

## 400W High Power High Security Multiple Redundant Rackmount PoE Switch

### RP428

#### Industrial 28G L2+ Rackmount Managed PoE+ Ethernet Switch

The RP428 is an industrial-grade rackmount 28G switch with 24 Giga PoE+ ports, each can output 30W. The 4 Giga combo ports and 4x100M/1G fiber SFP ports can configure max. 8 fiber Giga ports for more field switches with long-distance fiber connections. Standard redundancy mechanisms are designed with enhancement such as ITU-T G.8032 Ethernet Ring Protection Switching (ERPS) and ERPSv2 Plus, RSTP, and enhanced RSTP. Many High-level cybersecurity protocols are implemented such as DHCP Snooping, IP Source Guard, Dynamic ARP Inspection. Rugged design and high EMC immunity make RP428 an ideal solution for industrial Critical Surveillance applications.



ViewMaster  
NetMaster  
ThingsMaster



### Features & Benefits

#### High Throughput Ethernet Switching & Extreme 802.3at PoE+ Capacity

- 28-port Full GbE, by 20-port GbE RJ45 and 4-port GbE RJ45/SFP Combo, and 4 100M/1G SFP fiber ports.
- Up to 24 GbE IEEE 802.3at/af compliant PoE+ ports, up to 30W per port
- Up to 8 100M/1GbE fiber ports add more fiber links to field switches
- DDM function for 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, 512 L2 Multicast Groups for video applications
- 16K MAC address table, 9Kb Jumbo Frame
- **PoE management** including per-port Power Budget Control, PoE Scheduling, Priority, PD Alive Check and PoE Status

#### ITU-T G.8032 v2 ERPS Ring Redundancy

- ITU-T G.8032 v1/v2 ERPS Standard Ring Redundancy protocol
- Supports HW-based CFM transmission for overcoming GbE copper physical limitation and providing minimum 20ms recovery time, seamless restoration time
- Inter-Operability with 3rd party industrial switch and still remain fast recovery time
- Replace 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

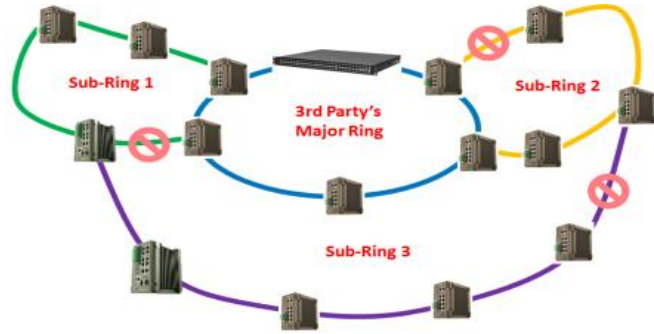
- Various configuration paths, including CGI WebGUI, CLI, SNMP and RMON
- Support WoMaster Software Utilities:
  - NetMaster Network Management System
  - ViewMaster for Configuration Management
  - ThingMaster\*, ThingMaster OTA\* for device management over Cloud\*
- Support MQTT\* protocol, ready to 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

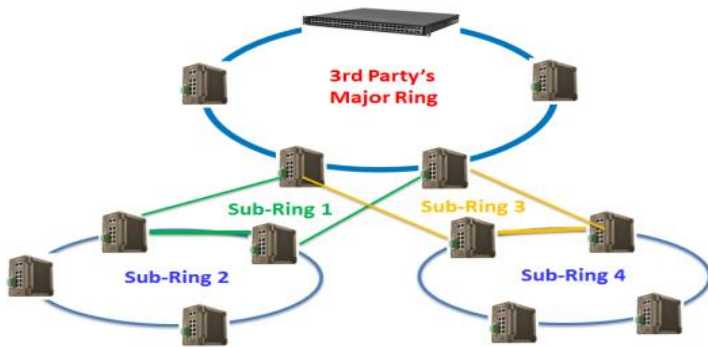
- **EN50121-4** compliance for Railway Trackside, Roadside, Industrial Control Room applications
- Seamless forwarding while EMC attack (TBD)
- Excellent heat dissipation design for operating in **-40~70°C** environments
- High level EMC protection exceeding traffic control and heavy industrial standards' requirements
- IEC 61000-6-2/4 Heavy Industrial Environment

✓ **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 3<sup>rd</sup> 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.

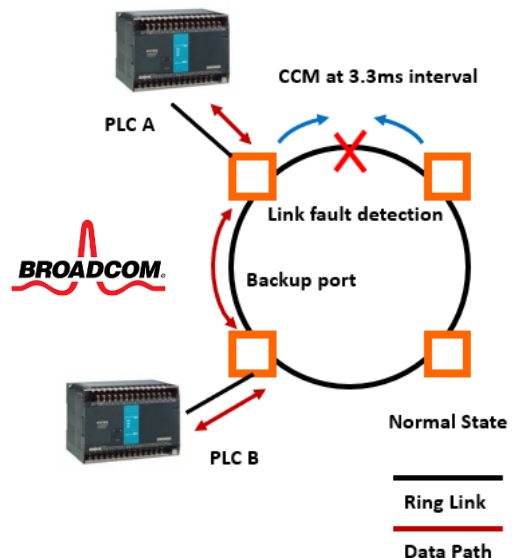
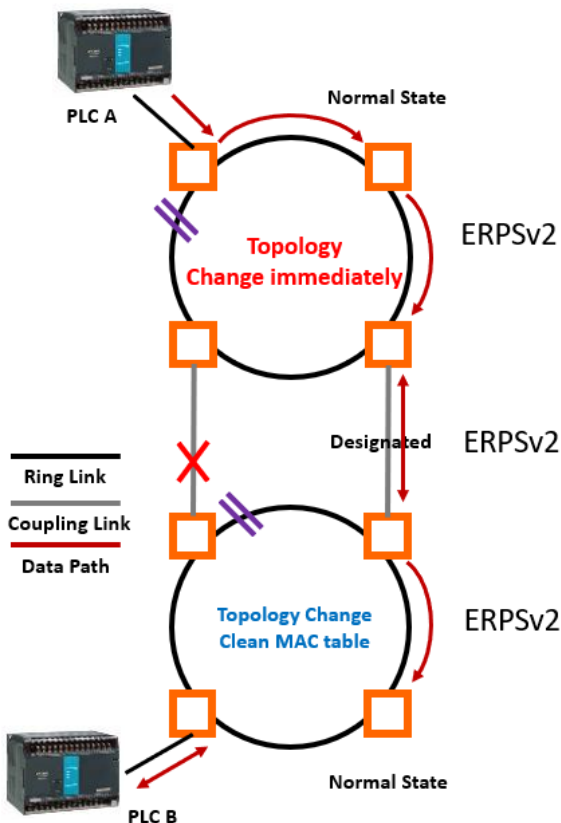


✓ **ITU-T G.8032 ERPSv2 reduces coupling Ring failure recovery time**

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.

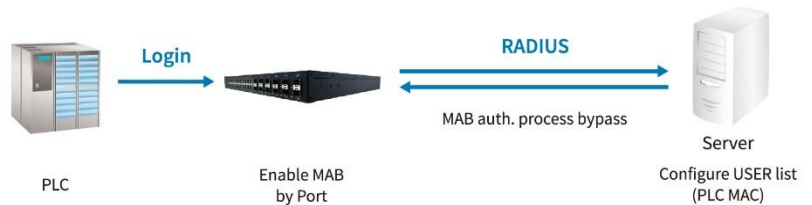
✓ **WoMaster ERPS v2 PLUS Technology – Fast Giga Copper Recovery Time**

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.



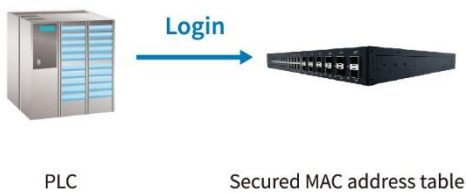
✓ **Advanced Port Based Security- IEEE802.1 x MAB (MAC Authentication Bypass)**

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.

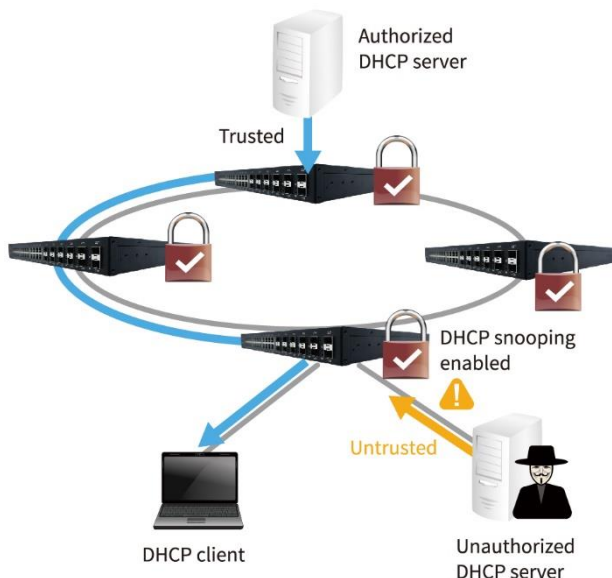


✓ **DHCP Snooping**

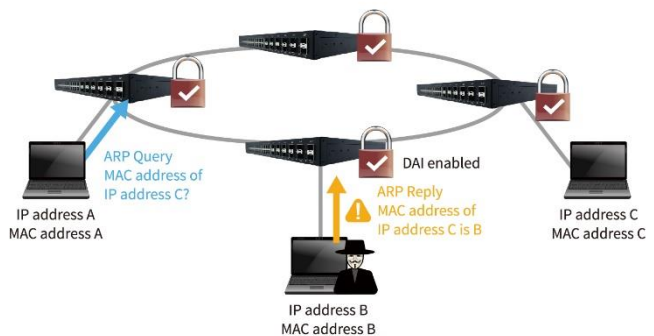
DHCP snooping acts like a firewall between untrusted hosts and trusted DHCP servers. It performs the following activities:

- 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.

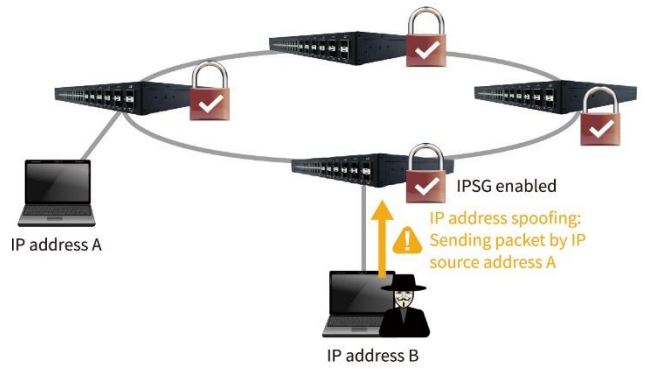
DAI determines the validity of an ARP packet based on valid IP-to-MAC address bindings stored in a trusted database, the DHCP snooping binding database. This database is built by DHCP snooping if DHCP snooping is enabled on the VLANs and on the switch. If the ARP packet is received on a trusted interface, 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.

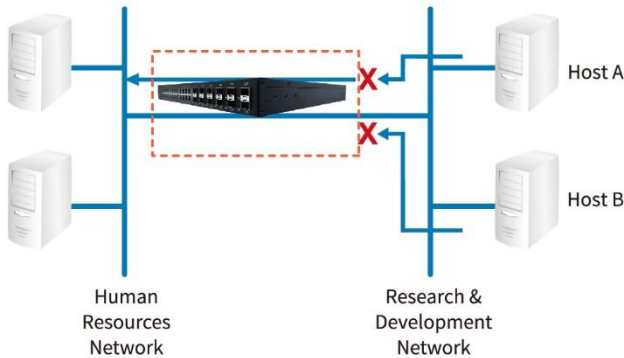
Traffic from other hosts is denied. This filtering limits a host's ability to attack the network by claiming a neighbor host's IP address.



✓ **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**

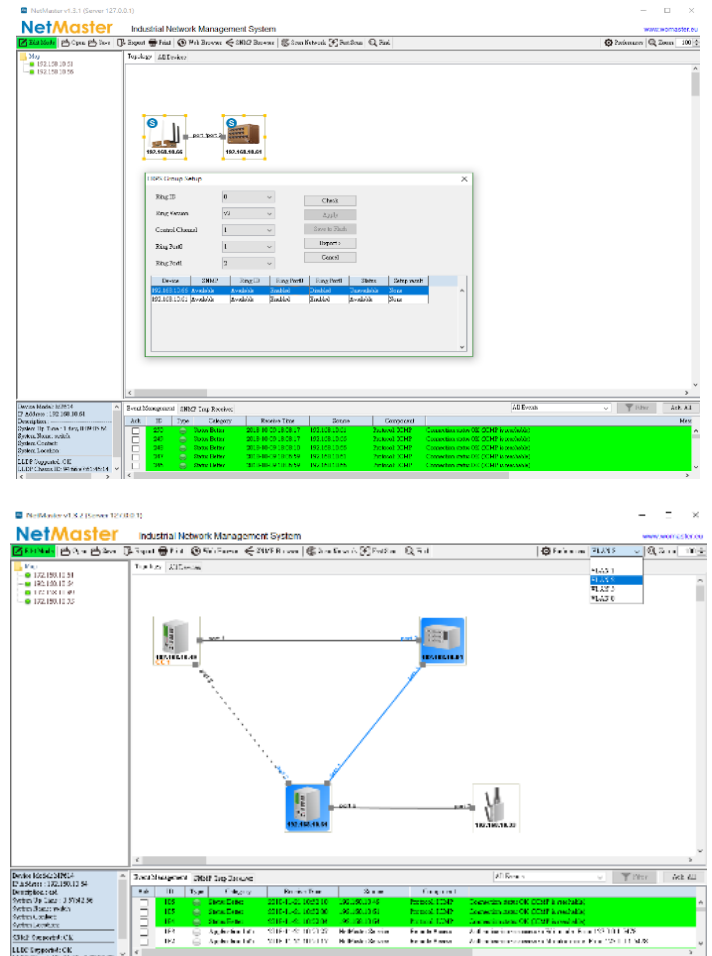
Different centralized authentication server is supported such as RADIUS and TACACS+. Using a central authentication server simplifies account administration, in particular when you have more than one switches in the network.

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

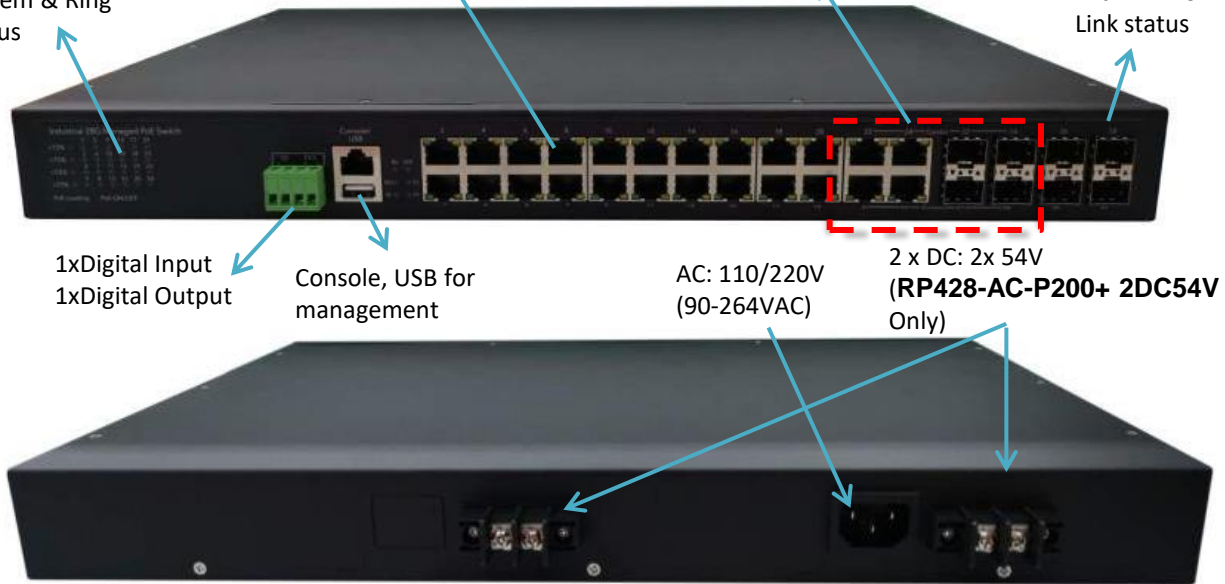
System LED:  
Power, PoE,  
System & Ring  
status

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

4x 100/1000M Copper / 100/1000M SFP  
Fiber Combo with LED for Link status  
Configured as

- 4 Copper PoE+ or
- 4 Fiber or
- 2 Copper and 2 Fiber

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



1xDigital Input  
1xDigital Output

Console, USB for  
management

AC: 110/220V  
(90-264VAC)

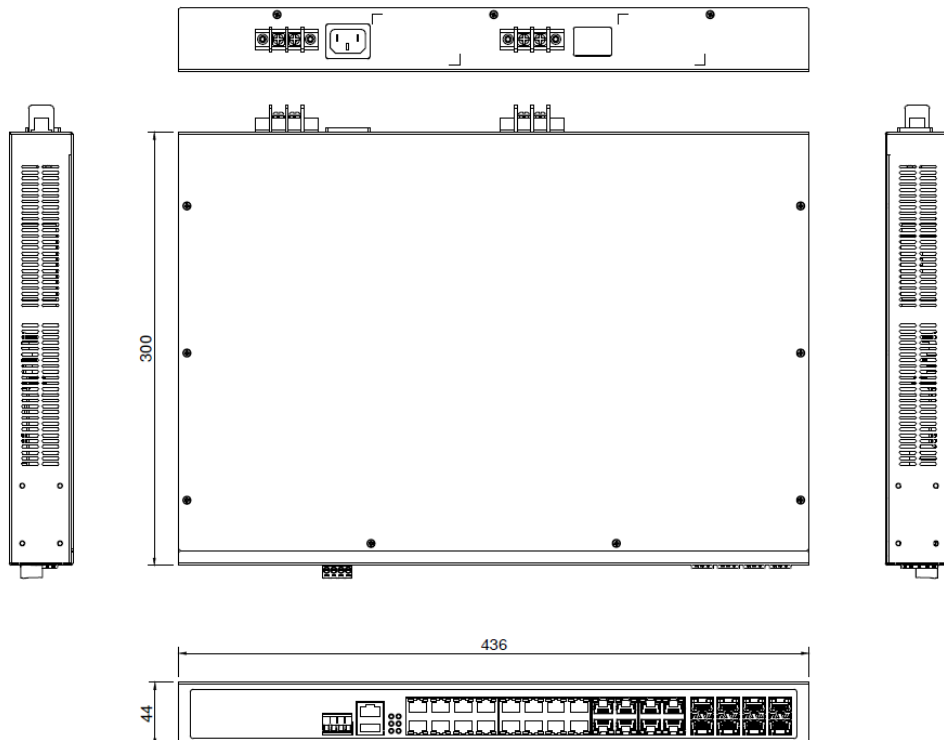
2 x DC: 2x 54V  
(RP428-AC-P200+ 2DC54V  
Only)



## Dimensions

### RP428-AC-P200 / RP428-AC-P200+ 2DC54V

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



Technology	
<b>Standard</b>	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	
<b>Switch Technology</b>	Store and Forward Technology with 56Gbps Non-Blocking Switch Fabric Internal Packet Buffer: 4Mb Forwarding rate: 41.67Mpps (1,488,000pps/port)
<b>CPU</b>	Cortex-A9, max. 1.2GHz
<b>RAM</b>	DDR3 2Gb
<b>Number of MAC Address</b>	16K
<b>Jumbo Frame</b>	9216 Bytes
<b>VLAN</b>	256 VLANs, VLAN ID 1~4094
<b>IGMP Groups</b>	512
<b>Traffic Prioritize</b>	8 Priority Queues per Port
Interface	
<b>Ethernet Port</b>	20 x 10/100/1000M RJ45, 24 x 802.3af/at PoE, Auto Negotiation 4 x 100/1000M 802.3af/at PoE RJ45/SFP Combo (4 Copper/4 fiber or 2 copper+2 fiber) 4 x 100/1000M SFP, DDM Energy-Efficient Ethernet for power saving
<b>System LED</b>	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
<b>Giga Ethernet Port LED</b>	Link (Green On), Activity (Green Blinking), Speed 1000M(Amber On), Speed 10M/100M (Amber Off)
<b>Giga SFP LED</b>	Port: Link (Green On), Activity (Green Blinking) 1000M: Speed 1000M (Amber On), Speed 100M (Off)
<b>PoE LED</b>	PoE Utilization: <b>Low</b> (0~25%, Green On), <b>Middle</b> (26~50%, Green On), <b>High</b> (51~75%, Amber On), <b>Critical</b> (Higher than 75%, Red On) 24x PoE: PoE ON (Amber On)
<b>Console</b>	1 x RJ45 based RS232 for System Configuration. Baud Rate: 115200.n.8.1

<b>USB</b>	1 x USB for Configuration/Firmware Update
<b>Digital Output (Alarm)</b>	1x Digital Output: Dry Relay Output with 0.5A/24V DC
<b>Digital Input</b>	1x Digital Input. Low: 0~10V, High: 11~30V
<b>Watchdog</b>	Hardware-based 10 seconds timer
<b>Power Requirement</b>	
<b>Operating Voltage</b>	AC Input: 110/220V (90-264VAC) <b>RP428-AC-P200+ 2DC54V</b> 2DC Input: 2x 54V Typical (IEEE 802.3at request 50~57V)
<b>Power Consumption</b>	Max. 20W @ 8x SFP plugged without PoE
<b>PoE</b>	
<b>Power forwarding mode</b>	802.3at Alternative A
<b>PoE Power Budget</b>	<b>RP428-AC-P200:</b> AC: Max. 220W@55°C, 150W@70°C (Derating) <b>RP428-AC-P200+ 2DC54V:</b> Max. 200W@70°C, 2 x DC Aggregated: Fixed 54V, Max. 400W@70°C Port 1~24: IEEE 802.3at/af, Max. 30W/port  When AC and DC are both powered and DC<54V: Powered by AC, DC as backup When AC and DC are both powered and DC>54V: Powered by DC, AC as backup When AC and DC are both powered and DC=54V: Powered by AC+DC Load Sharing Total 200W (AC) or (AC + DC<54V, DC as backup) or (AC + DC>54V, AC as backup) Total 400W (AC +2 DC > 54V, AC as backup) or (2DC >54V)
<b>PoE Standard</b>	IEEE 802.3at PoE+, IEEE 802.3af PoE
<b>Management</b>	System/Port Power Budget Control, PoE Scheduling, Priority, PD Alive Check, PoE Status
<b>Software</b>	
<b>Management</b>	WebGUI, Command Line Interface (CLI), IPv4/IPv6(RFC2460), Telnet, SNMP v1/v2c/v3, SNMP Trap/Informs*, RMON, LLDP, DHCP Server/Client/Option 82, TFTP, System Log, SMTP
<b>Traffic Management</b>	Flow Control, Rate Control, Port Mirror, CoS, QoS, RFC 2474 DiffServ
<b>Filter</b>	IGMP Snooping v1/v2/v3, IGMP Snooping Fast-Leave/Immediate-Leave, IGMP Query, GMRP, IEEE802.1Q VLAN, QinQ, GVRP, Private VLAN
<b>Security</b>	IEEE 802.1X/RADIUS, TLS v1.2, HTTPS/SSH
<b>Advanced Security</b>	TACACS+, Mutli-user authentication, IEEE802.1x MAB, DHCP Snooping/IPSG, Dynamic ARP inspection, DoS/DDoS*, Adv. Port security*, SFTP
<b>Redundancy</b>	<b>WoMaster ERPSv2 PLUS</b> -ITU-T G.8032 v1/v2 Ethernet Ring Protection Switching (ERPSv2), HW CFM, Loop Protection, Port Trunk/801.1AX/802.3ad LACP, Rapid Spanning Tree Protocol/Spanning Tree Protocol (RSTP/STP), Multiple Spanning Tree Protocol (MSTP) eRSTP (Enhanced Rapid Spanning Tree), up to 80 switches in one Ring
<b>Time Management</b>	NTP, IEEE 1588 Precision Time Protocol v2
<b>Industrial IoT</b>	Modbus TCP, EtherNet/IP
<b>Utility</b>	ViewMaster, NetMaster
<b>Mechanical</b>	
<b>Installation</b>	Rackmount
<b>Enclosure Material</b>	Steel Metal
<b>Dimension</b>	436 x 44 x 300 mm(W x H x D)
<b>Ingress Protection</b>	IP30
<b>Weight</b>	≈4.35KG(RP428-AC-P200), 4.6Kg(RP428-AC-P200+ 2DC54V)

## Specifications

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
Standard	
EMC	CE EN61000-6-2, EN61000-6-4 EN50121-4 Compliance design for Railway Roadside
FCC	FCC part 15B Class A

## Ordering Information

Model Name	Description
RP428-AC-P200	Industrial 28G L2+ Managed PoE+ Ethernet Switch, 24x802.3at PoE+, AC110/220V input
RP428-AC-P200+ 2DC54V	Industrial 28G L2+ Managed PoE+ Ethernet Switch, 24x802.3at PoE+, AC110/220V + Dual 54V input
	Package List
	1 x Product Unit (Without SFP Transceiver)
	2 x Power Cord (EU+US plug)
	1 x Quick Installation Guide
	<i>Note: Other Power Input Type, include high AC Budget by Request. Please contact WoMaster Sales.</i>

## Optional Accessory

Item	
SDR-480P-48	INPUT:90-264VAC, 120-370VDC, OUTPUT: 48VDC~55VDC, -25 ~ +70°C
NDR 480-48	INPUT:90-264VAC, 120-370VDC, OUTPUT: 48VDC~55VDC, -20 ~ +70°C
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