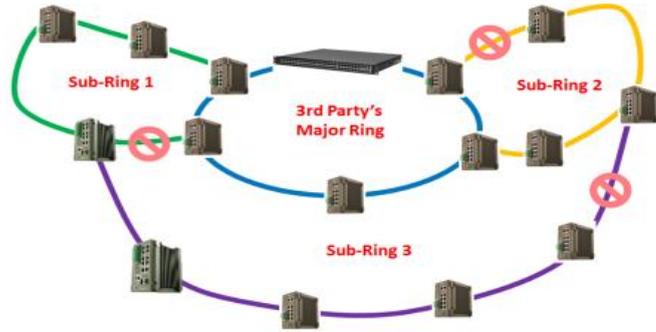
- Various configuration paths, including CGI WebGUI, CLI, SNMP and RMON
- Support WoMaster Software Utilities:
 - NetMaster Network Management System
 - ViewMaster for Configuration Management
 - ThingMaster*, ThingMaster OTA* for device management over Cloud*
- Support MQTT* protocol, ready to use AWS/Azure and Private Cloud Agent for cloud management
- LLDP for topology control, auto-topology drawing
- USB for easy field configuration and firmware update

Rugged Design for Industrial Control Room and Wayside Network Switching

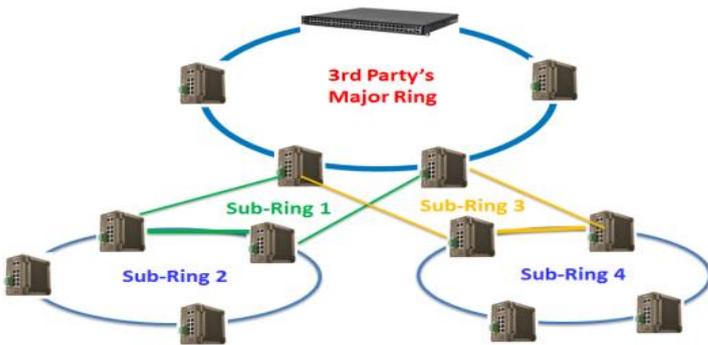
- EN50121-4 certification for Railway Trackside, Roadside & Industrial Control Room applications
- Excellent heat dissipation design for operating in -40~70°C environments
- Support AC, High Voltage DC and Low Voltage DC Input

✓ **ITU-T G.8032 ERPSv2 gives ultimate Inter-Operability, Flexibility, and Scalability**

G.8032 v.2 ERPS is becoming the most common standard for redundancy on industrial networks and replacing proprietary ring redundancy and standard Ethernet Ring Switching, as it provides stable protection of the entire Ethernet Ring from any loops and open standard for 3rd party devices. The ITU-T G.8032 v2 ERPS recovers the network break within less than 20ms recovery time thus significantly increases network reliability for critical IIoT applications, such as heavy industrial automation (power substation and oil and gas vertical markets), ITS (traffic control, public transportation), railway networks, and other smart city applications concerning public safety.

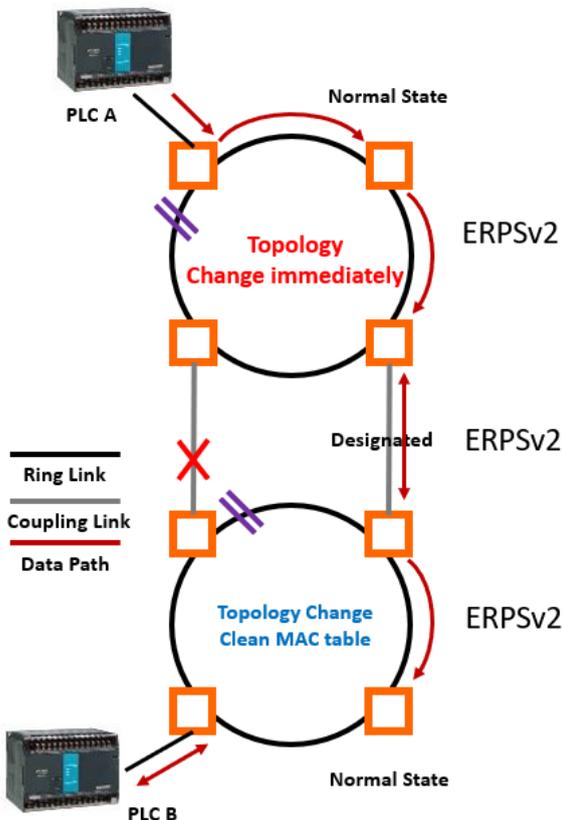


G.8032 v1 only supports single ring topology, whilst G.8032 version 2 additionally features recovery switching for Ethernet traffic in Multiple Ring (ladder) of conjoined Ethernet Rings by one or more interconnections which saves deployment costs by providing wide-area multipoint connectivity with reduced number of links. Deploying switches with support of G.8032 v2 ERPS ensures highly resilient Ethernet infrastructure whilst simultaneously saving costs, as they can interoperate with third-party switches and still guarantee fast network recovery time without any data loss.



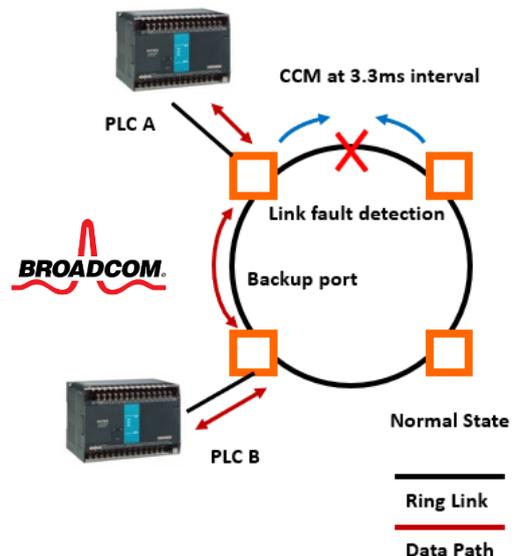
✓ **ITU-T G.8032 ERPSv2 reduces coupling Ring failure recovery time**

The G.8032 ERPS v2 technology effectively saves the recovery time for coupling ring link breakdown from 300 sec to less than 20ms by immediately change the topology of both major ring and sub ring.



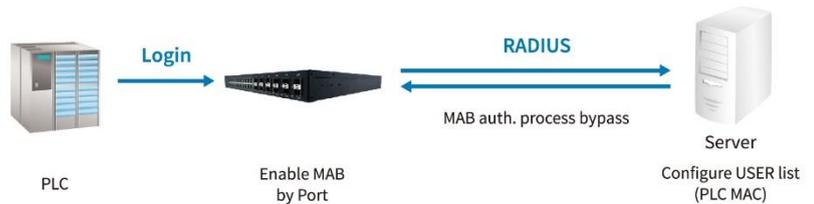
✓ **WoMaster ERPS v2 PLUS Technology – Fast Giga Copper Recovery Time**

The adaption of Broadcom® CFM Technology can reduce CFM Transmission for link failure within 3.3ms, thus, to detect the ring link fault within 11.55ms (3.5 times the CFM Interval) for ERPSv2 mechanism to respond. Once the ring port fails, the ERPS RPL-Owner will forward the backup port and recover the GbE copper within 20ms under the condition that 250pcs nodes in one ring.



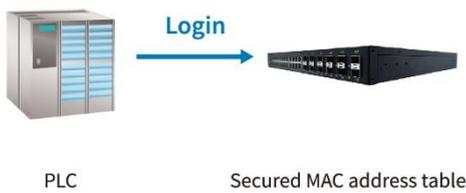
✓ **Advanced Port Based Security- IEEE802.1 x MAB (MAC Authentication Bypass)**

MAB enables port-based access control by bypassing the MAC address authentication process to TACACS+/Radius Server. Prior to MAB, the endpoint's (ex. PLC) identity is unknown and all traffic is blocked. The switch examines a single packet to learn and authenticate the source MAC address. After MAB succeeds, the endpoint's identity is known and all traffic from that endpoint is allowed. The switch performs source MAC address filtering to help ensure that only the MAB-authenticated endpoint is allowed to send traffic.



In addition to MAB, the authentication can also be done by the pre-configured static or auto-learn MAC address table in the switch.

- MAC address Auto Learning enables the switch to be programmed to learn (and to authorize) a preconfigured number of the first source MAC addresses encountered on a secure port. This enables the capture of the appropriate secure addresses when first configuring MAC address-based authorization on a port. Those MAC addresses are automatically inserted into the Static MAC Address Table and remained there until explicitly removed by the user.
- The port security is further enhanced by Sticky MAC setting. If Sticky MAC address is activated, the MACs/Devices authorized on the port 'sticks' to the port and the switch will not allow them to move to a different port.
- Port Shutdown Time allows users to specify for the time period to auto shutdown the port if a security violation event occurs.

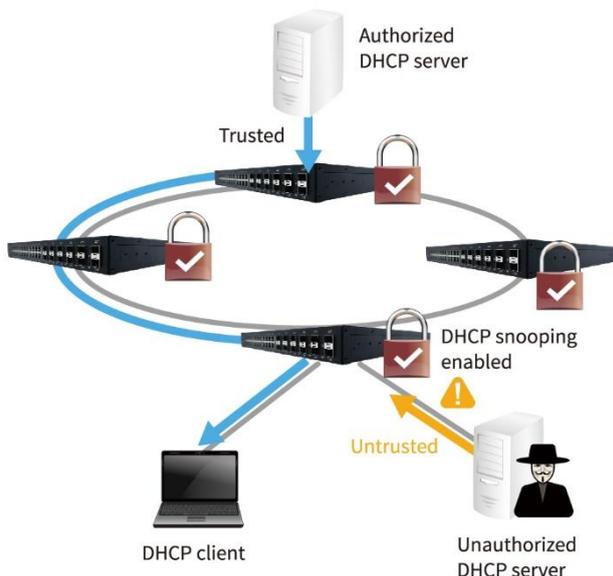


✓ **DHCP Snooping**

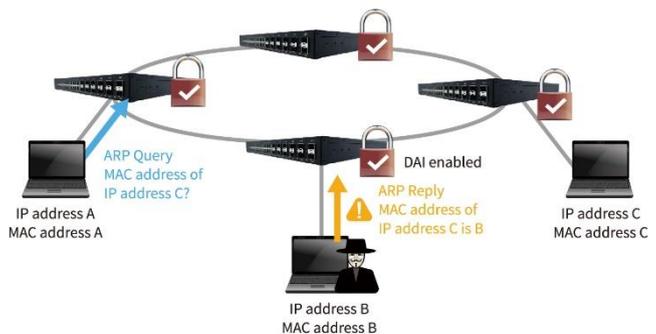
DHCP snooping acts like a firewall between untrusted hosts and trusted DHCP servers. It performs the following activities:

- Validates DHCP messages received from untrusted sources and filters out invalid messages.
- Rate-limits DHCP traffic from trusted and untrusted sources.
- Builds and maintains the DHCP snooping binding database, which contains information about untrusted hosts with leased IP addresses.
- Utilizes the DHCP snooping binding database to validate subsequent requests from untrusted hosts.

DHCP snooping is enabled on a per-VLAN basis. By default, the feature is inactive on all VLANs. You can enable the feature on a single VLAN or a range of VLANs.



✓ **Dynamic ARP Inspection (DAI)**



DAI validates the ARP packets in a network. DAI intercepts, logs, and discards ARP packets with invalid IP-to-MAC address bindings. This capability protects the network from some man-in-the-middle attacks.

DAI ensures that only valid ARP requests and responses are relayed. The switch performs these activities:

- Intercepts all ARP requests and responses on untrusted ports
- Verifies that each of these intercepted packets has a valid IP-to-MAC address binding before updating the local ARP cache or before forwarding the packet to the appropriate destination
- Drops invalid ARP packets.

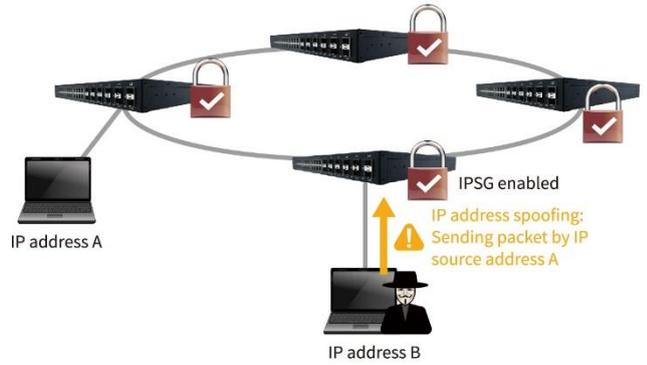
DAI determines the validity of an ARP packet based on valid IP-to-MAC address bindings stored in a trusted database, the DHCP snooping binding database. This database is built by DHCP snooping if DHCP snooping is enabled on the VLANs and on the switch. If the ARP packet is received on a trusted interface, the switch forwards the packet without any checks. On untrusted interfaces, the switch forwards the packet only if it is valid.

✓ **IP Source Guard**

IP source guard provides source IP address filtering on a Layer 2 port to prevent a malicious host from impersonating a legitimate host by assuming the legitimate host's IP address. The feature uses dynamic DHCP snooping and static IP source binding to match IP addresses to hosts on untrusted Layer 2 access ports.

Initially, all IP traffic on the protected port is blocked except for DHCP packets. After a client receives an IP address from the DHCP server, or after static IP source binding is configured by the administrator, all traffic with that IP source address is permitted from that client.

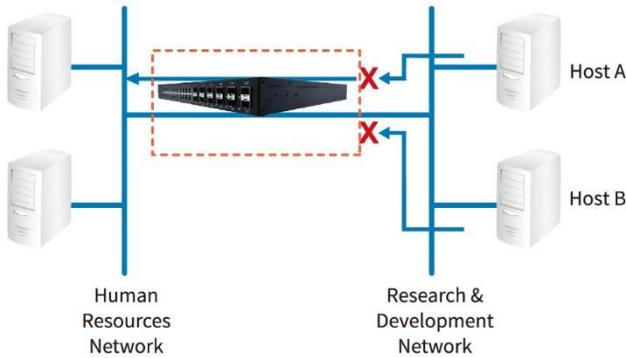
Traffic from other hosts is denied. This filtering limits a host's ability to attack the network by claiming a neighbor host's IP address.



✓ **IPv4/v6 Access Control List (ACL)**

Packet filtering limits network traffic and restricts network use by certain users or devices. ACLs filter traffic as it passes through a switch and permits or denies packets crossing specified interfaces. An ACL is a sequential collection of permit and deny conditions that apply to packets. When a packet is received on an interface, the switch compares the fields in the packet against any applied ACLs to verify that the packet has the required permissions to be forwarded, based on the criteria specified in the access lists.

WoMaster supports L2-L7 ACLs, parsing up to 128 bytes/packet and L2-L7 packet classification and filtering IPv4/IPv6 traffic, including TCP, User Datagram Protocol (UDP), Internet Group Management Protocol (IGMP), and Internet Control Message Protocol (ICMP).



X = ACL denying traffic from Host B and permitting traffic from Host A
← = Packet

✓ **Multi-Level User Passwords**

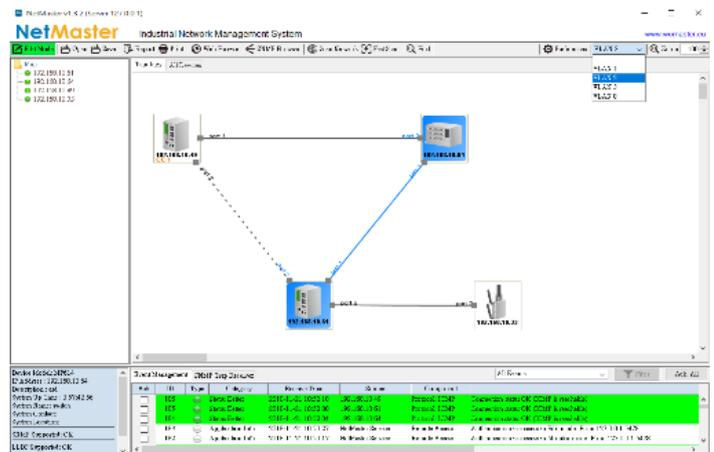
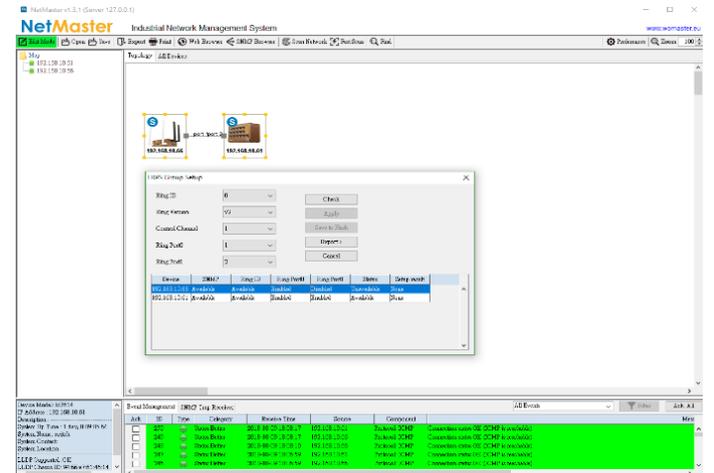
Different centralized authentication server is supported such as RADIUS and TACACS+. Using a central authentication server simplifies account administration, in particular when you have more than one switches in the network.

Authentication Chain is also supported. An authentication chain is an ordered list of authentication methods to handle more advanced authentication scenarios. For example, you can create an authentication chain which first contacts a RADIUS server, and then looks in a local database if the RADIUS server does not respond.



✓ **NMS NetMaster Made Easy Deploy and Visualize Large Scale of ERPS Ring and VLAN**

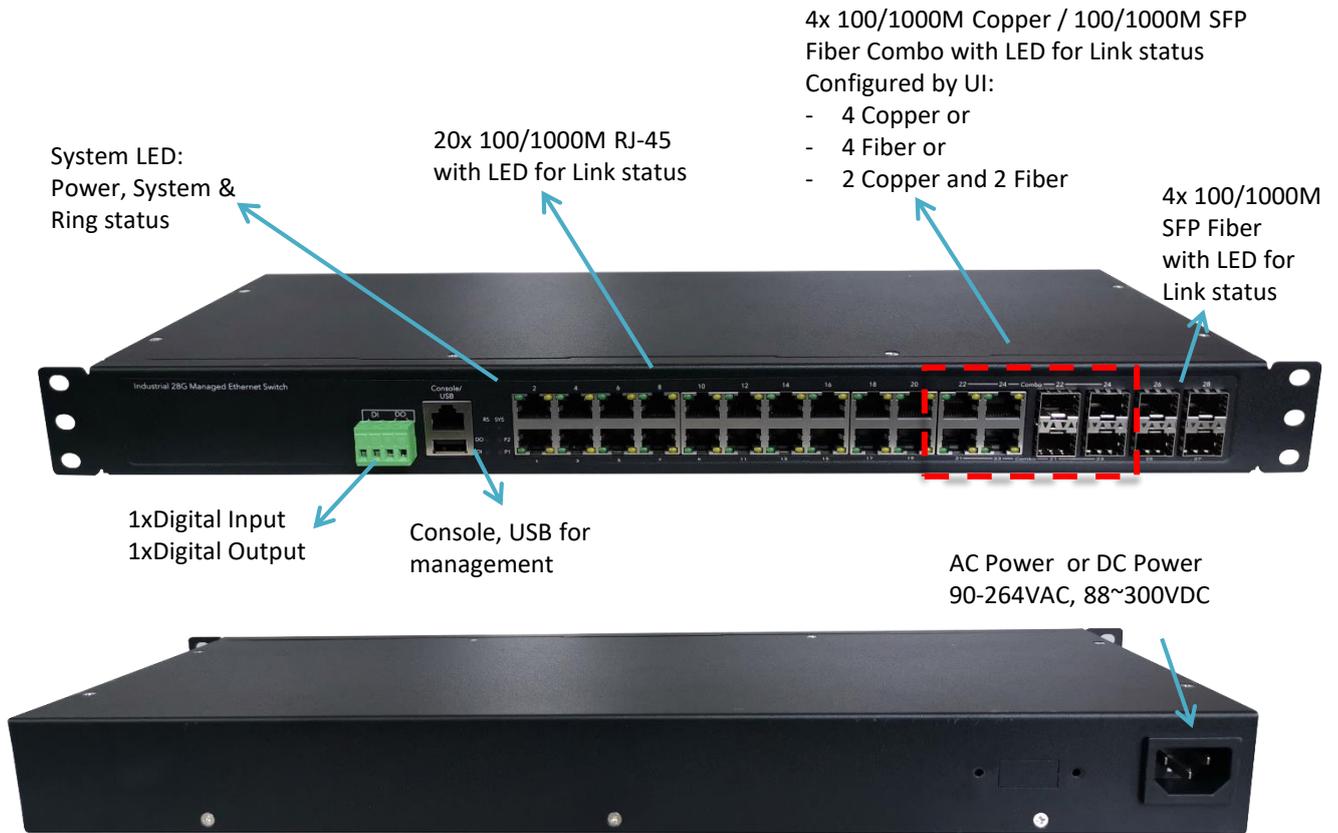
It is very time consuming and technical to set up a large group of ERPS v2 ring. However, NetMaster NMS provides a smart way to configure a group of ERPS ring and visualize ERPS major/sub ring in purple/yellow color. With VLAN visualization, devices, ports, and links with the VLAN ID will be colored-coded.





Interfaces

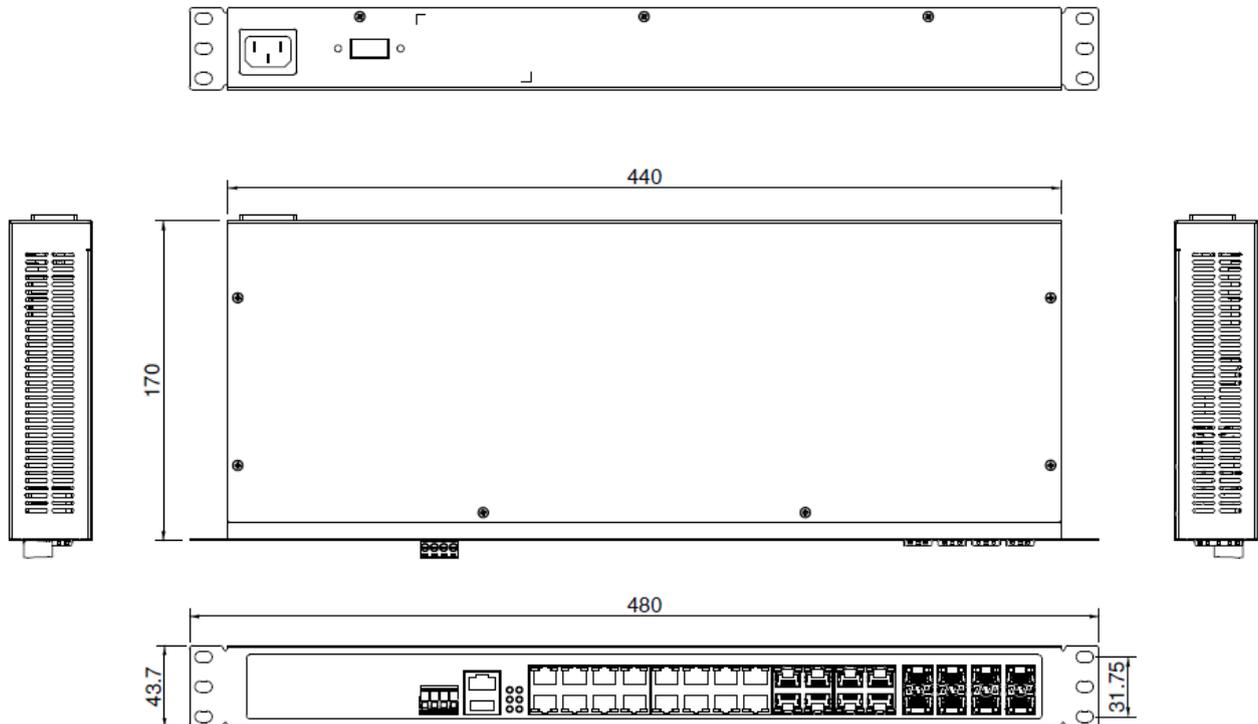
RS428-AC/428-DC



Dimensions

RS428-AC/428-DC

Dimension: 440 x 43.7 x **170** mm(W x H x D)





Interfaces

RS428-2AC/428-AC+DC

4x 100/1000M Copper / 100/1000M SFP
Fiber Combo with LED for Link Status
Configured by UI:

- 4 Copper or
- 4 Fiber or
- 2 Copper and 2 Fiber

4x 100/1000M
SFP Fiber
with LED for
Link status

System LED:
Power, System &
Ring status

20x 100/1000M RJ-45
with LED for Link status



1xDigital Input
1xDigital Output

Console, USB for
management

Power 2
AC Power or DC Power

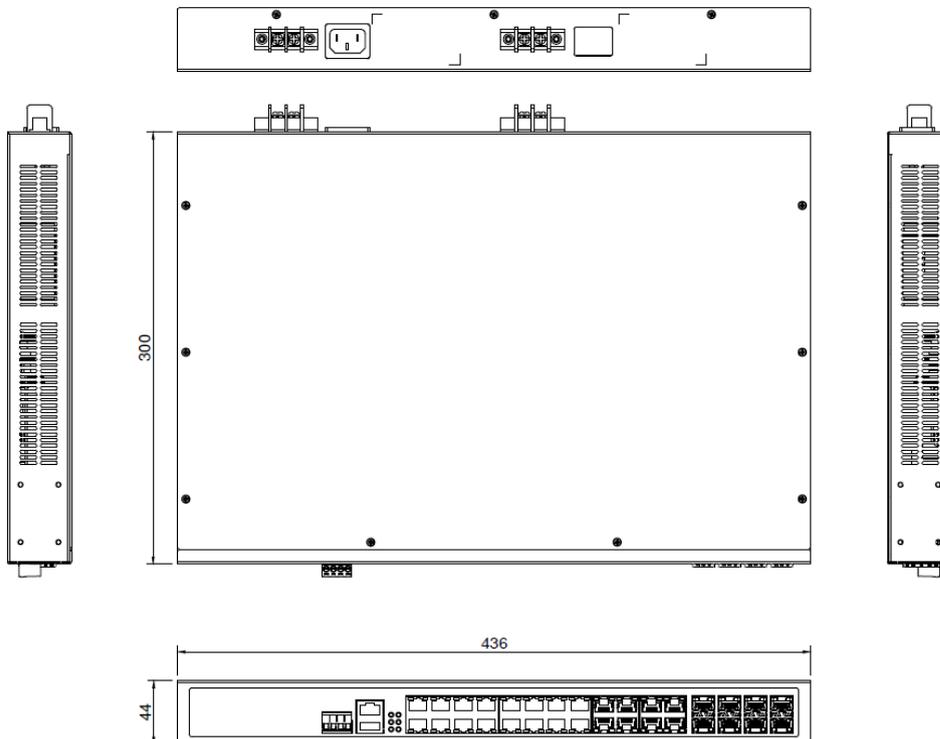
Power 1
AC Power or DC Power



Dimensions

RS428-2AC/428-AC+DC

Dimension: 436 x 44 x 300 mm(W x H x D)



Technology	
Standard	IEEE 802.3 10Base-T Ethernet
	IEEE 802.3u 100Base-TX Fast Ethernet
	IEEE 802.3u 100Base-FX Fast Ethernet Fiber
	IEEE 802.3ab 1000Base-T Gigabit Ethernet copper
	IEEE 802.3z Gigabit Ethernet Fiber
	IEEE 802.3x Flow Control and back-pressure
	IEEE 802.3az (Energy Efficient Ethernet)
	IEEE 802.1p Class of Service (CoS)
	IEEE 802.1Q VLAN and GVRP
	IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
	IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP)
	IEEE 802.1S Multiple Spanning Tree Protocol (MSTP)
	IEEE 801.1AX/802.3ad Link Aggregation Control Protocol (LACP)
	IEEE 802.1x Port based Network Access Protocol
	IEEE 1588 Precision Time Protocol v2
ITU-T G.8032 version 2 Ethernet ring protection switching(ERPSv2)	
Performance & Scalability	
Switch Technology	Store and Forward Technology with 56Gbps Non-Blocking Switch Fabric Internal Packet Buffer: 4Mb Forwarding rate: 41.67Mpps (1,488,000pps/port)
CPU	Cortex-A9, max. 1.2GHz
RAM	DDR3 2Gb
Number of MAC Address	16K
Jumbo Frame	9216 Bytes
VLAN	256 VLANs, VLAN ID 1~4094
IGMP Groups	512
Traffic Prioritize	8 Priority Queues per Port
Interface	
Ethernet Port	20 x 10/100/1000M RJ45, Auto Negotiation 4 x 100/1000M RJ45/SFP Combo(4 copper/4 fiber or 2 copper+2 fiber, Configured by User Interface) 4 x 100/1000M SFP, DDM Energy-Efficient Ethernet for power saving
System LED	2 x Power (P1/P2): Green On 1 x System Status: Ready: Green On, Firmware Updating: Green Blinking 1 x DI: Green On 1 x Alarm: Red On 1 x Ring Status: Node Normal: Green On, Owner Normal: Green Blinking, Owner/Node Abnormal: Amber On, Ring Port Fail: Amber Blinking
Giga Ethernet Port LED	Link (Green On), Activity (Green Blinking), Speed 1000M(Amber On), Speed 10M/100M (Amber Off)
Giga SFP LED	Port: Link (Green On), Activity (Green Blinking) 1000M: Speed 1000M (Amber On), Speed 100M (Off)
Console	1 x RJ45 based RS232 for System Configuration. Baud Rate: 115200.n.8.1
USB	1 x USB for Configuration/Firmware Update
Digital Output (Alarm)	1x Digital Output: Dry Relay Output with 0.5A/24V DC

Digital Input	1x Digital Input. Low: 0~10V, High: 11~30V
Watchdog	Hardware-based 10 seconds timer
Power Requirement	
Operating Voltage	Power Input: AC110/220V (90-264VAC), 88~300VDC 2AC: Dual AC110/220V (90-264VAC), 88~300VDC DC Input: 24V(18~72V) (DC Model only, Other DC Input Range By Request)
Power Consumption	Max. 19.8W@110VAC, 24.2W@220VAC (Operating with 20GT+8GSFP) (It's recommended to reserve 15% for power consumption)
Software	
Management	CGI WebGUI, Command Line Interface (CLI), IPv4/IPv6(RFC2460), Telnet, SNMP v1/v2c/v3, SNMP Trap/Informs*, RMON, DHCP server/client/Option 82, TFTP, System Log, SMTP
Traffic Management	Flow Control, Rate Control, Storm Control, CoS, QoS, RFC 2474 DiffServ
Filter	IGMP Snooping v1/v2/v3, IGMP Snooping Fast-Leave/Immediate-Leave, IGMP Query, GMRP, IEEE802.1Q VLAN, QinQ, GVRP, Private VLAN
Security	IEEE 802.1X/RADIUS, TLS v1.2, Access Control List (ACL, MAC/IP/ARP filter), HTTPs/SSH secure login, First login password management
Advanced Security	TACACS+, Multi-user authentication, IEEE802.1x MAB, DHCP Snooping, IP Source Guard, Dynamic ARP inspection, DoS/DDoS*, Adv. Port security*, SFTP
Redundancy	WoMaster ERPSv2 PLUS , STP/RSTP/MSTP, eRSTP, Loop Protection, Port Trunk/801.1AX/802.3ad LACP
Time Management	NTP, IEEE 1588 Precision Time Protocol v2
IIoT Industrial Protocol	Modbus TCP, EtherNet/IP*, MQTT*, RESTful API*
Private Cloud	ThingsMaster*, ThingMaster OTA*
Public Cloud	AWS Agent*, Azure Agent*
Utility	ViewMaster, NetMaster
MIB	ERPS MIB, MIB-II, Ethernet-like MIB*, P-BRIDGE MIB, Q-BRIDGE MIB, Bridge MIB, RMON MIB Group 1, 2, 3, 9*, WoMaster Private MIB
Diagnostic	LLDP, Port Mirror, Ping, Port Statistic, Event Log
Mechanical	
Installation	19", 1U Rackmount
Enclosure Material	Steel Metal
Dimension	RS428v2: 480 x 43.7 x 170 mm(W x H x D, include rackmount ear) RS428v2-2AC/RS428v2-AC+DC: 436 x 44 x 300 mm(W x H x D)
Ingress Protection	IP30
Weight	RS428-AC: 3.4Kg RS428-AC+DC: 4.4Kg
Environmental	
Operating Temperature & Humidity	-40°C~70°C , 0%~95% Non- Condensing
Storage Temperature	-40°C~85°C
MTBF	>445,000 hours
Warranty	5 years
Approval	
EMI	CISPR 22, FCC part 15B Class A
EMC	EN50121-4 for Railway Roadside



Ordering Information

Model Name	Description
RS428	Industrial 28G L2+ Managed Ethernet Switch, 20GT+4Gc+4GF, AC110/220V input
RS428-DC	Industrial 28G L2+ Managed Ethernet Switch, 20GT+4Gc+4GF, DC24(18-72)V input
RS428-2AC	Industrial 28G L2+ Managed Ethernet Switch, 20GT+4Gc+4GF, 2x AC110/220V input
RS428-AC+DC48V	Industrial 28G L2+ Managed Ethernet Switch, 20GT+4Gc+4GF, AC110/220V+DC24(18-72)V input
Package List	
	1 x Product Unit (Without SFP Transceiver)
	1 x AC Power Cord (EU plug, AC Model)
	1 x Quick Installation Guide
	<i>Note: Other DC Input Range by Request. Please contact WoMaster Sales.</i> *DC Version By Request *Other type plug of Power Cord by Request



Optional Accessory

Item	
SFPGEM05	SFP, 1000Mbps, LC, multi, 550M, 0~70°C
SFPGEM05T	SFP, 1000Mbps, LC, multi, 550M, -40~85°C
SFPGEM05D	SFP, 1000Mbps, LC, multi, DDM, 550M, 0~70°C
SFPGEM05DT	SFP, 1000Mbps, LC, multi, DDM, 550M, -40~85°C
SFPGEM2	SFP, 1000Mbps, LC, multi, 2KM, 0~70°C
SFPGEM2T	SFP, 1000Mbps, LC, multi, 2KM, -40~85°C
SFPGEM2D	SFP, 1000Mbps, LC, multi, DDM, 2KM, 0~70°C
SFPGEM2DT	SFP, 1000Mbps, LC, multi, DDM, 2KM, -40~85°C
SFPGES10	SFP, 1000Mbps, LC, single, 10KM, 0~70°C
SFPGES10T	SFP, 1000Mbps, LC, single, 10KM, -40~85°C
SFPGES10D	SFP, 1000Mbps, LC, single, DDM, 10KM, 0~70°C
SFPGES30	SFP, 1000Mbps, LC, single, 30KM, 0~70°C
SFPGES30T	SFP, 1000Mbps, LC, single, 30KM, -40~85°C
SFPGES30D	SFP, 1000Mbps, LC, single, DDM, 30KM, 0~70°C
SFPGES10-A	SFP, 1000Mbps, LC, single, 10KM, BiDi TX-1310nm RX-1550nm, 0~70°C
SFPGES10-B	SFP, 1000Mbps, LC, single, 10KM, BiDi TX-1550nm RX-1310nm, 0~70°C
SFPGES10T-A	SFP, 1000Mbps, LC, single, 10KM, BiDi TX-1310nm RX-1550nm, -40~85°C
SFPGES10T-B	SFP, 1000Mbps, LC, single, 10KM, BiDi TX-1550nm RX-1310nm, -40~85°C
SFPGES10D-A	SFP, 1000Mbps, LC, single, DDM, 10KM, BiDi TX-1310nm RX-1550nm, 0~70°C
SFPGES10D-B	SFP, 1000Mbps, LC, single, DDM, 10KM, BiDi TX-1550nm RX-1310nm, 0~70°C