KY-3000EM
Industrial Managed Ethernet Switch

User’s Manual

Version 4.0
July 2014

Compliant: For Military Contracts that require the continuous monitoring and protection of Industrial Control Systems (ICS) Networks Operating / monitoring the operating utilities such as Water, Sewer, Electrical, Security, Video, Building Controls, Street and Intelligent Transportation Systems (ITS)

www.Kyland-USA.com

Table of Contents

1 Preface

This manual applies to industrial switches KY-3000EM.

1.1 Conventions

GUI Convention	Description
Boldface	Keywords on web management page are in **Boldface**
Italic	Tab page names are in *italic*
<>	Buttons are in <>
[ ]	Menus and submenus are in [ ].
🕮 Note	This icon is added to the notes.
⚠ Caution	Means reader be careful. Improper operation may cause data loss or damage to equipment.

1.2 Device Introduction

1.2.1 Brief Introduction

KY-3000EM Industrial Ethernet Switches are designed to meet various industrial application needs and provide customer with a high-end industrial Ethernet network communication solution. KY-3000EM' high availability and reliability, as well as the rich security features make it ideal for data transmission securely. KY-3000EM provide powerful management capabilities, and can be managed through Web, CLI, Telnet/serial console, Windows utility and SNMP. It is designed to apply dual power supplies for redundancy with wide DC input range and support DIN rail and wall mounting for installation in industrial environments.

Ky-Anillo is a proprietary technology of our company. It is designed especially for industrial applications, providing fast Ethernet ring protection and recovery within 20ms. From the management interface, users can choose either port from normal Ethernet port or trunk port to form an Ethernet ring for faster recovering and wider bandwidth to keeping industrial applications running continuously.

1.2.2 Port Introduction

Model	Ethernet Port	Console port	Power supply
KY-3000EM	7X10/100BaseTX port +1X10/100/1000BaseTX port + 2X1000BaseX SFP slots	1X RS232	2X24VDC

1.2.3 Indicator Introduction

10/100BaseTX Port

Port Indicator Status	Description
Green	Green On —The port works at 100Mbps. Green Off—The port works at 10Mbps.
Yellow	Yellow On and Blinking—Port LINK UP, data is being transmitted. Yellow On – No Blinking –Port Link Up Yellow Off - Port Link down

10/100/1000BaseTX auto negotiation Ethernet port

Port Indicator Status	Description
Green	Green On—Port Link Up Green Off—Port Link Down
Yellow	Yellow Blinking—Data is transmitting. Yellow Off—No data is being transmitted.

100BaseFX port/1000BaseX SFP slots

Port Indicator Status	Description
Green	Green On and Blinking—Port Link Up, date is being transmitted. Green On—Port Link Up Green Off—Port Link Down

Other Indicators

Port Indicator Status	Description
Power status indicator(PWR)	Green On—Power on

	Yellow Off—Power off
System status indicator	Green On—The system starts up successfully Green Off — The system doesn't start up successfully.

1.2.4 Default Configuration

User Level	User Name	Password	Privilege
Administrator	superuser	123	Can carry out all the functions of the switch.
User	manager	123	Can carry out all the functions except: ● Create or delete an account ● Reset to default configuration ● Use the TFTP service to update firmware, backup and restore configuration.
Visitor	guest	(none)	Can use the internet diagnosis commands, such as ping command for system maintainace, and the "show" commands except "show user", "show snmp community", "show snmp traps-host" and "show snmp user". Note: Visitor can only access the switch by Console port.

1.2.5 Login to the Switch

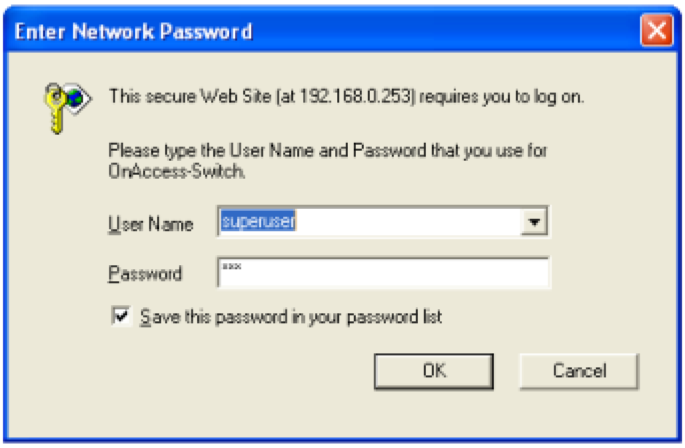
To access the switch web management function, open a web-browser and type in the default address http://192.168.0.253 in the address field of the browser, then press the **Enter** key.

Address http://192.168.0.253

Note:

To log in to the switch, the IP address of your PC should be set in the same subnet addresses of the switch. For the first time, set your PC IP address as 192.168.0.x ("x" is any number from 1 to 254, except 253), subnet mask as 255.255.255.0.

And then a login window will appear, as shown follows. Enter the default User Name and Password. The default values are set in section 1.2.5 Default Configuration. Then click the Login button or press the **Enter** key, so that you can see the switch system information.



This secure Web Site (at 192.168.0.253) requires you to log on.

Please type the User Name and Password that you use for OnAccess-Switch.

User Name: superuser

Password: ***

☑ Save this password in your password list

If you need to change the switch IP address at the first time, you can modify it through RS232 console, or using telnet to login, you can refer to “KY-3000EM Industrial Switch User Manual V1.2”.

1.2.6 WEB Management Overview

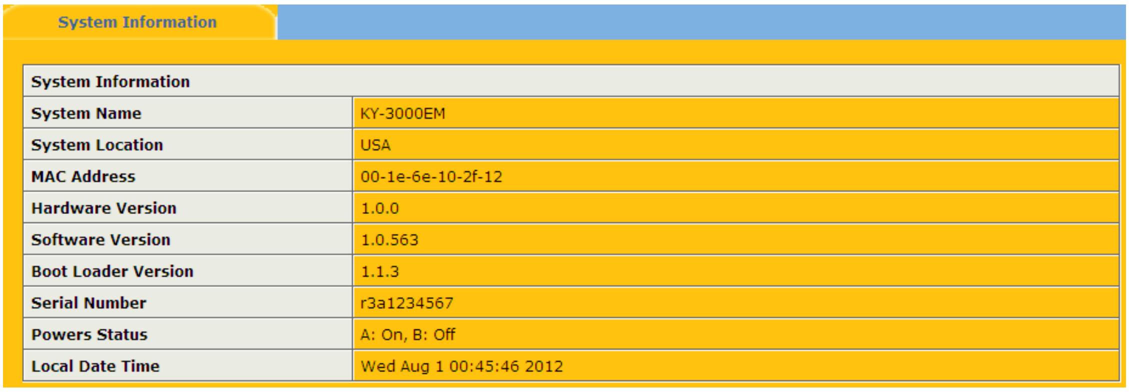
This manual introduces the Industrial Switch User Manual V1.2industrial Ethernet switches by the WEB interface, shown as follows.

Menu	**Function Introduction**
System Information	Shows the device system information.
Advanced Configuration	Enables or disables the main functions.
Port Management	Set port configuration, Aggregation, Bandwidth and Mirroring
VLAN	Configures Port-based VLAN and 802.1Q VLAN, as well as GARP.
QoS	Configures QoS, Scheduling Mechanism, Transmit Queues and DSCP Map.
Forwarding	Configures unicast MAC and multicast MAC as well as IGMP Snooping.
Security	Configures Radius server, port authentication, MAC authentication and storm control.
LLDP	Configures port LLDP and neighbor information, and checks LLDP statistics information.
Statistics	Checks Port Status, Port Statistics, VLAN List, MAC Address Table, IGMP Snooping Group, Link Aggregation and Fi Ring Status
Spanning Tree	Configures STP and RSTP.

Fi Ring Configuration	Configures Fi Ring, coupling and the related timers.
SNMP Manager	Configures SNMP accouts and traps.
RMON	Configures RMON event, alarm and history and checks RMON statistics.
PTP	
Administration	Configures device web interface language, IP, SNTP, SMTP. Email alarm, relay alarm; checks system log; carries out ping diagnosis; manages accounts; uses TFTP services; reboots and resets the device and saves the configuration.
Logout	Logs out from the switch Web interface.

2 System Information

The device system information is shown as follows.

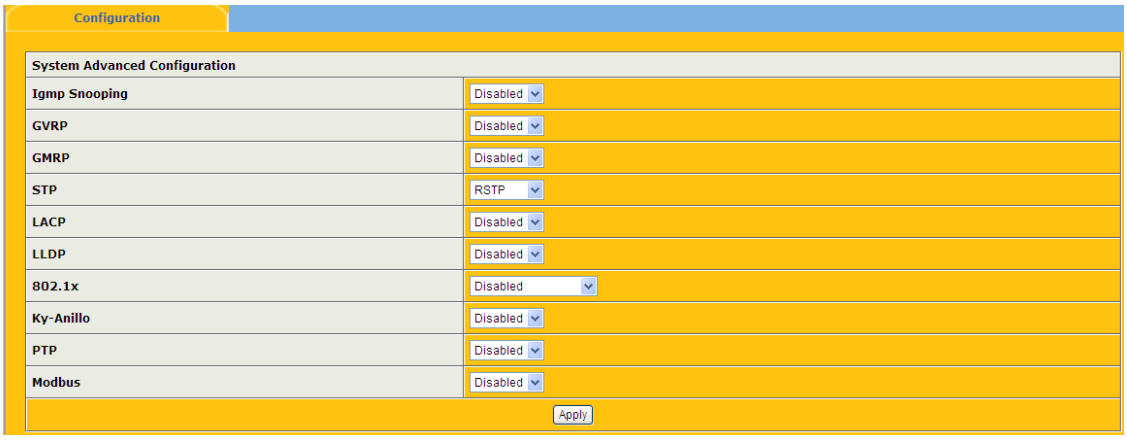


System Information	
System Name	KY-3000EM
System Location	USA
MAC Address	00-1e-6e-10-2f-12
Hardware Version	1.0.0
Software Version	1.0.563
Boot Loader Version	1.1.3
Serial Number	r3a1234567
Powers Status	A: On, B: Off
Local Date Time	Wed Aug 1 00:45:46 2012

Through SNMP, you can configure the corresponding system name and system location for each switch for convenient management.

3 Advanced Configuration

IGMP Snooping, GVRP, STP, LACP, LLDP, 802.1X, Ky-Anillo and Modbus can be enabled or disabled globally on this page.



System Advanced Configuration	
Igmp Snooping	Disabled
GVRP	Disabled
GMRP	Disabled
STP	RSTP
LACP	Disabled
LLDP	Disabled
802.1x	Disabled
Ky-Anillo	Disabled
PTP	Disabled
Modbus	Disabled

4 Port Management

You can set port configuration, aggregation, bandwidth and mirroring with this menu.

4.1 Port Configuration

At first, you should select a port for configuration. You can cofigure the port state, negotiation, speed and duplex, flow control, MAC learning and MDI/MDIX.

⚠ Caution:

- Only when the state is enbaled, can you configure the negotiation, speed and duplex, flow control, MAC learning and MDI/MDIX.
- Only when the negotiation is in Force mode, can you configure the speed and duplex.

Port Specifies a port to configure

State Enable/disble the port

Negotiation Selects Auto or Force, if Auto is selected, the port will automatically use the best operating mode; while is Force is selected, it needs to configure the speed and duplex manually.

Speed & Duplex There are four choices: 10M Half, 10M Full, 100M Half, and 100M Full.

Flow Control If flow control is enabled on both the local and peer switches. If congestion occurs on the local switch:

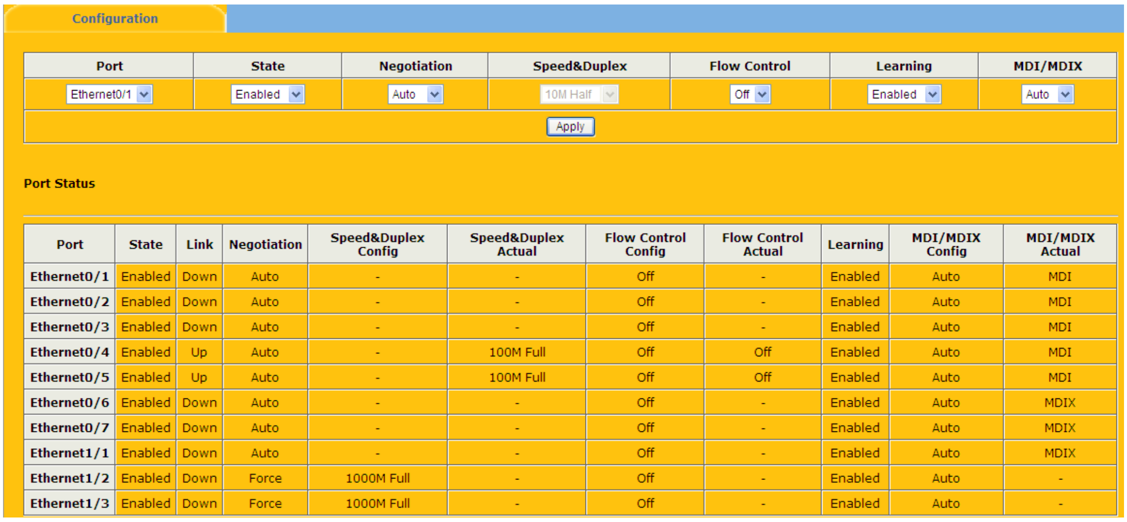
- The local switch sends a message to notify the peer switch of stopping sending packets to itself or reducing the sending rate temporarily.
- The peer switch will stop sending packets to the local switch or reduce the sending rate temporarily when it receives the message; and vice versa. By this way, packet loss is avoided and the network service operates normally.

If it is off, the port runs at full speed.

Learning Enable/disable learning function

MDI/MDIX Three selections: Auto, MDI and MDIX.

After clicking <Apply>, the lower part lists the port status.



Port	State	Negotiation	Speed&Duplex	Flow Control	Learning	MDI/MDIX
Ethernet0/1	Enabled	Auto	10M Half	Off	Enabled	Auto

Port Status

Port	State	Link	Negotiation	Speed&Duplex Config	Speed&Duplex Actual	Flow Control Config	Flow Control Actual	Learning	MDI/MDIX Config	MDI/MDIX Actual
Ethernet0/1	Enabled	Down	Auto	-	-	Off	-	Enabled	Auto	MDI
Ethernet0/2	Enabled	Down	Auto	-	-	Off	-	Enabled	Auto	MDI
Ethernet0/3	Enabled	Down	Auto	-	-	Off	-	Enabled	Auto	MDI
Ethernet0/4	Enabled	Up	Auto	-	100M Full	Off	Off	Enabled	Auto	MDI
Ethernet0/5	Enabled	Up	Auto	-	100M Full	Off	Off	Enabled	Auto	MDI
Ethernet0/6	Enabled	Down	Auto	-	-	Off	-	Enabled	Auto	MDIX
Ethernet0/7	Enabled	Down	Auto	-	-	Off	-	Enabled	Auto	MDIX
Ethernet1/1	Enabled	Down	Auto	-	-	Off	-	Enabled	Auto	MDIX
Ethernet1/2	Enabled	Down	Force	1000M Full	-	Off	-	Enabled	Auto	-
Ethernet1/3	Enabled	Down	Force	1000M Full	-	Off	-	Enabled	Auto	-

4.2 Port Aggregation

Link aggregation means aggregating several links together to form an aggregation group, so as to implement outgoing/incoming load balance among the member ports in the group and to enhance the connection reliability. Depending on different aggregation modes, aggregation groups fall into three types: manual, static LACP, and dynamic LACP.

4.2.1 Aggregate Groups

KY-3000EMindustrial switches supports 13 link aggregation groups.

Configuration steps:

Step 1 Select Trunk ID. There are 13 groups(T1 ~ T13);

Step 2 Specify the trunk name;

Step 3 Specify the trunk type;

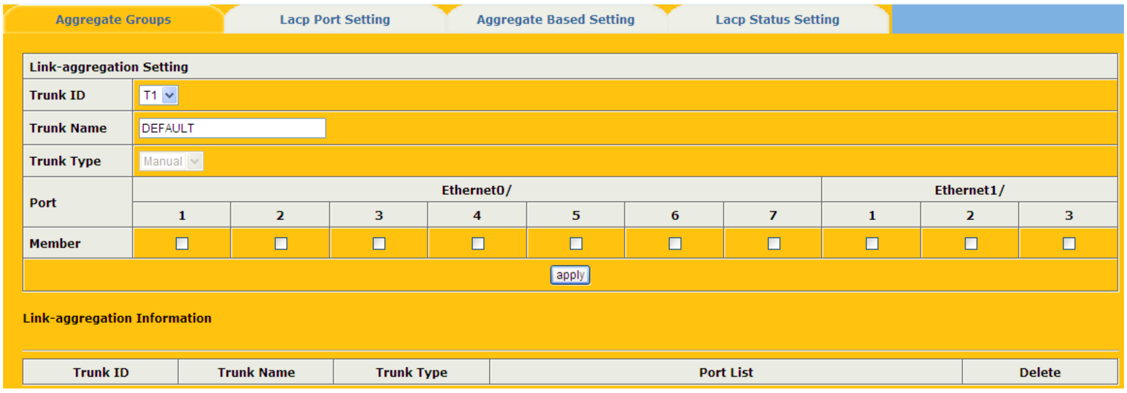
Manual: a manual trunk can only be manually set or deleted; LACP can be disabled.

Static: a static LACP trunk can only be manually set or deleted; any port in a static LACP trunk shall enable LACP protocol. When a static LACP trunk is (manually) deleted, all ports of this trunk with “up” status will generate one or more dynamic LACP trunks automatically.

Step 4 Select the ports as members of an aggregate group (2 ~ 8 ports);

Step 5 Click <Apply>, and then the link-aggregation Information will be listed at the lower part.

🕮 Note: A trunk may be configured as a mirroring port, but it is not allowed to configure a trunk as a monitoring port.



Link-aggregation Setting										
Trunk ID	T1									
Trunk Name	DEFAULT									
Trunk Type	Manual									
Port	Ethernet0/							Ethernet1/		
	1	2	3	4	5	6	7	1	2	3
Member	□	□	□	□	□	□	□	□	□	□

Link-aggregation Information

Trunk ID	Trunk Name	Trunk Type	Port List	Delete

Caution:

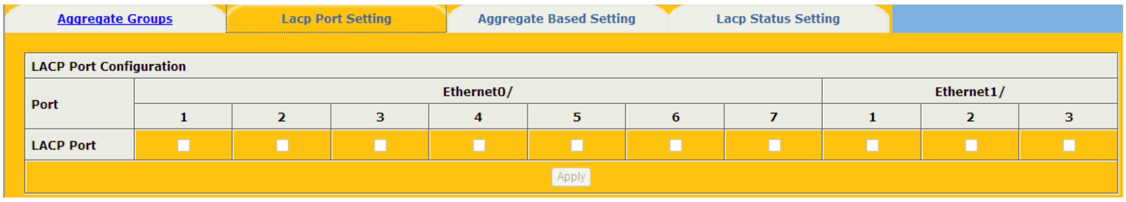
- If LACP (Link Aggregation Control Protocol) is disabled in Advanced Configuration, you can only configure port aggregration manually, so If you want to configure port aggregation statically, you need to enable LACP in Advanced Configuration.
- The ports of the same link-aggregration group should have the same basic configuration, such as STP, QoS, VLAN and port attribute and so on.

4.2.2 LACP Port Setting

On this page, you can configure dynamic LACP aggregation. A dynamic LACP trunk can only be set or deleted automatically by the protocol. This protocol is based on IEEE802.3ad and uses LACPDUs (link aggregation control protocol data unit) to interact with its peer. After LACP is enabled on a port, LACP notifies the following information of the port to its peer by sending LACPDUs: priority and MAC address of this system, priority, number and operation key of the port. Upon receiving the information, the peer compares the information with the information of other ports on the peer device to determine the ports that can be aggregated. In this way, the two parties can reach an agreement in adding/removing the port to/from a dynamic aggregation group. Any port in a dynamic LACP trunk shall have this port's LACP enabled.

Two link aggregation groups are configured, including Ethernet port 0/1, 0/3, 0/7 and 0/8 in 4.2.1 Aggregate Groups. So Ethernet port 0/2, 0/4, 0/5 to 0/6 can be configured as dynamic LACP ports.

A dynamic LACP aggregation group is automatically created and removed by the system. Users cannot add/remove ports to/from it. A port can participate in dynamic link aggregation only when it is LACP-enabled. Ports can be aggregated into a dynamic aggregation group only when they are connected to the same peer device and have the same basic configuration (such as rate and duplex mode).



LACP Port Configuration										
Port	Ethernet0/							Ethernet1/		
	1	2	3	4	5	6	7	1	2	3
LACP Port	□	□	□	□	□	□	□	□	□	□

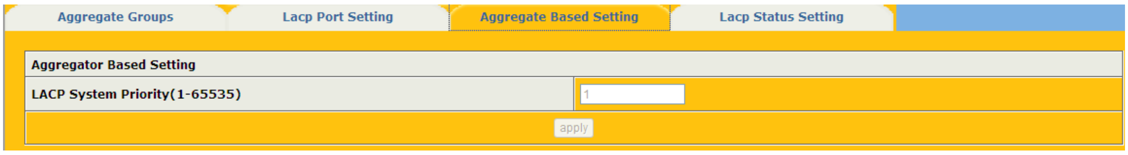
4.2.3 Aggregate Basic Setting

LACP determines the dynamic aggregation group members according to the priority of the port ID on the end with the preferred device ID. The device ID consists of two-byte system priority and six-byte system MAC address, that is, device ID = system priority + system MAC address.

When two device KY-3000EM are compared, the system priorities are compared first, and the system MAC addresses are compared when the system priorities are the same. The device with smaller device ID will be considered as the preferred one.

There is a limit on the number of selected ports in an aggregation group. Therefore, if the number of selected ports in an aggregation group exceeds the maximum member port number supported by the device, the system will choose the ports with lower port numbers as the member ports.

Set LACP system priority (from 1 to 65535).



Aggregator Based Setting

LACP System Priority(1-65535)	1

4.2.4 LACP Status Setting

Set LACP port status as active or passive.

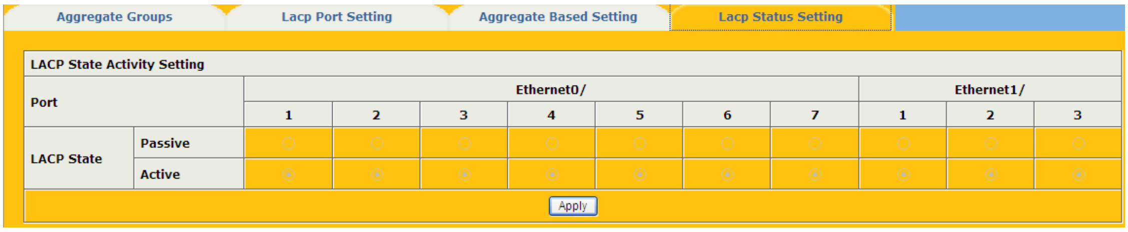
Passive The port does not automatically send LACP protocol packets; it responds only if it receives an LACP protocol packet from the peer device.

Active The port automatically sends LACP protocol packets.

A link having either one or two active LACP ports can perform dynamic LACP trunking. If the two LACP ports connected are passive, they will not perform dynamic LACP trunking as both ports are waiting for LACP protocol packet from the peer device.

📖 Note:

The dynamic active LACP ports on this device can aggregate with the active or passive LACP ports of the peer devices, but the passive LACP ports of this device can only aggregate with the active LACP ports of the peer devices.



LACP State Activity Setting

Port		Ethernet0/							Ethernet1/		
		1	2	3	4	5	6	7	1	2	3
LACP State	Passive	○	○	○	○	○	○	○	○	○	○
	Active	●	●	●	●	●	●	●	●	●	●

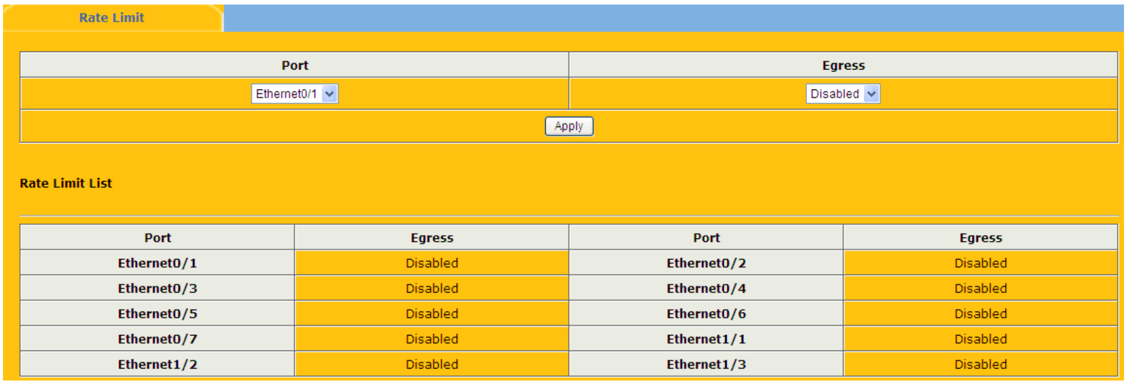
4.3 Port Bandwidth

You can configure the egress traffic limit on individual ports, so as to keep normal network service. The bottom of the page will show the rate limit list.

Port Select the port to configure

Egress The desired egress rate limit to be configured. Choose “disabled” to set the port with no egress rate limit, which means the port will run in full speed for egress traffic. You can also select a specific egress rate from the drop-down list for a port.

When completing the configuration, click <apply> to take effect. The lower part of this page shows a full list of rate limit for each port.



Port	Egress
Ethernet0/1	Disabled

Rate Limit List

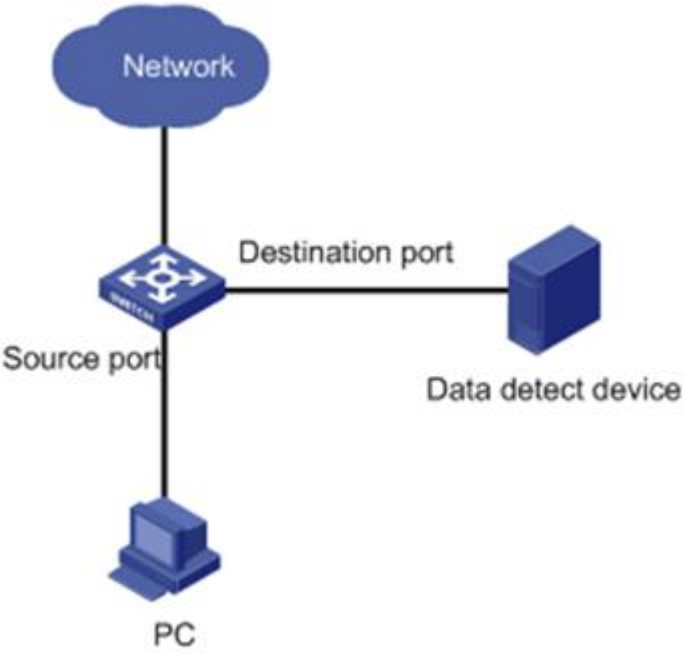
Port	Egress	Port	Egress
Ethernet0/1	Disabled	Ethernet0/2	Disabled
Ethernet0/3	Disabled	Ethernet0/4	Disabled
Ethernet0/5	Disabled	Ethernet0/6	Disabled
Ethernet0/7	Disabled	Ethernet1/1	Disabled
Ethernet1/2	Disabled	Ethernet1/3	Disabled

Note: The Egress status of Ethernet 0/1, 0/3, 0/7 and 0/8 are displayed gray, they cannot be condigured the egress rate, because they are aggregration ports.

Caution: Egress rate cannot be enabled on the aggregration ports.

4.4 Port Mirroring

Port mirroring refers to the process of copying the packets received or sent by the specified port to the destination port for packet analysis and monitoring. Generally, a destination port is connected to a data detect device, which users can use to analyze the mirrored packets for monitoring and troubleshooting the network, shown as the following figure:



Configuration steps:

Step 1 Enable/disable mirroring state;

Step 2 If mirroring state is enabled, choose a port as the monitoring port;

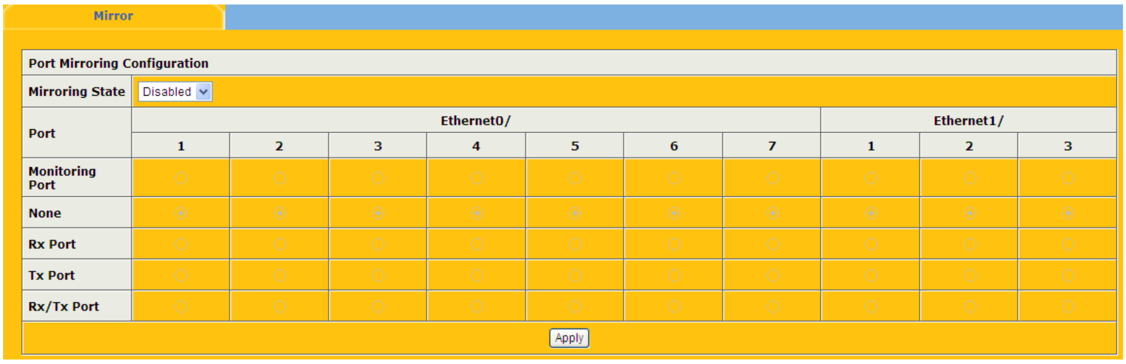
Caution:

- Monitoring port cannot be link-aggregration port;
- Only one port can be selected as monitoring port;
- Monitoring port cannot be mirroring port at the same time.

Step 3 Select the mirroring ports and whether the packets to be mirrored are Rx, Tx or both Rx /Tx.

None: Means to mirror none packets on the port;
Rx Port: Means only to mirror the packets received by the port;
Tx Port: Means only to mirror the packets sent by the port;
Rx /Tx Port: Means to mirror the packets received and sent by the port.

Step 4 Click <Apply> to make it effective.



Port Mirroring Configuration										
Mirroring State	Disabled									
Port	Ethernet0/							Ethernet1/		
	1	2	3	4	5	6	7	1	2	3
Monitoring Port	○	○	○	○	○	○	○	○	○	○
None	●	●	●	●	●	●	●	●	●	●
Rx Port	○	○	○	○	○	○	○	○	○	○
Tx Port	○	○	○	○	○	○	○	○	○	○
Rx/Tx Port	○	○	○	○	○	○	○	○	○	○

5 VLAN

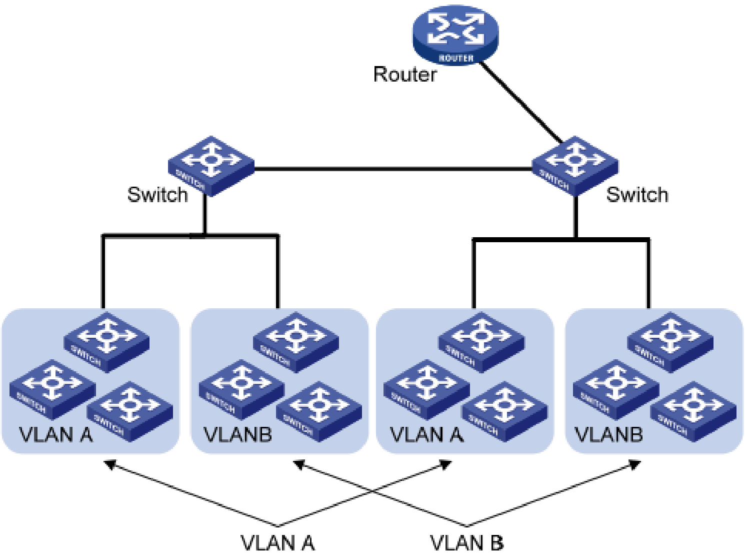
The traditional Ethernet is a broadcast network, where all hosts are in the same broadcast domain and connected with each other through hubs or switches. The hub is a physical layer device without the switching function, so it forwards the received packet to all ports. The switch is a link layer device which can forward the packet according to the MAC address of the packet. However, when the switch receives a broadcast packet or an unknown unicast packet whose MAC address is not included in the MAC address table of the switch, it will forward the packet to all the ports except the inbound port of the packet. In this case, a host in the network receives a lot of packets whose destination is not the host itself. Thus, plenty of bandwidth resources are wasted, causing potential serious security problems.

The traditional way to isolate broadcast domains is to use routers. However, routers are expensive and provide few ports, so they cannot subnet the network particularly.

The virtual local area network (VLAN) technology is developed for switches to control broadcast in LANs.

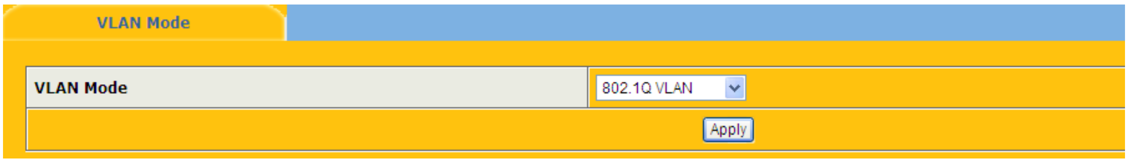
By creating VLANs in a physical LAN, you can divide the LAN into multiple logical LANs, each of which has a broadcast domain of its own. Hosts in the same VLAN communicate with each other as if they are in a LAN. However, hosts in different VLANs cannot communicate with each other directly.

This managed switch supports 802.1Q VLAN and port-based VLAN. VLAN is in 802.1Q mode in default configuration.



5.1 Advanced

This page globally sets the VLAN mode from the following: NO VLAN, port-based VLAN and 802.1Q VLAN.



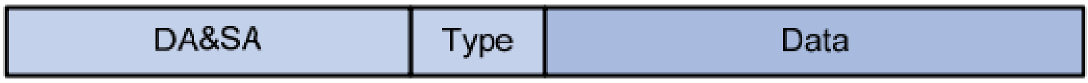
VLAN Mode	802.1Q VLAN

5.2 802.1Q VLAN

VLAN tags in the packets are necessary for the switch to identify packets of different VLANs. The switch works at Layer 2 and it can identify the data link layer encapsulation of the packet only, so you can add the VLAN tag field into only the data link layer encapsulation if necessary.

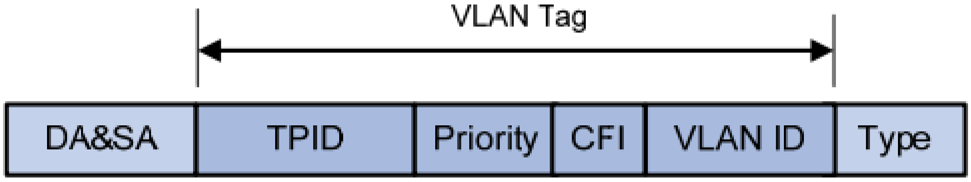
In 1999, IEEE issues the IEEE 802.1Q protocol to standardize VLAN implementation, defining the structure of VLAN-tagged packets.

In traditional Ethernet data frames, the type field of the upper layer protocol is encapsulated after the destination MAC address and source MAC address, as shown in the follow figure of Encapsulation format of traditional Ethernet frames.



DA refers to the destination MAC address, SA refers to the source MAC address, and Type refers to the protocol type of the packet. IEEE 802.1Q protocol defines that a 4-byte VLAN tag is encapsulated after the destination MAC address and source MAC address to show the information about VLAN.

As shown in the following figure of Format of VLAN tag, a VLAN tag contains four fields, including TPID, priority, CFI, and VLAN ID.



TPID is a 16-bit field, indicating that this data frame is VLAN-tagged. By default, it is 0x8100 in KY-3000EM Ethernet industrial switches.

Priority is a 3-bit field, referring to 802.1p priority. Refer to section “QoS & QoS profile” for details.

CFI is a 1-bit field, indicating whether the MAC address is encapsulated in the standard format in different transmission media.

VLAN ID is a 12-bit field, indicating the ID of the VLAN to which this packet belongs. It is in the range of 0 to 4,095. Generally, 0 and 4,095 is not used, so the field is in the range of 1 to 4,094.

VLAN ID identifies the VLAN to which a packet belongs. When the switch receives a packet carrying no VLAN tag, it will encapsulate a VLAN tag with the default VLAN ID of the inbound port for the packet, and the packet will be assigned to the default VLAN of the inbound port for transmission.

Note:

Select 802.1Q VLAN from the VLAN Mode in 5.1 Advanced, so that you can enter the 802.1Q VLAN configuration page.

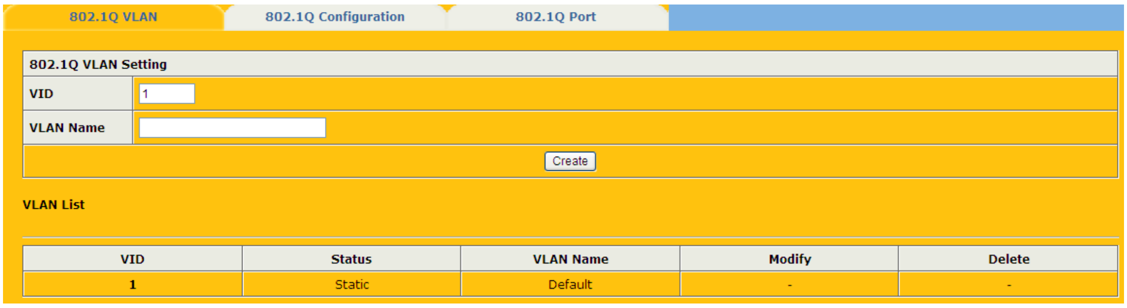
5.2.1 802.1Q VLAN Setting

On this tab page, you can create a new VLAN group with specific VID and VLAN group name. Up to 256 VLAN groups can be created; each VLAN group can have an ID number from 1 to 4094.

The VLAN group with VLAN identifier (VID) of 1 is a default VLAN group. Each port is a member of this group by default, and its value can be modified.

The lower part of this page lists all existing VLAN groups, as well as the information of each VLAN group. Users can also modify or delete an existing VLAN group except the default VLAN with VID 1.

Caution: It is not allowed to delete VLAN group 1.



802.1Q VLAN Setting

VID	1
VLAN Name	

VLAN List

VID	Status	VLAN Name	Modify	Delete
1	Static	Default	-	-

5.2.2 802.1Q Configuration

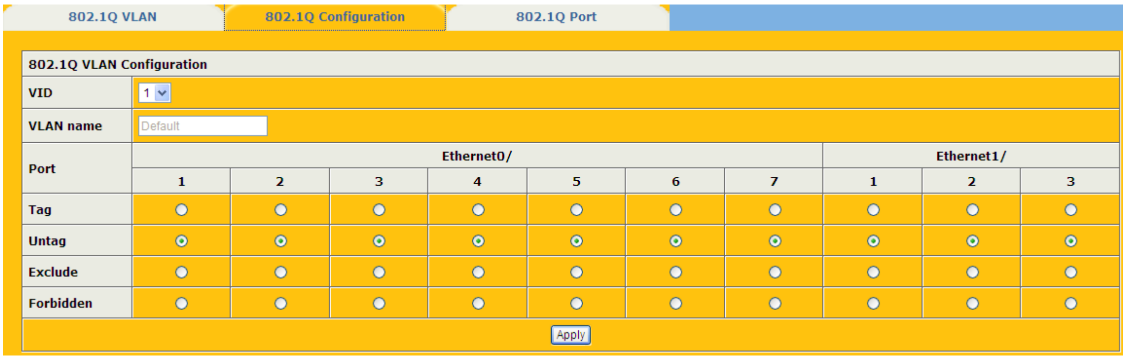
This tab page configures a VLAN group; each port can be configured as a specific state for this VLAN group:

Tag Indicates the port is a tagged member of the VLAN group. All packets forwarded by the port are tagged. The packets contain VLAN information.

Untag Indicates the port is an untagged VLAN member of the VLAN group. Packets forwarded by the port are untagged.

Exclude Excludes the port from the VLAN group. However, the port can be added to the VLAN group through GVRP.

Forbidden Does not allow the port to be added to the VLAN group, even if GVRP indicates so.



802.1Q VLAN Configuration

VID	1
VLAN name	Default

Port	Ethernet0/							Ethernet1/		
	1	2	3	4	5	6	7	1	2	3
Tag	○	○	○	○	○	○	○	○	○	○
Untag	●	●	●	●	●	●	●	●	●	●
Exclude	○	○	○	○	○	○	○	○	○	○
Forbidden	○	○	○	○	○	○	○	○	○	○

5.2.3 802.1Q Port

This tab page configures 802.1Q VLAN port parameters:

Port : Specify the port to be configured.

PVID: Each port can have only one Port VLAN ID (PVID), an untagged Ethernet package will be tagged a VID of PVID when arriving at the port. The default PVID is 1 for each port.

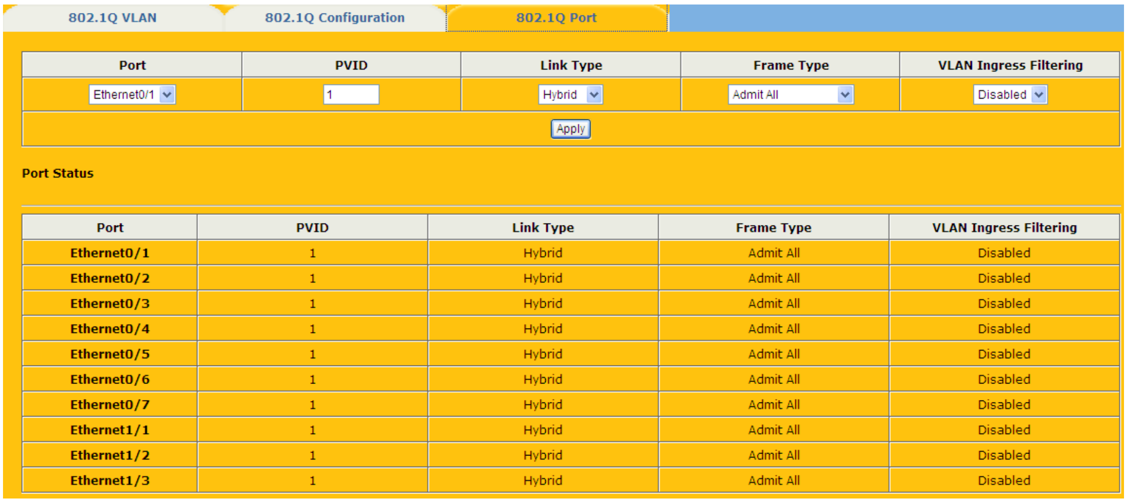
Link Type: Can choose **Hybrid** (by default), **Access** or **Trunk** from this drop-down list.

- **Access**: An access port can belong to only one VLAN, and is generally used to connect user PCs. Tag is deleted when transmitting packets.
- **Trunk**: A trunk port can belong to more than one VLAN. It can receive/send packets from/to multiple VLANs, and is generally used to connect another switch. A trunk port can belong to multiple VLANs, but it can only be configured as untagged in one VLAN. All packages are tagged, except when an egress package is in a VLAN group with VID the same as PVID.
- **Hybrid**: A hybrid port can belong to more than one VLAN. It can receive/send packets from/to multiple VLANs, and can be used to connect either a switch or user PCs. A Hybrid port is similar to a Trunk port, except it leaves the user a flexibility of configuring each port as tagged or untagged.

Frame Type: Chooses how the port accepts Ethernet package. When **Admit All** is selected, the port accepts all ingress packages; while **Admit Only Tagged** accepts only tagged packages, and discards untagged ones.

VLAN Ingress Filter: When enabled, an Ethernet package is discarded if this port is not a member of the VLAN with which this package is associated. When disabled (by default), all packages are forwarded in accordance with the 802.1Q VLAN bridge specification.

The lower part of this tab page lists the status of all ports.



Port	PVID	Link Type	Frame Type	VLAN Ingress Filtering
Ethernet0/1	1	Hybrid	Admit All	Disabled

Port Status

Port	PVID	Link Type	Frame Type	VLAN Ingress Filtering
Ethernet0/1	1	Hybrid	Admit All	Disabled
Ethernet0/2	1	Hybrid	Admit All	Disabled
Ethernet0/3	1	Hybrid	Admit All	Disabled
Ethernet0/4	1	Hybrid	Admit All	Disabled
Ethernet0/5	1	Hybrid	Admit All	Disabled
Ethernet0/6	1	Hybrid	Admit All	Disabled
Ethernet0/7	1	Hybrid	Admit All	Disabled
Ethernet1/1	1	Hybrid	Admit All	Disabled
Ethernet1/2	1	Hybrid	Admit All	Disabled
Ethernet1/3	1	Hybrid	Admit All	Disabled

5.3 GARP Setting

GARP VLAN registration protocol (GVRP) is an implementation of generic attribute registration protocol (GARP). It maintains dynamic VLAN registration information and propagates the information to other switches by adopting the same mechanism as that of GARP.

After the GVRP feature is enabled on a switch, the switch receives the VLAN registration information from other switches to dynamically update the local VLAN registration information (including VLAN members, ports through which the VLAN members can be reached, and so on). The switch also propagates the local VLAN registration information to other switches so that all the switching devices in the same switched network can have the same VLAN information. The VLAN registration information includes not only the static registration information configured locally, but also the dynamic registration information received from other switches.

Note:

Before configuring GARP, make sure to enable GVRP in 3 Advanced Configuration.

5.3.1 GARP

The information exchange between GARP members is completed by messages. The messages performing important functions for GARP fall into three types: Join, Leave and LeaveAll.

When a GARP entity expects other switches to register certain attribute information of its own, it sends out a Join message.

When a GARP entity expects other switches to unregister certain attribute information of its own, it sends out a Leave message.

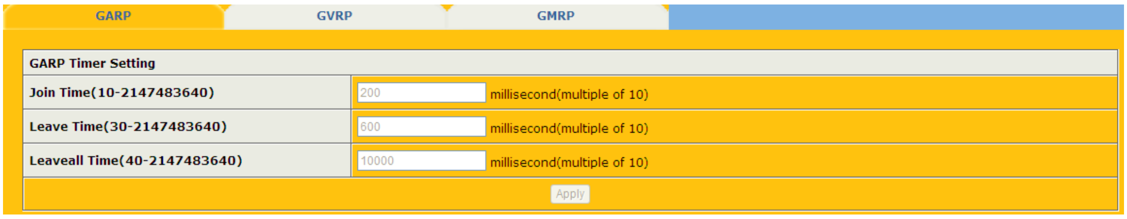
Once a GARP entity starts up, it starts the LeaveAll timer. After the timer times out, the GARP entity sends out a LeaveAll message.

The Join message and the Leave message are used together to complete the un-registration and re-registration of information. Through message exchange, all the attribute information to be registered can be propagated to all the switches in the same switched network.

GARP uses the following timers:

- Join Timer: To transmit the Join messages reliably to other entities, a GARP entity sends each Join message two times. The Join timer is used to define the interval at which each Join message is sent. It ranges from 10 to 2147483640 milliseconds, and it must be integral multiple of 10. It is 200 milliseconds by default.
- Leave Timer: When a GARP entity expects to unregister a piece of attribute information, it sends out a Leave message. Any GARP entity receiving this message starts its Leave timer, and unregisters the attribute information if it does not receives a Join message again before the timer times out. It ranges from 30 to 2147483640 milliseconds, and it must be integral multiple of 10. It is 600 milliseconds by default.
- LeaveAll Timer: Once a GARP entity starts up, it starts the LeaveAll timer, and sends out a LeaveALL message after the timer times out, so that other GARP entities can re-register all the attribute information on this entity. After that, the entity restarts the LeaveAll timer to begin a new cycle. It ranges from 40 to 2147483640 milliseconds, and it must be integral multiple of 10. It is 1000 milliseconds by default.

⚠ Caution: It must satisfy 2*(join_time) < leave_time < leaveall_time.



GARP Timer Setting	
Join Time(10-2147483640)	200 millisecond(multiple of 10)
Leave Time(30-2147483640)	600 millisecond(multiple of 10)
Leaveall Time(40-2147483640)	10000 millisecond(multiple of 10)

5.3.2 GVRP

GVRP (GARP VLAN Registration Protocol) is an implementation of GARP (generic attribute registration protocol). GVRP allows the switch to automatically add or remove the VLANs via the dynamic VLAN registration information and propagate the local VLAN registration information to other switches, without having to individually configure each VLAN.

GVRP has the following three port registration modes: Normal, Fixed, and Forbidden.

- Normal: In this mode, a port can dynamically register/deregister a VLAN and propagate the dynamic/static VLAN information.
- Fixed: In this mode, a port cannot register/deregister a VLAN dynamically. It only propagates static VLAN information. That is, a trunk port only permits the packets of manually configured VLANs in this mode even if you configure the port to permit the packets of all the VLANs.
- Forbidden: In this mode, a port cannot register/deregister VLANs. It only propagates VLAN 1 information. That is, a trunk port only permits the packets of the default VLAN (namely VLAN 1) in this mode even if you configure the port to permit the packets of all the VLANs.

Configuration Steps:

Step 1 Select a specific port for setting;

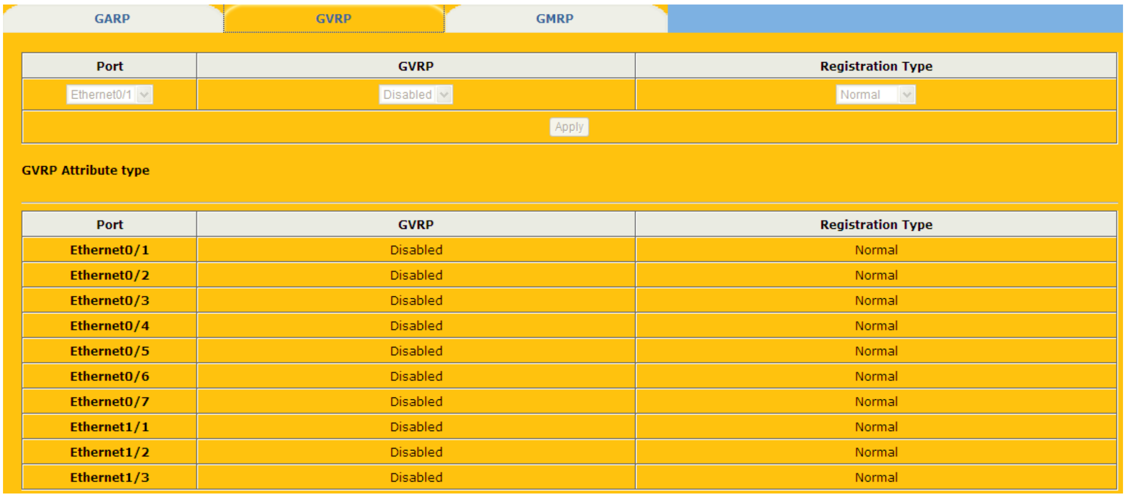
Step 2 Enable or disable the GVRP function on the port;

Step 3 Select the Registration Type for the selected port.

The lower part lists the GVRP attribute of all ports.

⚠ Caution:

- If a port is configured in Ky-Anillo, it cannot be enabled GVRP ;
- The port to configure GVRP must be a trunk port.



Port	GVRP	Registration Type
Ethernet0/1	Disabled	Normal

GVRP Attribute type

Port	GVRP	Registration Type
Ethernet0/1	Disabled	Normal
Ethernet0/2	Disabled	Normal
Ethernet0/3	Disabled	Normal
Ethernet0/4	Disabled	Normal
Ethernet0/5	Disabled	Normal
Ethernet0/6	Disabled	Normal
Ethernet0/7	Disabled	Normal
Ethernet1/1	Disabled	Normal
Ethernet1/2	Disabled	Normal
Ethernet1/3	Disabled	Normal

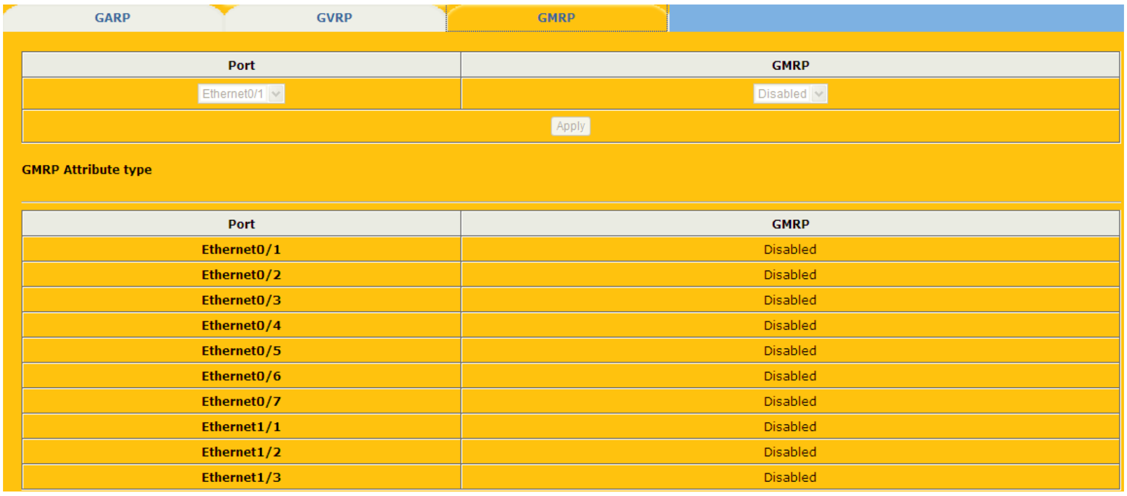
5.3.3 GMRP

GMRP is a concrete application based on GARP. It avoids the network resources waste for the broadcast of multicast by taking use of GARP working mechanism to maintain the information of multicast MAC form in switchboard. All the switchboards which support GMRP can receive the multicast MAC address registration information from other switchboards, then dynamically update the corresponding information for local system, including indicating which current ports have these information already. Meanwhile, all these switchboards can transmit the local multicast MAC address registration information to other switchboards as well.
The configuration steps are as follows:

Step 1 Enable global GMRP

Step 2 Select Ethernet port

Step 3 Enable or disable the GMRP function of port



Port	GMRP
Ethernet0/1	Disabled

GMRP Attribute type

Port	GMRP
Ethernet0/1	Disabled
Ethernet0/2	Disabled
Ethernet0/3	Disabled
Ethernet0/4	Disabled
Ethernet0/5	Disabled
Ethernet0/6	Disabled
Ethernet0/7	Disabled
Ethernet1/1	Disabled
Ethernet1/2	Disabled
Ethernet1/3	Disabled

6 QoS

In data communications, Quality of Service (QoS) is the ability of a network to provide differentiated service guarantees for diversified traffic in terms of bandwidth, delay, jitter, and drop rate.

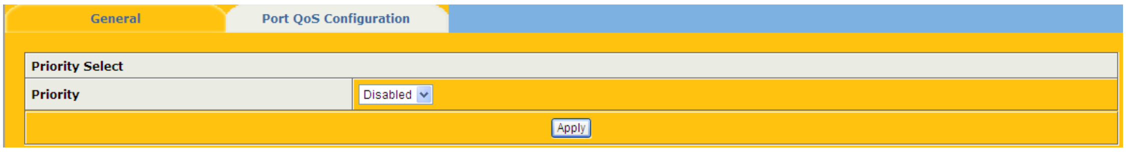
On traditional IP networks, devices treat all packets equally and handle them using the first in first out (FIFO) policy. All packets share the resources of the network and devices. How many resources the packets can obtain completely depends on the time they arrive. This service is called best-effort. It delivers packets to their destinations as possibly as it can, without any guarantee for delay, jitter, packet loss ratio, reliability and so on.

The Internet has been growing along with the fast development of networking technologies. More and more users take the Internet as their data transmission platform to implement various applications. Besides traditional applications such as WWW, e-mail and FTP, network users are experiencing new services, such as tele-education, telemedicine, video telephone, video conference and Video-on-Demand (VoD). The enterprise users expect to connect their regional branches together through VPN technologies to carry out operational applications, for instance, to access the database of the company or to monitor remote devices through Telnet. These new applications have one thing in common, that is, they all have special requirements for bandwidth, delay, and jitter. For instance, videoconference and VoD need large bandwidth, low delay and jitter. As for mission-critical applications, such as transactions and Telnet, they may not require large bandwidth but do require low delay and preferential service during congestion.

6.1 QoS Configuration

6.1.1 General Priority

Enable of disable the priority of the switch.



Priority Select

Priority: Disabled

6.1.2 Port QoS Configuration

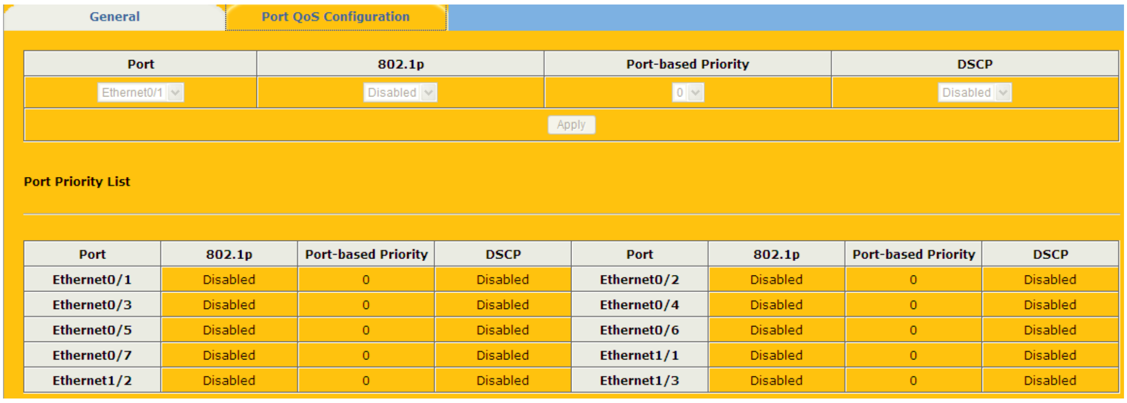
This tab page sets QoS parameters of each port. For a selected port, set the 802.1P, Port-based Priority with DSCP enabled or disabled, the Default Priority can be set from 0 to 7.

802.1P Enable or disable 802.1P. 802.1p priority lies in Layer 2 packet headers and is applicable to occasions where the Layer 3 packet header does not need analysis but QoS must be assured at Layer 2.

Port-based Priority There is 8 priorities from 0 to 7.

DSCP Enable or disable DSCP

The lower part of QoS Configuration tab page lists the default priority of all ports and the state of DSCP.



Port	802.1p	Port-based Priority	DSCP
Ethernet0/1	Disabled	0	Disabled

Port Priority List

Port	802.1p	Port-based Priority	DSCP	Port	802.1p	Port-based Priority	DSCP
Ethernet0/1	Disabled	0	Disabled	Ethernet0/2	Disabled	0	Disabled
Ethernet0/3	Disabled	0	Disabled	Ethernet0/4	Disabled	0	Disabled
Ethernet0/5	Disabled	0	Disabled	Ethernet0/6	Disabled	0	Disabled
Ethernet0/7	Disabled	0	Disabled	Ethernet1/1	Disabled	0	Disabled
Ethernet1/2	Disabled	0	Disabled	Ethernet1/3	Disabled	0	Disabled

6.2 Scheduling Mechanism

This page sets the queue scheduling algorithm and related parameters.

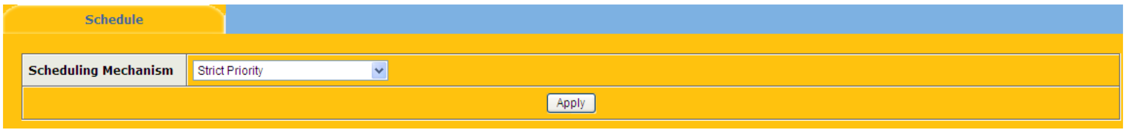
Scheduling Mechanism: Can be set to **Strict Priority** or **Weighted Round-Robin (WRR)**

Strict Priority: SP queue-scheduling algorithm is specially designed for critical service applications. An important feature of critical services is that they demand preferential service in congestion in order to reduce the response delay. Assume that there are eight output queues on the port and the preferential queue classifies the eight output queues on the port into eight classes, which are queue 7, queue 6, queue 5, queue 4, queue 3, queue 2, queue 1, and queue 0. Their priorities decrease in order.

In queue scheduling, SP sends packets in the queue with higher priority strictly following the priority order from high to low. When the queue with higher priority is empty, packets in the queue with lower priority are sent. You can put critical service packets into the queues with higher priority and put non-critical service (such as e-mail) packets into the queues with lower priority. In this case, critical service packets are sent preferentially and non-critical service packets are sent after critical service groups are sent.

The disadvantage of SP queue is that: if there are packets in the queues with higher priority for a long time in congestion, the packets in the queues with lower priority will be “starved” because they are not served.

Weighted Round-Robin (WRR) (8:4:2:1): WRR queue-scheduling algorithm schedules all the queues in turn and every queue can be assured of a certain service time. Assume there are four priority queues on a port. WRR configures a weight value for each queue, which are Q1, Q2, Q3 and Q4. The weight value indicates the proportion of obtaining resources. On a 150 M port, configure the weight value of WRR queue-scheduling algorithm to 8, 4, 2 and 1 (corresponding to Q1, Q2, Q3 and Q4 in order). In this way, the queue with the lowest priority can get 10 Mbps bandwidth at least, and the disadvantage of SP queue-scheduling that the packets in queues with lower priority may not get service for a long time is avoided. Another advantage of WRR queue is that: though the queues are scheduled in order, the service time for each queue is not fixed; that is to say, if a queue is empty, the next queue will be scheduled. In this way, the bandwidth resources are made full use.



Scheduling Mechanism: Strict Priority

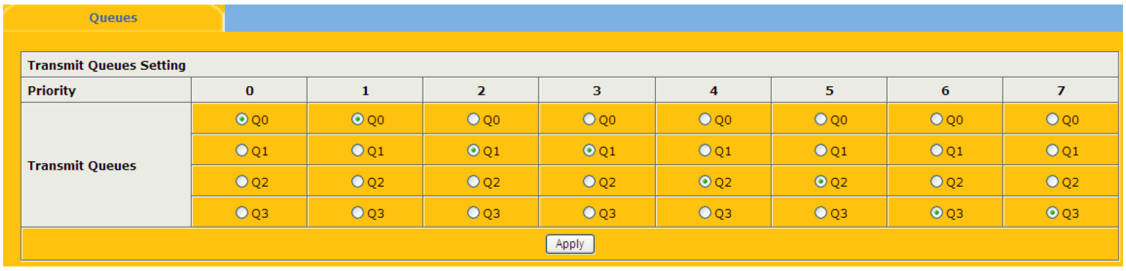
6.3 Transmit Queues

This page sets the 802.1p priority to local precedence mapping. The following table lists the default mapping between 802.1p priority and local precedence:

If the map between the default 802.1p priority and the local precedence cannot satisfy the user's need, you can modify the map from 802.1p priority to local precedence to change the relationship between 802.1p priority and transmit queues. The following table lists the map from 802.1p priority to local precedence.

802.1p priority	Local precedence
0	Q0
1	Q0
2	Q1
3	Q1
4	Q2
5	Q2
6	Q3
7	Q3

You can modify the transmit queues here. Click <Apply> to make it take effect. If there is no modification for the queues, directly click <Apply>.



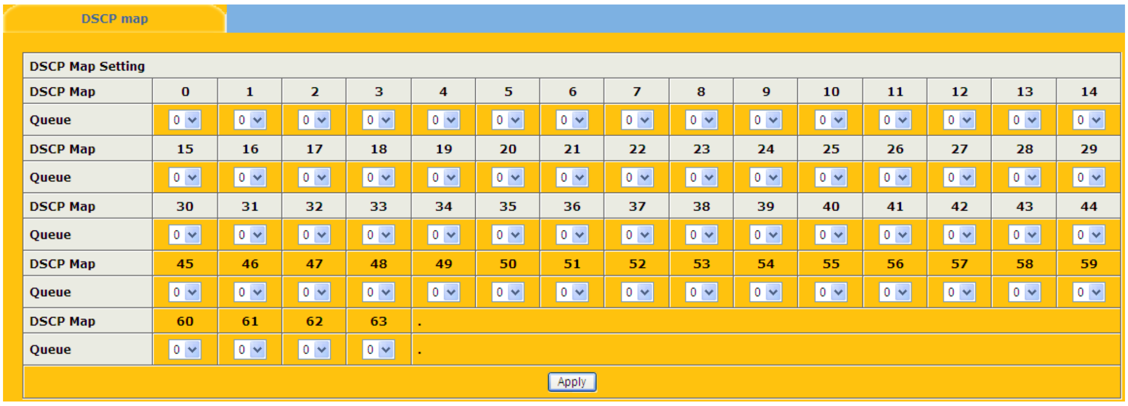
Queues

Transmit Queues Setting

Priority	0	1	2	3	4	5	6	7
Transmit Queues	● Q0	● Q0	○ Q0	○ Q0	○ Q0	○ Q0	○ Q0	○ Q0
	○ Q1	○ Q1	● Q1	● Q1	○ Q1	○ Q1	○ Q1	○ Q1
	○ Q2	○ Q2	○ Q2	○ Q2	● Q2	● Q2	○ Q2	○ Q2
	○ Q3	○ Q3	○ Q3	○ Q3	○ Q3	○ Q3	● Q3	● Q3

6.4 DSCP Map

This page sets the mapping between the DSCP value and the local precedence priority. DSCP (Differentiated Services CodePoint) priority ranges from 0 to 63.



DSCP map

DSCP Map Setting

DSCP Map	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Queue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSCP Map	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Queue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSCP Map	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Queue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSCP Map	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
Queue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSCP Map	60	61	62	63	.										
Queue	0	0	0	0	.										

7 Forwarding

KY-3000EM industrial switch has unicast MAC address forwarding and multicast MAC address forwarding, the introduction is followed.

7.1 Unicast MAC Address

MAC address forwarding table: the device forwards the packets to the corresponding port according to the packet destination MAC address. The MAC address forwarding table reflects the relationship between the MAC address and the forwarding port.

A MAC address table is maintained for packet forwarding. Each entry in this table indicates the following information:

- The MAC address of a connected network device
- The interface to which the device is connected
- The VLAN to which the interface belongs

Unicast MAC address configuration is for the unicast forwarding mode.

7.1.1 MAC Address

On this page, you can add an entry in MAC table.

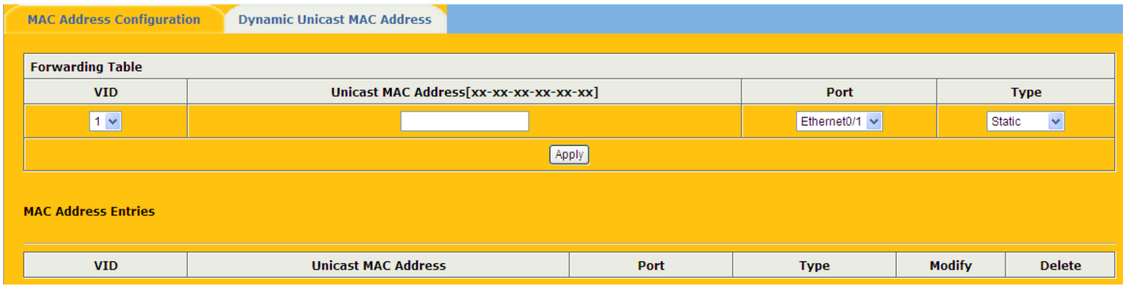
VID	Specifies a VLAN group with which the MAC address corresponds.
Unicast MAC Address	Specifies the destination MAC address.
Port	Specifies the port of the outbound interface.
Type	Choose among **Dynamic, Static and Blackhole**.

- Static MAC address entry: Also known as permanent MAC address entry. This type of MAC address entries are added/removed manually and cannot age out by themselves. Using static MAC address entries can reduce broadcast packets remarkably and are suitable for networks where network devices seldom change.
- Dynamic MAC address entry: This type of MAC address entries age out after the configured aging time. They are generated by the MAC address learning mechanism or configured manually.
- Blackhole MAC address entry: This type of MAC address entries are configured manually. A switch discards the packets destined for or originated from the MAC addresses contained in blackhole MAC address entries.

The lower part lists all existing unicast MAC addresses, as well as the information of each unicast MAC address. The user can also modify or delete an existing unicast MAC address. Dynamic MAC address will also be shown on the Dynamic MAC Address page.

Caution:

- The port must be a member of this VLAN.
- The port should not be a member of a trunk group.



Forwarding Table

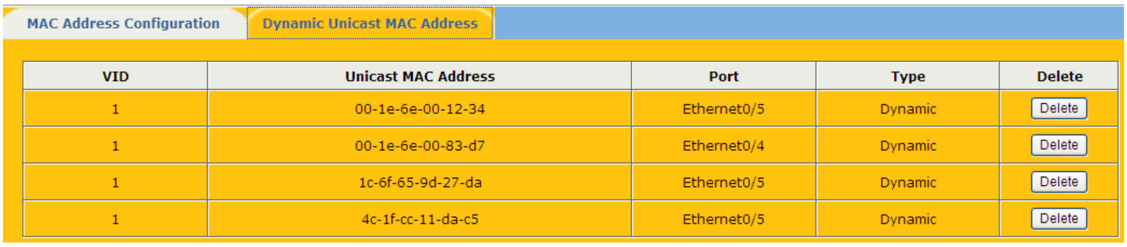
VID	Unicast MAC Address[xx-xx-xx-xx-xx-xx]	Port	Type
1		Ethernet0/1	Static

MAC Address Entries

VID	Unicast MAC Address	Port	Type	Modify	Delete

7.1.2 Dynamic Unicast MAC

This page lists all dynamic unicast MAC addresses, including learned by the switch and added manually. An entry can be deleted. If the time is out, it will refresh the list automatically. The timer is 300 seconds fixedly.



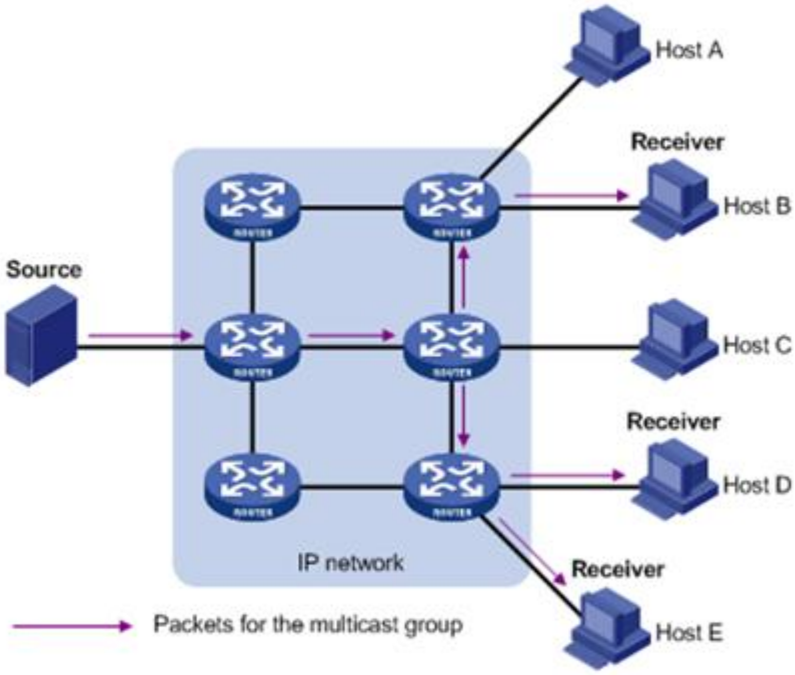
VID	Unicast MAC Address	Port	Type	Delete
1	00-1e-6e-00-12-34	Ethernet0/5	Dynamic	Delete
1	00-1e-6e-00-83-d7	Ethernet0/4	Dynamic	Delete
1	1c-6f-65-9d-27-da	Ethernet0/5	Dynamic	Delete
1	4c-1f-cc-11-da-c5	Ethernet0/5	Dynamic	Delete

7.2 Multicast MAC Address

As a technique coexisting with unicast and broadcast, the multicast technique effectively addresses the issue of point-to-multipoint data transmission. By allowing high-efficiency point-to-multipoint data transmission over a network, multicast greatly saves network bandwidth and reduces network load.

With the multicast technology, a network operator can easily provide new value-added services, such as live Webcasting, Web TV, distance learning, telemedicine, Web radio, real-time videoconferencing, and other bandwidth- and time-critical information services.

When some hosts on the network need multicast information, the information sender, or multicast source, sends only one copy of the information. Multicast distribution trees are built through multicast routing protocols, and the packets are replicated only on nodes where the trees branch.



The advantages of multicast are summarized as follows:

- Over unicast: As multicast traffic flows to the node the farthest possible from the source before it is replicated and distributed, an increase of the number of hosts will not increase the load of the source and will not remarkably add to network resource usage.
- Over broadcast: As multicast data is sent only to the receivers that need it, multicast uses the network bandwidth reasonably and enhances network security. In addition, data broadcast is confined to the same subnet, while multicast is not.

A multicast group is a multicast receiver set identified by an IP multicast address. Hosts join a multicast group to become members of the multicast group, before they can receive the multicast data addressed to that multicast group. Typically, a multicast source does not need to join a multicast group. An information sender is referred to as a multicast source. A multicast source can send data to multiple multicast groups at the same time, and multiple multicast sources can send data to the same multicast group at the same time. All hosts that have joined a multicast group become members of the multicast group.

This page sets multicast MAC address entries. Each multicast MAC address entry contains multicast address, forward ports, and VID.

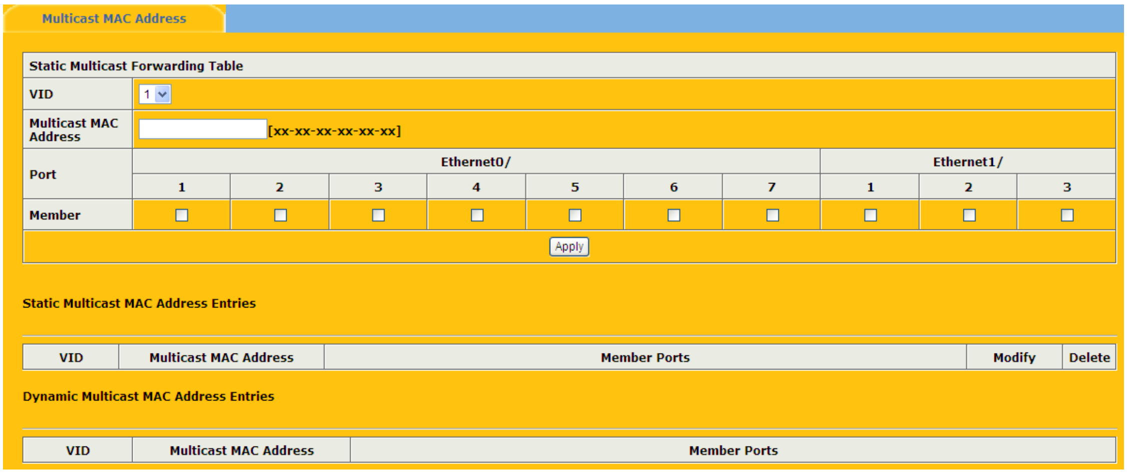
VID	Specifies the VLAN group of which the forwarding ports are members.
Multicast MAC Address	Multicast MAC address, in the form of xx-xx-xx-xx-xx-xx.
Member	Specifies forwarding ports for the specified multicast MAC group address. One or more ports can be added as the member.

The lower part of this page lists all existing multicast MAC addresses, as well as the information of each multicast MAC address. The user can also modify or delete an existing multicast MAC address.

Caution:

- Multicast source maybe doesn't belong to the multicast group, that is to say, it is not necessarily the receiver of multicast data;
- A multicast source can transmit packets to multiple multicast groups at the same time, while several multicast source can also send packets to the same multicast group.

As shown in the following figure, the port 0/2 in VLAN 1 can send packets to the multicast address 01-ac-2b-4e-32-55.



Multicast MAC Address

Static Multicast Forwarding Table										
VID	1									
Multicast MAC Address	[xx-xx-xx-xx-xx-xx]									
Port	Ethernet0/							Ethernet1/		
	1	2	3	4	5	6	7	1	2	3
Member	□	□	□	□	□	□	□	□	□	□

Apply

Static Multicast MAC Address Entries

VID	Multicast MAC Address	Member Ports	Modify	Delete

Dynamic Multicast MAC Address Entries

VID	Multicast MAC Address	Member Ports

Caution: Multicast MAC address cannot configured on Link-aggregation ports.

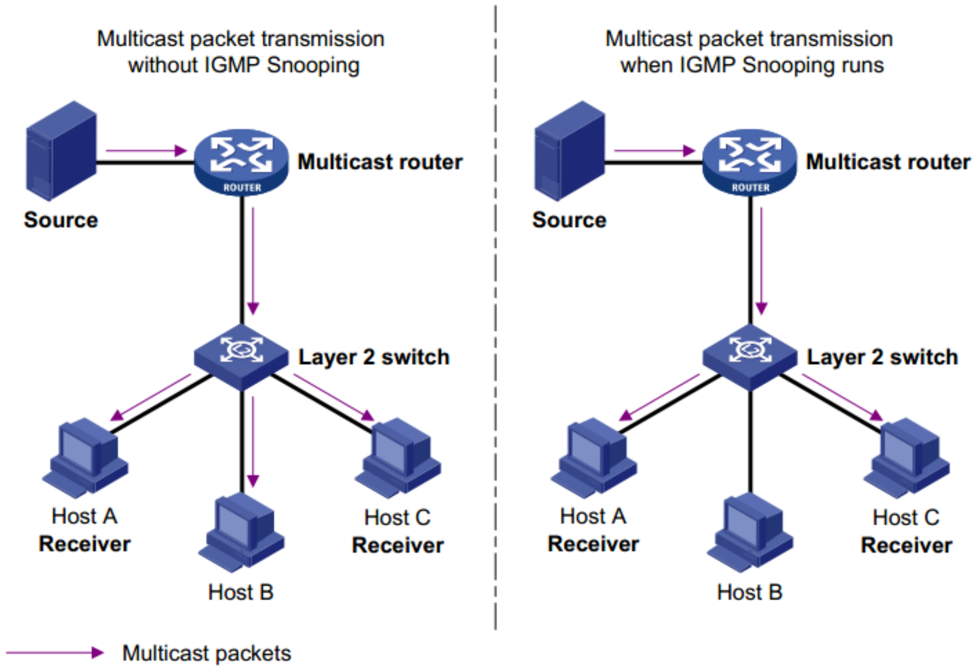
7.3 IGMP Snooping Configuration

Note: Before configuring IGMP Snooping, first enable IGMP Snooping in 3 Advanced Configuration.

Internet Group Management Protocol Snooping (IGMP Snooping) is a multicast constraining mechanism that runs on Layer 2 devices to manage and control multicast groups.

By listening to and analyzing IGMP messages, a Layer 2 device running IGMP Snooping establishes mappings between ports and multicast MAC addresses and forwards multicast data based on these mappings.

As shown in the following figure, when IGMP Snooping is not running on the device, multicast packets are broadcast to all devices at Layer 2. When IGMP Snooping is running on the switch, multicast packets for known multicast groups are multicast to the receivers, rather than broadcast to all hosts, at Layer 2.



7.3.1 IGMP Snooping

On this page, you can enable IGMP Snooping feature for a VLAN group. By default, the IGMP Snooping feature is disabled.

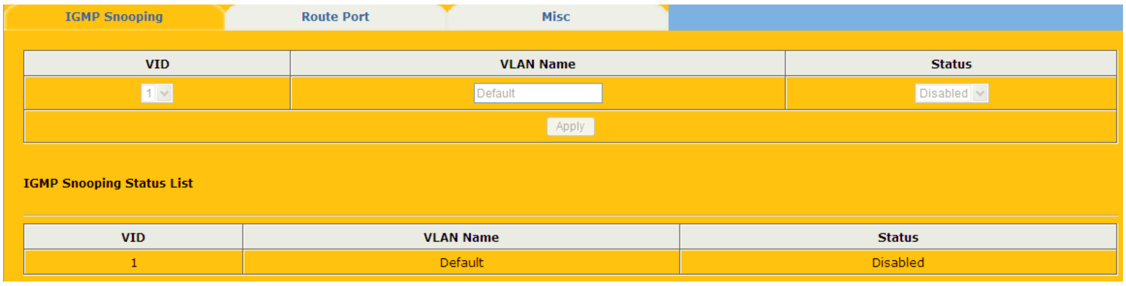
With the wide use of multicast, IGMPv3 is used more and more. It adds the multicast source filtering function, which enabled the receiver be able to specify the multicast group to join in as well as specify the multicast source to receive multicast information from.

The configuration steps are as follows:

Step 1 Specify the VLAN ID of a multicast group, the VLAN name cannot be changed here.

Step 2 Enable or disable IGMP Snooping on the field of Status, if enable it, select IGMP version 2 or 3. Until now, IGMP has three versions: including IGMP Version 1 (defined by RFC1112), IGMP Version 2 (defined by RFC2236), and IGMP Version 3 (defined by RFC 3376). IGMP Version 2 is compatible with IGMP Version 1.

The lower part of this page lists all VLAN IGMP Snooping feature status.



VID	VLAN Name	Status
1	Default	Disabled

IGMP Snooping Status List

VID	VLAN Name	Status
1	Default	Disabled

7.3.2 Route Port

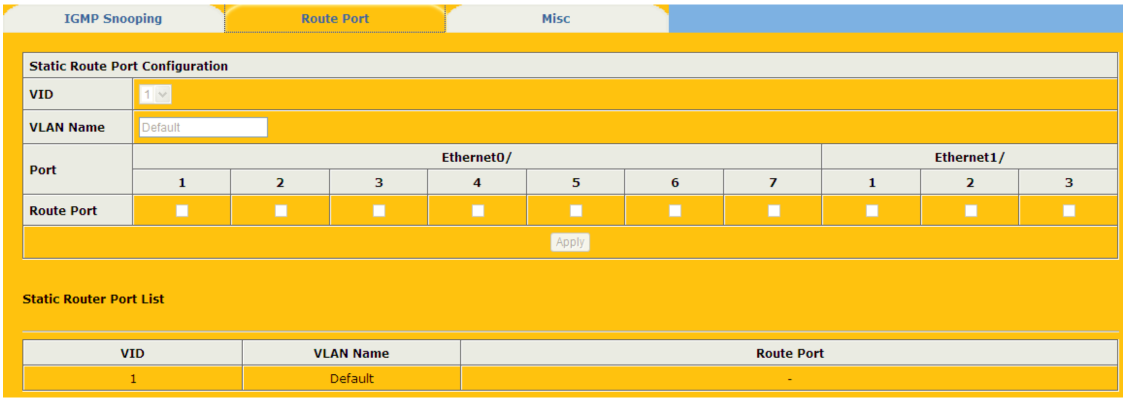
On this page, you can configure a port in a specified VLAN group as a static router port. By default, a port is not a static router port.

If a port is fixed to receive the packets from a multicast group, it can be configured to join in the multicast group statically, so that the device can receive IGMP message by the port from router.

Route port: The port directly connected to multicast devices, which is the IGMP Querier.

The lower part of this page lists static router ports of all VLANs.

Caution: the router port should be within the VLAN. Please refer to 5 VLAN.



Static Route Port Configuration										
VID	1									
VLAN Name	Default									
Port	Ethernet0/							Ethernet1/		
	1	2	3	4	5	6	7	1	2	3
Route Port	□	□	□	□	□	□	□	□	□	□
Apply										

Static Router Port List

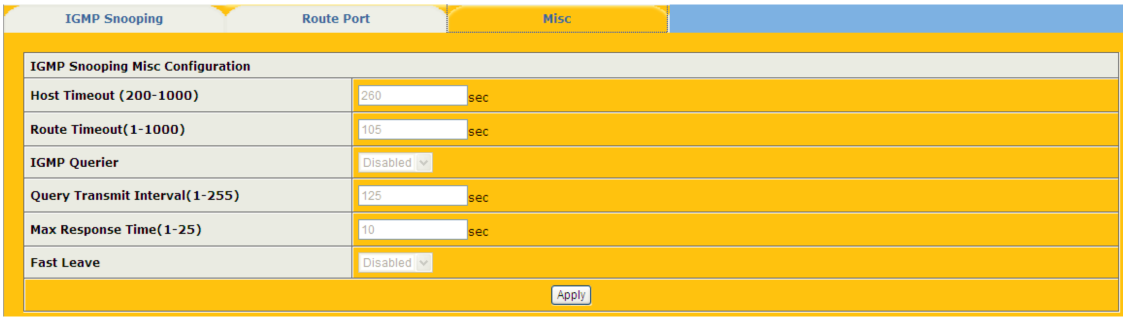
VID	VLAN Name	Route Port
1	Default	-

7.3.3 Misc

This tab page sets the following IGMP Snooping Misc configuration parameters:

Host Timeout	The switch starts for a port after the port joins a multicast group. After it time out, the port will be deleted from the group. It is in the range of 200 to 1000; by default, the value is 260 seconds.
Route Timeout	The switch starts Router Timeout for each router port when it time out, it will be deleted from the router port list. It is in the range of 1 to 1000; by default, the value is 105 seconds.
IGMP Querier	IGMP Querier sends IGMP general query packets to all the hosts and router ports in the network segment to check the multicast group members. By default, IGMP Querier is disabled.
Query Transmit Interval	The interval IGMP Querier sends IGMP general query packets to all the hosts and router ports. After it times out, it will delete the port form the group. It is in the range of 1 to 255, by default, the value is 125 seconds.
Max Response Time	The maximum response time of the IGMP general query packets. After it times out, it will delete the port form the group. It is in the range of 1 to 25, by default, the value is 10 seconds.
Fast Leave	If Fast Leave is enabled, when a port receives a leave message from a multicast group, the switch will delete the port directly. In this way, when the port has only one

user, it can save bandwidth.



IGMP Snooping Misc Configuration	
Host Timeout (200-1000)	260 sec
Route Timeout(1-1000)	105 sec
IGMP Querier	Disabled
Query Transmit Interval(1-255)	125 sec
Max Response Time(1-25)	10 sec
Fast Leave	Disabled

8 Security

It mainly introduces Management Security, Port Authentication, MAC Authentication and Storm Control.

The 802.1x protocol (802.1x for short) was developed by IEEE802 LAN/WAN committee to address security issues of wireless LANs. It was then used in Ethernet as a common access control mechanism for LAN ports to address mainly authentication and security problems. 802.1x is a port-based network access control protocol. It authenticates and controls devices requesting for access in terms of the ports of LAN access control devices. With the 802.1x protocol employed, a user-side device can access the LAN only when it passes the authentication. Those fail to pass the authentication are denied when accessing the LAN, as if they are disconnected from the LAN.

8.1 Management Security

Note: Enable 802.1x in 3 Advanced Configuration before configuring Radius.

This page configures the 802.1x system as follows: Authentication RADIUS Server IP, Authentication Port, Authentication Shared Key, Accounting RADIUS Server IP, Accounting Port and Accounting Shared Key.

Authentication RADIUS Server IP IP address of the radius server to be used, a valid unicast address in dotted decimal notation; the default value is 192.168.0.234.

Authentication Port UDP port number of the radius server, ranging from 0 to 65535; the default value is 1812.

Authentication Shared Key Sets a shared key for radius messages. String length is 1 to 15 characters.

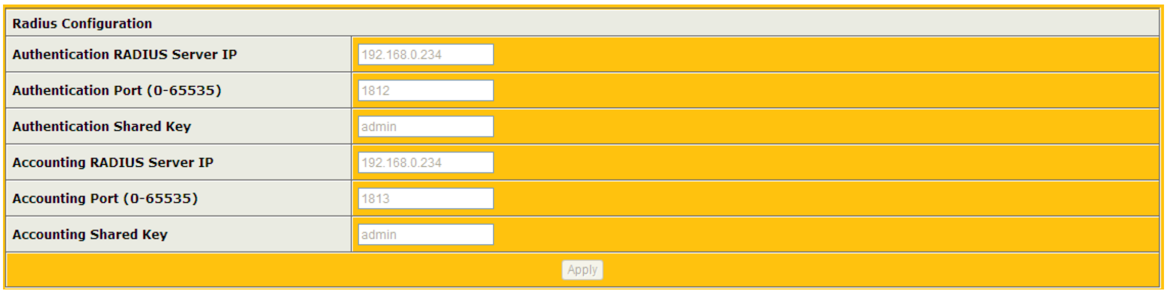
Accounting RADIUS Server IP IP address of accounting radius server to be used, a valid unicast address in dotted decimal notation; the default value is 192.168.0.234.

Accounting Port UDP port number of the radius server, ranging from 0 to 65535; the default value is 1813.

Accounting Shared Key Sets a shared key for accounting radius. String length is from 1 to 15 characters.

The authentication server system is an entity that provides authentication service to the authenticator system. Normally in the form of a RADIUS server, the authentication server system serves to perform AAA (authentication, authorization, and accounting) services to users. It also stores user information, such as user name, password, the VLAN a user belongs to, priority, and the ACLs (access control list) applied.

Set RADIUS configuration, including the authentication RADIUS server IP, authentication port, authentication shared key, accounting RADIUS server IP, accounting port and accounting shared key.



Radius Configuration

Authentication RADIUS Server IP	192.168.0.234
Authentication Port (0-65535)	1812
Authentication Shared Key	admin
Accounting RADIUS Server IP	192.168.0.234
Accounting Port (0-65535)	1813
Accounting Shared Key	admin

8.2 Port Authentication

IEEE 802.1x authentication system uses extensible authentication protocol (EAP) to exchange information between supplicant systems and the authentication servers. When a supplicant system passes the authentication, the authentication server passes the information about the supplicant system to the authenticator system. The authenticator system in turn determines the state (authorized or unauthorized) of the controlled port according to the instructions (accept or reject) received from the RADIUS server.

802.1x Authentication Procedure:

- A supplicant system launches an 802.1x client to initiate an access request by sending an EAPoL-start packet to the switch, with its user name and password provided. The 802.1x client program then forwards the packet to the switch to start the authentication process.
- Upon receiving the authentication request packet, the switch sends an EAP-request/identity packet to ask the 802.1x client for the user name.
- The 802.1x client responds by sending an EAP-response/identity packet to the switch with the user name contained in it. The switch then encapsulates the packet in a RADIUS Access-Request packet and forwards it to the RADIUS server.
- Upon receiving the packet from the switch, the RADIUS server retrieves the user name from the packet, finds the corresponding password by matching the user name in its database, encrypts the password using a randomly-generated key, and sends the key to the switch through an RADIUS access-challenge packet. The switch then sends the key to the 802.1x client.
- Upon receiving the key (encapsulated in an EAP-request/MD5 challenge packet) from the switch, the client program encrypts the password of the supplicant system with the key and sends the encrypted password (contained in an EAP-response/MD5 challenge packet) to the RADIUS server through the switch. (Normally, the encryption is irreversible.)
- The RADIUS server compares the received encrypted password (contained in a RADIUS access-request packet) with the locally-encrypted password. If the two match, it will then send feedbacks (through a RADIUS access-accept packet and an EAP-success packet) to the switch to indicate that the supplicant system is authenticated.
- The switch changes the state of the corresponding port to accepted state to allow the supplicant system to access the network.
- The supplicant system can also terminate the authenticated state by sending EAPoL-Logoff packets to the switch. The switch then changes the port state from accepted to rejected.

8.2.1 802.1x Port

This tab page sets 802.1x port enabling, port control, re-authentication and Guest VLAN for a specified Ethernet port. There are three choices for **Port Control**: **Auto**, **Force Authorized** and **Force Unauthorized**.

Configuration Steps:

Step 1 Specify the port to configure

⚠ Caution: The port to configure authentication cannot be link-aggregation port.

Step 2 Enable or disable the 802.1x authentication function

Step 3 If 802.1x is enabled, you can further configure port control, re-authentication and Guest VLAN;

Auto Specify to operate in auto access control mode. When one port operates in this mode, all the unauthenticated hosts connected to it are unauthorized. In this case, only EAPoL packets can be exchanged between the switch and the hosts. And the authenticated hosts connected to the port are authorized to access the network resources.

Force Authorized Specify to operate in authorized-force access control mode. When one port operates in this mode, all the hosts connected to it can access the network resources without the need of authentication.

Force Unauthorized Specify to operate in unauthorized-force access control mode. When one port operates in this mode, the hosts connected to it cannot access the network resources.

Guest VLAN A guest VLAN can be enabled for each IEEE 802.1x port on the switch to provide limited services to the clients.

Step 4 Enable or disable Re-authentication

Step 5 Enable or disable Guest VLAN

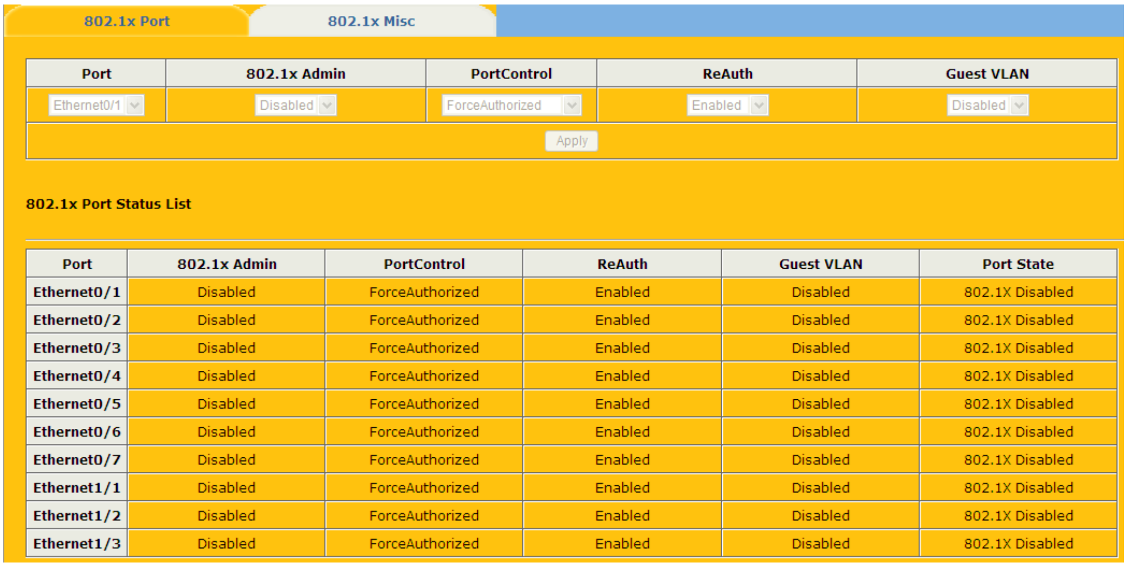
The Guest VLAN function enables supplicant systems that that are not authenticated to access network resources in a restrained way. It enables supplicant systems that do not have 802.1x client installed to access specific network resources. It also enables supplicant systems that are not authenticated to upgrade their 802.1x client programs.

With this function enabled:

- After the maximum number retries have been made and there are still ports that have not sent any response back, the switch will then add these ports to the Guest VLAN.

- Users belonging to the Guest VLAN can access the resources of the Guest VLAN without being authenticated. But they need to be authenticated when accessing external resources.

The lower part of this page lists all 802.1x port status.



Port	802.1x Admin	PortControl	ReAuth	Guest VLAN
Ethernet0/1	Disabled	ForceAuthorized	Enabled	Disabled

802.1x Port Status List

Port	802.1x Admin	PortControl	ReAuth	Guest VLAN	Port State
Ethernet0/1	Disabled	ForceAuthorized	Enabled	Disabled	802.1X Disabled
Ethernet0/2	Disabled	ForceAuthorized	Enabled	Disabled	802.1X Disabled
Ethernet0/3	Disabled	ForceAuthorized	Enabled	Disabled	802.1X Disabled
Ethernet0/4	Disabled	ForceAuthorized	Enabled	Disabled	802.1X Disabled
Ethernet0/5	Disabled	ForceAuthorized	Enabled	Disabled	802.1X Disabled
Ethernet0/6	Disabled	ForceAuthorized	Enabled	Disabled	802.1X Disabled
Ethernet0/7	Disabled	ForceAuthorized	Enabled	Disabled	802.1X Disabled
Ethernet1/1	Disabled	ForceAuthorized	Enabled	Disabled	802.1X Disabled
Ethernet1/2	Disabled	ForceAuthorized	Enabled	Disabled	802.1X Disabled
Ethernet1/3	Disabled	ForceAuthorized	Enabled	Disabled	802.1X Disabled

8.2.2 802.1x Misc

In 802.1 x authentication, the following timers are used to ensure that the supplicant system, the switch, and the RADIUS server interact in an orderly way.

Quiet Period Set the quiet-period, when a supplicant system fails to pass the authentication; the switch quiets for the set period before it processes another authentication request re-initiated by the supplicant system. During this quiet period, the switch does not perform any 802.1x authentication-related actions for the supplicant system. The value is in the range of 1 to 65535, and is set to 60 seconds by default.

Tx Period Set the transmission timer, and is triggered in two cases. The first case is when the client requests authentication, the switch sends a unicast request/identity packet to a supplicant system and then triggers the transmission timer. The switch sends another request/identity packet to the supplicant system if it does not receive the reply packet from the supplicant system when this timer times out. The second case is when the switch authenticates the 802.1x client which cannot request for authentication actively. The switch sends multicast request/identity packets periodically through the port enabled by 802.1x function. In this case, this timer sets the interval to send the multicast request/identity packets. It is in the range of 1 to 65535; the default value is 30 seconds.

Supplicant Timeout: Set the supplicant system timer, this timer sets the supp-timeout period and is triggered by the switch after the switch sends a request/challenge packet to a supplicant system. The switch sends another request/challenge packet to the supplicant system if the switch does not receive any response from the supplicant system when this timer times out. It is in the range of 1 to 300; the default value is 30 seconds.

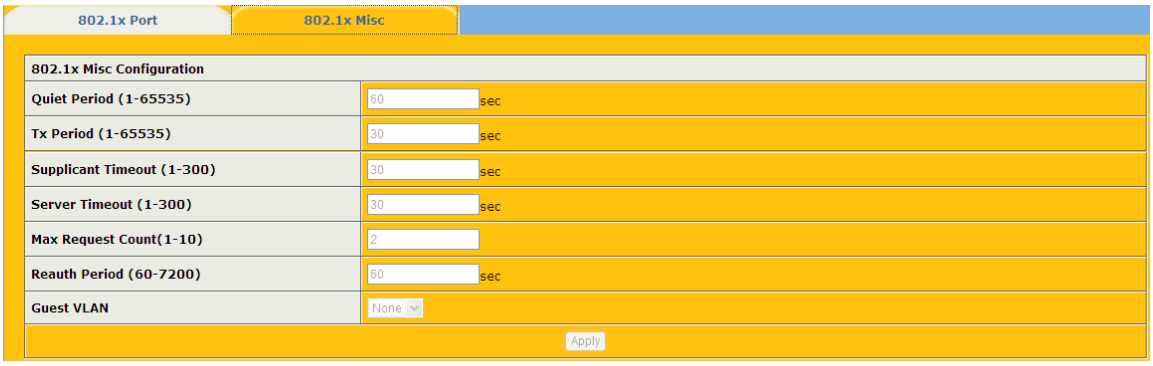
Server Timeout Set the radius server timer, this timer sets the server-timeout period. After sending an authentication request packet to the radius server, a switch sends another authentication request packet if it does not receive any response from the radius server when this timer times out. It is in the range of 1 to 300; the default value is 30 seconds.

Max Request Count Set the maximum number of times that a switch sends authentication request packets to a user. It is in the range of 1 to 10, and the default value is 2.

Reauth Period Set re-authentication interval in second. After this timer expires, the switch indicates: 802.1x re-authentication. It is in the range of 60 to 7200; the default value is 60 seconds.

Guest VLAN Can choose a guest VLAN on the switch to provide limited services to clients, such as downloading. By default, there is none guest VLAN.

When enabling a guest VLAN on an IEEE 802.1x port, the switch assigns the client port to a guest VLAN in case that the switch does not receive any response to its EAP request/identity frame, or EAPOL packets are not sent by the client. The switch allows the client that is failed in authentication to access the guest VLAN, regardless of whether EAPOL packets have been detected. However, access to external ports out of guest VLAN still needs to be authorized.



802.1x Misc Configuration	
Quiet Period (1-65535)	60 sec
Tx Period (1-65535)	30 sec
Supplicant Timeout (1-300)	30 sec
Server Timeout (1-300)	30 sec
Max Request Count(1-10)	2
Reauth Period (60-7200)	60 sec
Guest VLAN	None

8.3 MAC Authentication

Note:

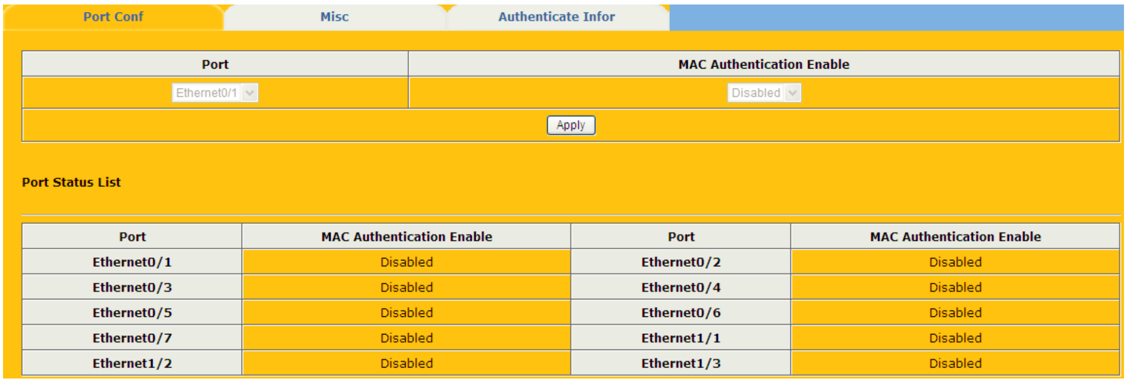
Enable MAC Authenticantion in 3 Advanced Configuration before configuring .

MAC address authentication is port- and MAC address-based authentication used to control user permissions to access a network. MAC address authentication can be performed without client-side software. With this type of authentication employed, a switch authenticates a user upon detecting the MAC address of the user for the first time.

There are three tab pages in this page: Port Conf, Misc and Authenticate Infor.

8.3.1 Port Configuration

This page enables **MAC Authentication** on a specific port. The lower part shows the port status list.



Port	MAC Authentication Enable
Ethernet0/1	Disabled

Port Status List

Port	MAC Authentication Enable	Port	MAC Authentication Enable
Ethernet0/1	Disabled	Ethernet0/2	Disabled
Ethernet0/3	Disabled	Ethernet0/4	Disabled
Ethernet0/5	Disabled	Ethernet0/6	Disabled
Ethernet0/7	Disabled	Ethernet1/1	Disabled
Ethernet1/2	Disabled	Ethernet1/3	Disabled

Caution: Link-aggregation port cannot be configured MAC authenticaiton.

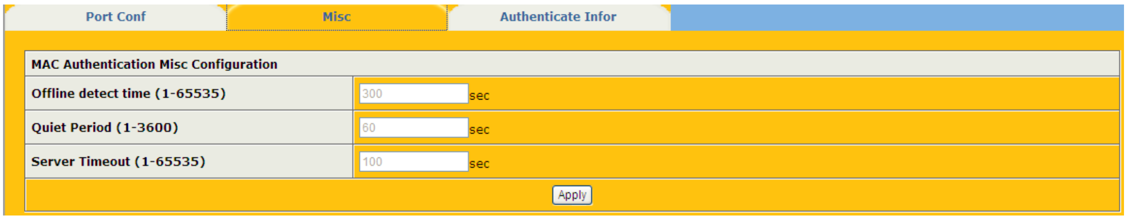
8.3.2 Misc

MAC authentication process is affected by the following timers:

Offline detect time Sets the time interval for a switch to test whether a user goes offline. Upon detecting a user is offline, a switch notifies the RADIUS server of the user to trigger the RADIUS server to stop the accounting on the user. The value ranges from 1 to 65535, and the default value is 300 seconds.

Quiet Period Sets the quiet period for a switch. After a user fails to pass the authentication performed by a switch, the switch quiets for a specific period (the quiet period) before it authenticates users again. The value ranges from 1 to 3600, and the default value is 60 seconds.

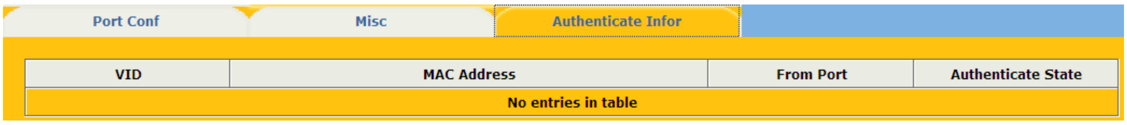
Server Timeout Sets the time interval the switch waits for a response, when there is a connection request from the authentication server to the client. The value ranges from 1 to 65535, and the default value is 100 seconds.



MAC Authentication Misc Configuration	
Offline detect time (1-65535)	300 sec
Quiet Period (1-3600)	60 sec
Server Timeout (1-65535)	100 sec

8.3.3 Authentication Information

This page lists all the MAC authentication information including MAC Address, From Port, and Authenticate state.



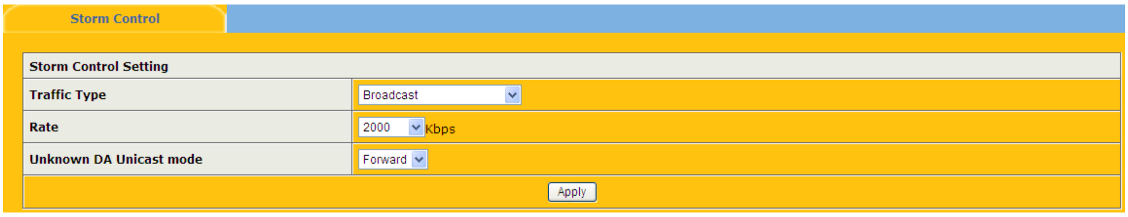
VID	MAC Address	From Port	Authenticate State
No entries in table			

8.4 Storm Control

Traffic storm will be generated when there are multiple broadcast / multicast / DLF (Destination Lookup Failed) packets passing through a port, thus it will lead to traffic congestion. If the transmission rate of the three kind packets exceeds the set bandwidth, the packets will be automatically discarded to avoid network broadcast storm.

This page sets thresholds of the specified **Traffic Type**.

Specify the traffic Type can be selected from: None, Broadcast, Broadcast + Multicast, and Broadcast + Multicast + DLF Multicast. If “None” is selected, it means that storm control is disabled. And specify the limited rate. As to the unknown DA unicast, there are two ways to deal with: discard and forward.



Storm Control Setting	
Traffic Type	Broadcast
Rate	2000 Kbps
Unknown DA Unicast mode	Forward

9 LLDP

Note: Enable LLDP in 3 Advanced Configuration.

In a heterogeneous network, it is important that different types of network devices from different vendors can discover one another and exchange configuration for interoperability and management sake. Therefore, a standard configuration exchange platform was created.

The IETF drafted the Link Layer Discovery Protocol (LLDP) in IEEE 802.1AB. The protocol operates on the data link layer to exchange device information between directly connected devices. With LLDP, a device sends local device information (including its major functions, management IP address, device ID, and port ID) as TLV (type, length, and value) triplets in Link Layer Discovery Protocol Data Units (LLDPDUs) to the directly connected devices, and at the same time, stores the device information received in LLDPDUs sent from the LLDP neighbors in a standard management information base (MIB). It allows a network management system to fast detect Layer-2 network topology change and identify what the change is.

9.1 Management LLDP

9.1.1 Configuration

This page configures LLDP for a specified Ethernet port.

Configuration Steps:

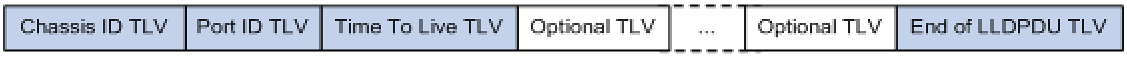
Step 1 Specify the port to configure LLDP;

Step 2 Enable or disable LLDP on the port;

Step 3 Specify the LLDP status: Disabled, Tx and Rx, Tx Only and Rx Only;

Step 4 Specify the encapsulation format: Ethernet II and SNAP.

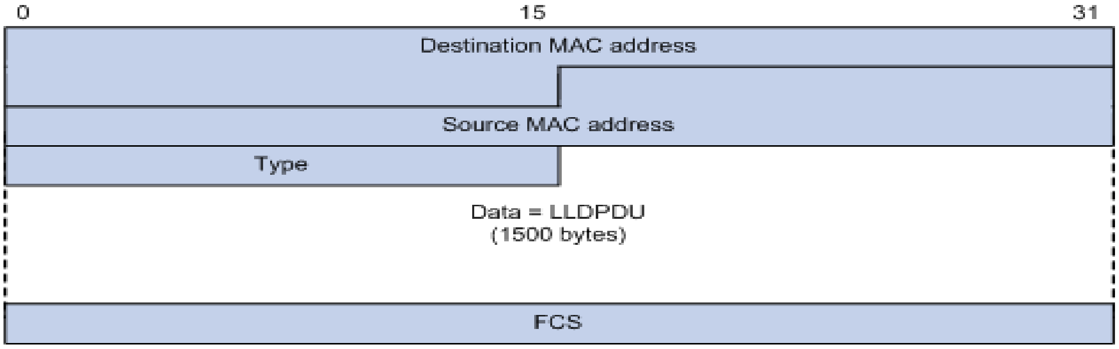
LLDP uses LLDPDUs to exchange information. An LLDPDU comprises multiple type, length, and value (TLV) sequences. Each carries a specific type of device information, as shown in the flowing LLDPDU encapsulation format figure.



An LLDPDU can carry up to 28 types of TLVs. Mandatory TLVs include Chassis ID TLV, Port ID TLV, Time To Live TLV, and End of LLDPDU TLV. Other TLVs are optional.

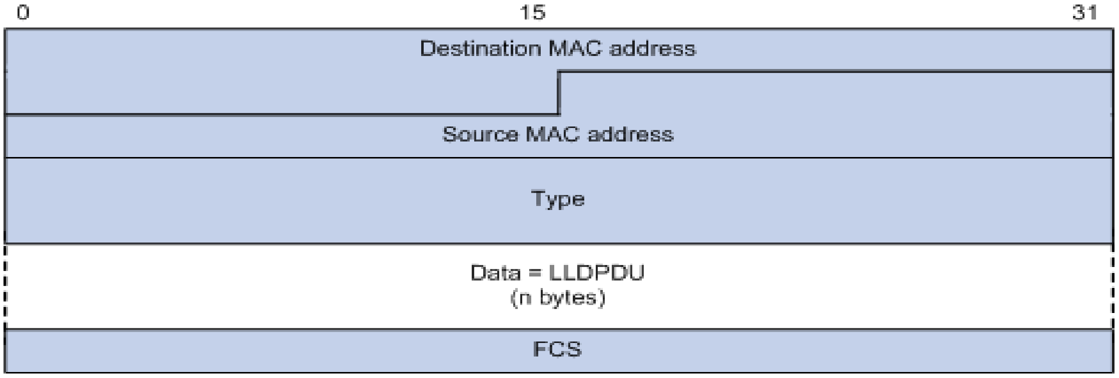
LLDP sends device information in LLDP data units (LLDPDUs). LLDPDUs are encapsulated in Ethernet II or SubNetwork Access Protocol (SNAP) frames.

(1) Ethernet II-encapsulated LLDPDU format



Field	Description
Destination MAC address	The MAC address to which the LLDPDU is advertised. It is fixed to 0x0180-C200-000E, a multicast MAC address.
Source MAC address	The MAC address of the sending port. If the port does not have a MAC address, the MAC address of the sending bridge is used.
Type	The Ethernet type for the upper layer protocol. It is 0x88CC for LLDP.
Data	LLDP data unit (LLDPDU)
FCS	Frame check sequence, a 32-bit CRC value used to determine the validity of the received Ethernet frame

(2) SNAP-encapsulated LLDPDU format



Field	Description
Destination MAC address	The MAC address to which the LLDPDU is advertised. It is fixed to 0x0180-C200-000E, a multicast MAC address.
Source MAC address	The MAC address of the sending port. If the port does not have a MAC address, the MAC address of the sending bridge is used.
Type	The SNAP type for the upper layer protocol. It is 0xAAAA-0300-0000-88CC for LLDP.
Data	LLDPDU
FCS	Frame check sequence, a 32-bit CRC value used to determine the validity of the received Ethernet frame

When Ethernet II encapsulation format is adopted, LLDPDUs sent from the port with LLDP enabled will be encapsulated with Ethernet II format, and the device will only deal with the LLDPDUs encapsulated with the same encapsulation format. So is for the SNAP-encapsulated LLDPDU.

LLDPDU encapsulation format is Ethernet II by default. If the neighbor devices encapsulates LLDPDU with SNAP format, the user can change the LLDPDU encapsulation format to SNAP to maintain the normal communication with neighbor devices.

LLDP can operate in one of the following modes:

Disabled mode	A port in this mode does not send or receive LLDPDUs.
Tx and Rx mode	A port in this mode sends and receives LLDPDUs.
Tx Only mode	A port in this mode only sends LLDPDUs.
Rx Only mode	A port in this mode only receives LLDPDUs.

When the LLDP operating mode of a port takes change, its LLDP protocol state machine will re-initialize. To prevent LLDP from being initialized too frequently during times of frequent operating mode change, you can configure a re-initialization delay. With this delay configured, a port must wait for the specified interval before it can initialize LLDP after the LLDP operating mode changes.

Transmitting LLDPDUs

An LLDP-enabled port operating in “Tx and Rx” mode or “Tx Only” mode sends LLDPDUs to its directly connected devices both periodically and when the local configuration changes. To prevent the network from being overwhelmed by LLDPDUs during times of frequent local device information change, an interval is introduced between two successive LLDPDUs.

This interval is shortened to 1 second in either of the following two cases:

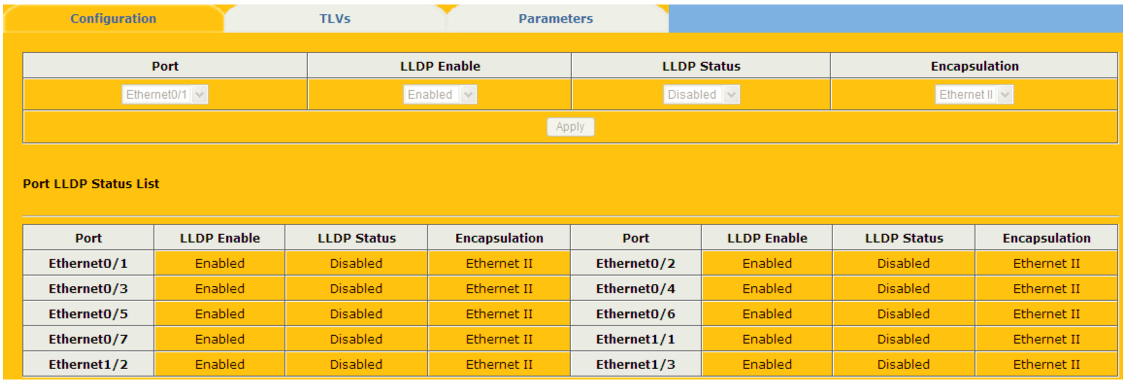
- A new neighbor is discovered, in other words, a new LLDPDU is received carrying device information new to the local device.
- The LLDP operating mode of the port changes from “Disabled” /”Rx Only” to “Tx and Rx” or “Tx Only”.

This is the fast sending mechanism of LLDP. This feature sends a specific number of LLDPDUs at the 1-second interval to help LLDP neighbors discover the local device as soon as possible. Then, the normal LLDPDU transmit interval resumes.

Receiving LLDPDUs

An LLDP-enabled port operating in “Tx and Rx” mode or “Rx Only” mode checks the validity of TLVs carried in every received LLDPDU. If valid, the information is saved and an aging timer is set for it based on the time to live (TTL) value in the Time To Live TLV carried in the LLDPDU. If the TTL value is zero, the information is aged out immediately.

The lower part of this page lists the LLDP status for all ports.



Port	LLDP Enable	LLDP Status	Encapsulation
Ethernet0/1	Enabled	Disabled	Ethernet II

Port LLDP Status List

Port	LLDP Enable	LLDP Status	Encapsulation	Port	LLDP Enable	LLDP Status	Encapsulation
Ethernet0/1	Enabled	Disabled	Ethernet II	Ethernet0/2	Enabled	Disabled	Ethernet II
Ethernet0/3	Enabled	Disabled	Ethernet II	Ethernet0/4	Enabled	Disabled	Ethernet II
Ethernet0/5	Enabled	Disabled	Ethernet II	Ethernet0/6	Enabled	Disabled	Ethernet II
Ethernet0/7	Enabled	Disabled	Ethernet II	Ethernet1/1	Enabled	Disabled	Ethernet II
Ethernet1/2	Enabled	Disabled	Ethernet II	Ethernet1/3	Enabled	Disabled	Ethernet II

Caution: The port should not be a member of a trunk group.

9.1.2 TLVs

TLVs are type, length, and value sequences that carry information elements. The type field identifies the type of information, the length field measures the length of the information field in octets, and the value field contains the information itself.

LLDPDU TLVs fall into these categories: basic management TLVs, organizationally (IEEE 802.1 and IEEE 802.3) specific TLVs, and LLDP-MED (media endpoint discovery) TLVs. Basic management TLVs are essential to device management. Organizationally specific TLVs and LLDP-MED TLVs are used for enhanced device management; they are defined by standardization or other organizations and thus are optional to LLDPDUs.

Decide which of the following information is included in LLDPDU.

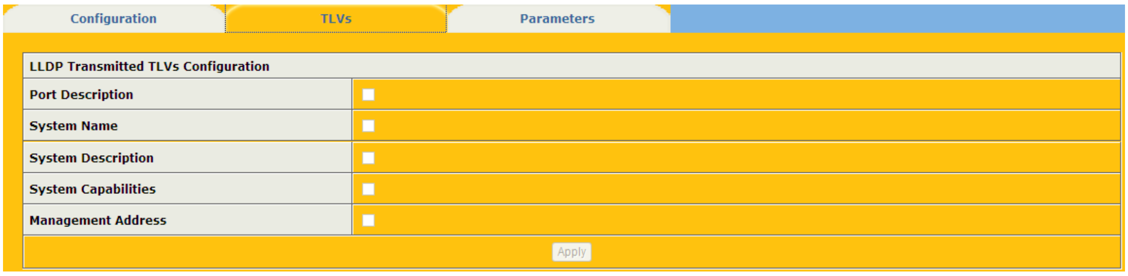
Port Description Identifies information of the interface, including the name of manufacturer, product name, and the version of the interface hardware & software.

System Name Identifies the administratively-assigned name for the device.

System Description A textual description of the device, this value typically includes the full name and version identification of the system's hardware type, software operating system, and networking software.

System Capability identifies the capabilities of the device and its primary function (e.g. repeater, Bridge, WLAN, Access Point, Router, Telephone, DOCSIS cable device, Station, etc.)

Management Address Identifies the IP address or MAC address of the device.



LLDP Transmitted TLVs Configuration	
Port Description	□
System Name	□
System Description	□
System Capabilities	□
Management Address	□

9.1.3 LLDP Parameters

This page sets LLDP parameters: **TX Interval**, **Tx Hold**, **Tx Delay**, **Re-init Delay,** and **Fast Count**.

Tx Interval The time interval between sending LLDP packets, its range is from 5 to 32768 seconds. The default value is 30 seconds.

Tx Hold TTL multiplier. TTL of TLV carried in LLDPDU is used to set the aging time on the neighbor device. Since TTL of TLV = TTL multiplier × Tx Interval, the aging time on the neighbor device can be adjusted by the TTL multiplier. The range of this value is from 2 to 10, and the default value is 4.

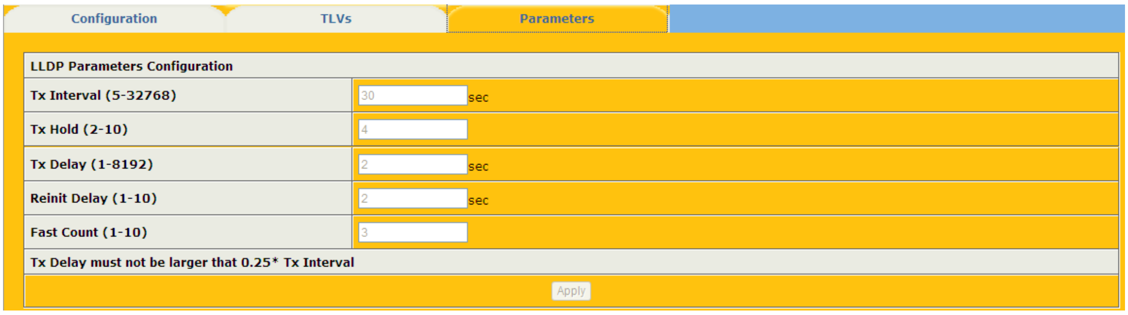
Tx Delay The delay period between successive LLDP packets which are initiated by port parameter changes. The range is from 1 to 8192, and the default value is 2.

Re-init Delay in the case of **LLDP Status** mode changes, the port will initialize the protocol state machine, and the switch will need to wait for **Re-init Delay** to be able to start the next initialization. The range of this value is from 1 to 10 seconds, and the default value is 2.

Fast Count The number of fast sending packets. It is in the range of 1 to 10, and the default value is 3.

Caution:

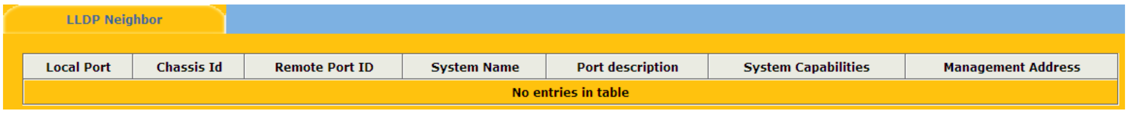
Tx Interval and Tx Delay both should be smaller than TTL; otherwise it will cause the neighbor device be unable to receive the LLDPDU from the current device after aging.



LLDP Parameters Configuration	
Tx Interval (5-32768)	30 sec
Tx Hold (2-10)	4
Tx Delay (1-8192)	2 sec
Reinit Delay (1-10)	2 sec
Fast Count (1-10)	3
Tx Delay must not be larger that 0.25* Tx Interval	

9.2 Neighbor Information

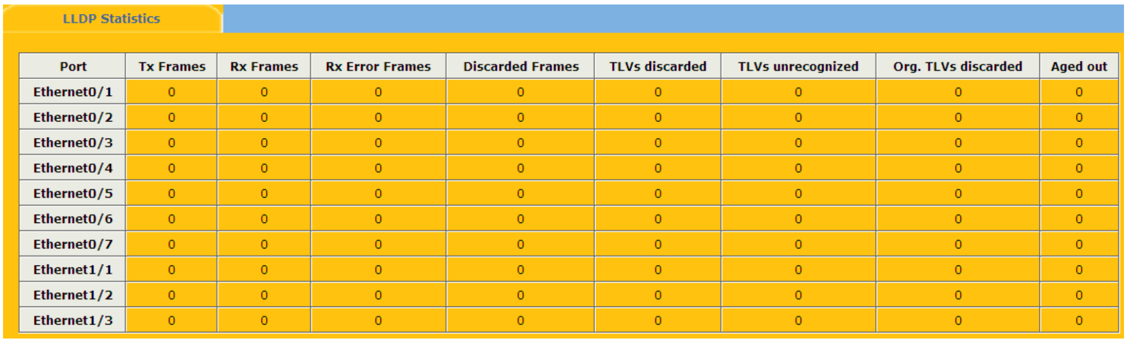
This page shows the Local Port, Chassis ID of a local device, and the Remote Port ID, System name, Port description, System Capabilities, and Management Address of a neighbor device.



Local Port	Chassis Id	Remote Port ID	System Name	Port description	System Capabilities	Management Address
No entries in table						

9.3 LLDP Statistics

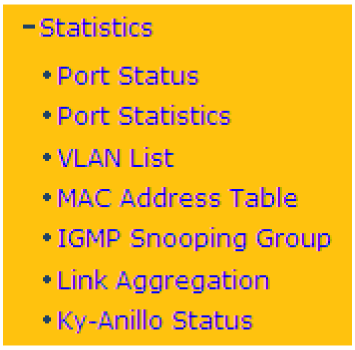
This page shows the statistics of Tx Frames, Rx Frames, Rx Error Frames, Discarded Frames, TLVs discarded, TLVs unrecognized, Org.TLVs discarded, and Age out packet counts of LLDP packets on each Ethernet port.



Port	Tx Frames	Rx Frames	Rx Error Frames	Discarded Frames	TLVs discarded	TLVs unrecognized	Org. TLVs discarded	Aged out
Ethernet0/1	0	0	0	0	0	0	0	0
Ethernet0/2	0	0	0	0	0	0	0	0
Ethernet0/3	0	0	0	0	0	0	0	0
Ethernet0/4	0	0	0	0	0	0	0	0
Ethernet0/5	0	0	0	0	0	0	0	0
Ethernet0/6	0	0	0	0	0	0	0	0
Ethernet0/7	0	0	0	0	0	0	0	0
Ethernet1/1	0	0	0	0	0	0	0	0
Ethernet1/2	0	0	0	0	0	0	0	0
Ethernet1/3	0	0	0	0	0	0	0	0

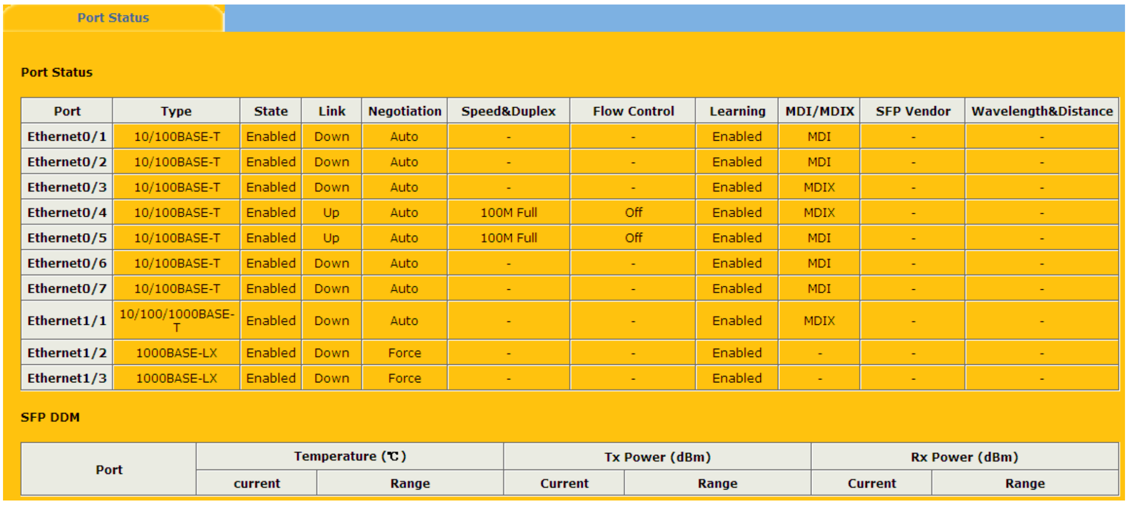
10 Statistics

It shows the following items:



10.1 Port Status

This page shows the State, Media, Link, Negotiation, Speed & Duplex, Flow Control, Learning and MDI/MDIX of each Ethernet port.



Port Status

Port Status

Port	Type	State	Link	Negotiation	Speed&Duplex	Flow Control	Learning	MDI/MDIX	SFP Vendor	Wavelength&Distance
Ethernet0/1	10/100BASE-T	Enabled	Down	Auto	-	-	Enabled	MDI	-	-
Ethernet0/2	10/100BASE-T	Enabled	Down	Auto	-	-	Enabled	MDI	-	-
Ethernet0/3	10/100BASE-T	Enabled	Down	Auto	-	-	Enabled	MDIX	-	-
Ethernet0/4	10/100BASE-T	Enabled	Up	Auto	100M Full	Off	Enabled	MDIX	-	-
Ethernet0/5	10/100BASE-T	Enabled	Up	Auto	100M Full	Off	Enabled	MDI	-	-
Ethernet0/6	10/100BASE-T	Enabled	Down	Auto	-	-	Enabled	MDI	-	-
Ethernet0/7	10/100BASE-T	Enabled	Down	Auto	-	-	Enabled	MDI	-	-
Ethernet1/1	10/100/1000BASE-T	Enabled	Down	Auto	-	-	Enabled	MDIX	-	-
Ethernet1/2	1000BASE-LX	Enabled	Down	Force	-	-	Enabled	-	-	-
Ethernet1/3	1000BASE-LX	Enabled	Down	Force	-	-	Enabled	-	-	-

SFP DDM

Port	Temperature (℃)		Tx Power (dBm)		Rx Power (dBm)	
	current	Range	Current	Range	Current	Range

10.2 Port Statistics

This page shows the TxGoodPkts, TxBadPkts, RxGoodPkts, RxBadPkts, TxAbort, Collision, and DropPkt of each Ethernet port.

TxGoodPkts The total number of outgoing normal packets on the port, including outgoing normal packets and normal pause frames

TxBadPkts The total byte number of outgoing error frames

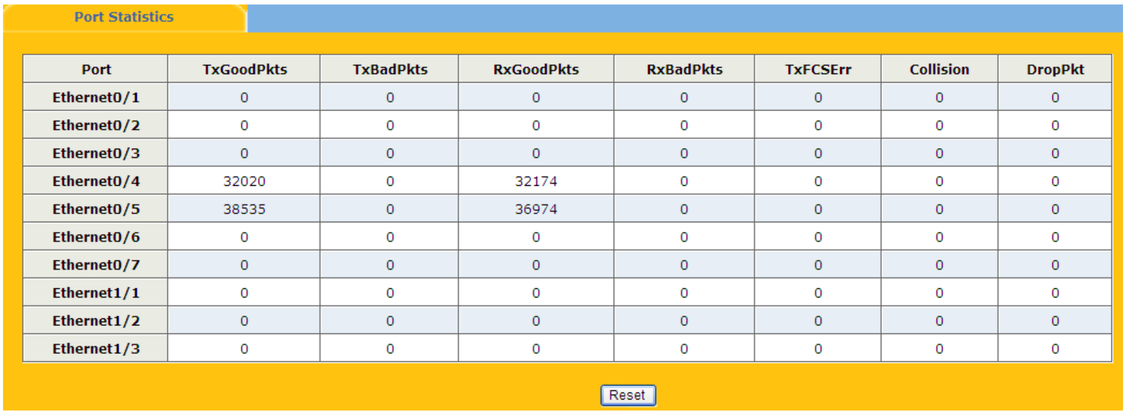
RxGoodPkts The total number of incoming normal packets on the port, including incoming normal packets and normal pause frames

RxBadPkts The total number of incoming error frames

TxFCSErr The number of FCS (Frame Check (Checking) Sequence) packets

Collision The number of detected collisions

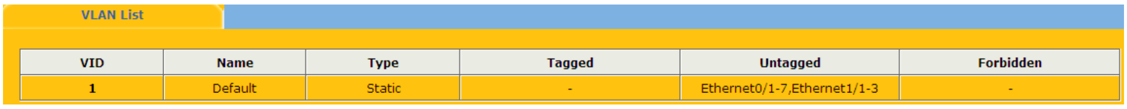
DropPkt The number of packets dropped for various reasons



Port	TxGoodPkts	TxBadPkts	RxGoodPkts	RxBadPkts	TxFCSErr	Collision	DropPkt
Ethernet0/1	0	0	0	0	0	0	0
Ethernet0/2	0	0	0	0	0	0	0
Ethernet0/3	0	0	0	0	0	0	0
Ethernet0/4	32020	0	32174	0	0	0	0
Ethernet0/5	38535	0	36974	0	0	0	0
Ethernet0/6	0	0	0	0	0	0	0
Ethernet0/7	0	0	0	0	0	0	0
Ethernet1/1	0	0	0	0	0	0	0
Ethernet1/2	0	0	0	0	0	0	0
Ethernet1/3	0	0	0	0	0	0	0

10.3 VLAN List

This page lists the information of all VLANs, including VID, Name, Type, Tagged ports, Untagged ports, and Forbidden ports. Type includes Static and Dynamic; Tagged lists all ports from which packets are sent tagged; Untagged lists all ports from which packets are sent untagged; and Forbidden lists all ports that cannot be added to the VLAN group.

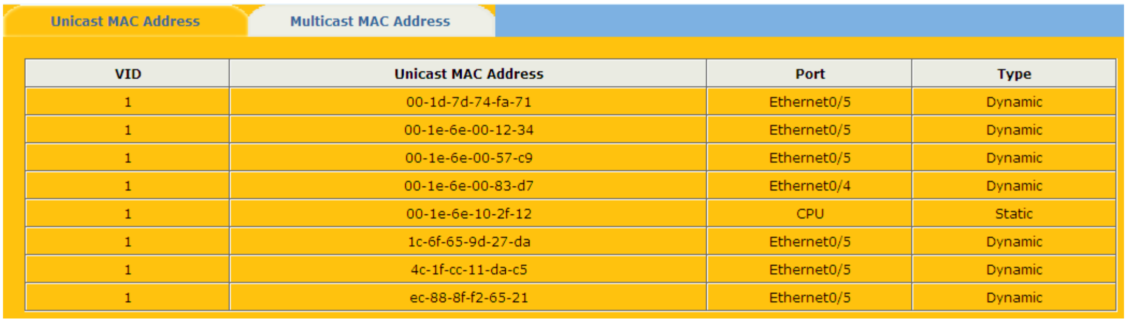


VID	Name	Type	Tagged	Untagged	Forbidden
1	Default	Static	-	Ethernet0/1-7,Ethernet1/1-3	-

10.4 MAC Address Table

10.4.1 Unicast MAC Address

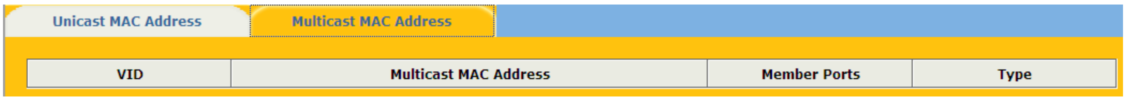
This page shows information of unicast MAC address entries, including VID, Unicast MAC Address, Port, and Type. Type includes Dynamic, Static, Blackhole and Learned.



VID	Unicast MAC Address	Port	Type
1	00-1d-7d-74-fa-71	Ethernet0/5	Dynamic
1	00-1e-6e-00-12-34	Ethernet0/5	Dynamic
1	00-1e-6e-00-57-c9	Ethernet0/5	Dynamic
1	00-1e-6e-00-83-d7	Ethernet0/4	Dynamic
1	00-1e-6e-10-2f-12	CPU	Static
1	1c-6f-65-9d-27-da	Ethernet0/5	Dynamic
1	4c-1f-cc-11-da-c5	Ethernet0/5	Dynamic
1	ec-88-8f-f2-65-21	Ethernet0/5	Dynamic

10.4.2 Multicast MAC Address

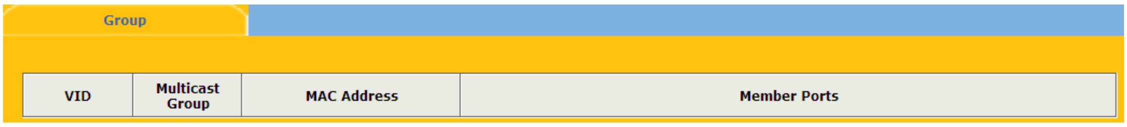
This page shows information of multicast MAC address.



VID	Multicast MAC Address	Member Ports	Type

10.5 IGMP Snooping Group

This page shows IGMP Snooping multicast group information.

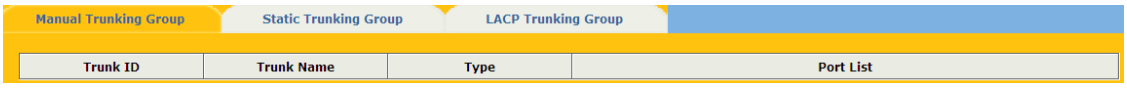


VID	Multicast Group	MAC Address	Member Ports

10.6 Link Aggregation

10.6.1 Manual Trunking Group

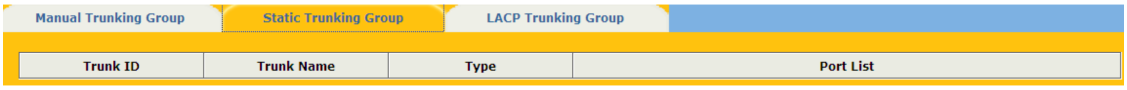
This page shows manual trunking information, including **Trunk ID**, **Trunk Name**, **Type**, and **Port List**. **Type** is fixed to **Manual**.



Trunk ID	Trunk Name	Type	Port List

10.6.2 Static Trunking Group

This page shows static trunk information, including **Trunk ID**, **Trunk Name**, **Type**, and **Port List**. **Type** is fixed to **Static**.



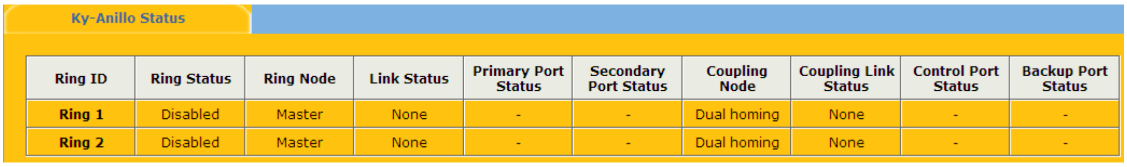
Trunk ID	Trunk Name	Type	Port List

10.6.3 LACP Trunking Group

This page shows LACP trunking group information, including **Priority**, **MAC** of Actor and Partner. It also shows the **Key**, **priority**, **Active state** of member ports.

10.7 Ky-Anillo Status

This page shows Ky-Anillo information, as shown follows.



Ring ID	Ring Status	Ring Node	Link Status	Primary Port Status	Secondary Port Status	Coupling Node	Coupling Link Status	Control Port Status	Backup Port Status
Ring 1	Disabled	Master	None	-	-	Dual homing	None	-	-
Ring 2	Disabled	Master	None	-	-	Dual homing	None	-	-

11 Spanning Tree

🕮 Note: the default global mode of spanning tree is RSTP.

1. Purpose of STP

Spanning tree protocol (STP) is a protocol conforming to IEEE 802.1d. It aims to eliminate loops on data link layer in a local area network (LAN). Devices running this protocol detect loops in the network by exchanging packets with one another and eliminate the loops detected by blocking specific ports until the network is pruned into one with a tree topology. As a network with a tree topology is loop-free, STP prevents packets in it from being duplicated and forwarded endlessly and prevents device and network performance degradation caused by data loops.

In the narrow sense, STP refers to IEEE 802.1d STP; in the broad sense, STP refers to the IEEE 802.1d STP and various enhanced spanning tree protocols derived from that protocol.

2. Protocol Packets of STP

STP uses bridge protocol data units (BPDUs), also known as configuration messages, as its protocol packets. STP identifies the network topology by transmitting BPDUs between STP compliant network devices, typically switches and routers. BPDUs contain sufficient information for the network devices to complete the spanning tree calculation.

3. Basic concepts in STP

(1) Root bridge

A tree network must have a root; hence the concept of **root bridge** has been introduced in STP.

There is one and only one root bridge in an entire STP-based network at a given time. But the root bridge can change because of with changes of the network topology. Therefore, the root bridge is not fixed.

Upon initialization of a network, each device generates and sends out BPDUs periodically with itself as the root bridge; after network convergence, only the root bridge generates and sends out configuration BPDUs at a certain interval, and the other devices just forward the BPDUs.

(2) Root port

On a non-root bridge device, the root port is the port with the lowest path cost to the root bridge. The root port is used for communicating with the root bridge. A non-root-bridge device has one and only one root port. The root bridge has no root port.

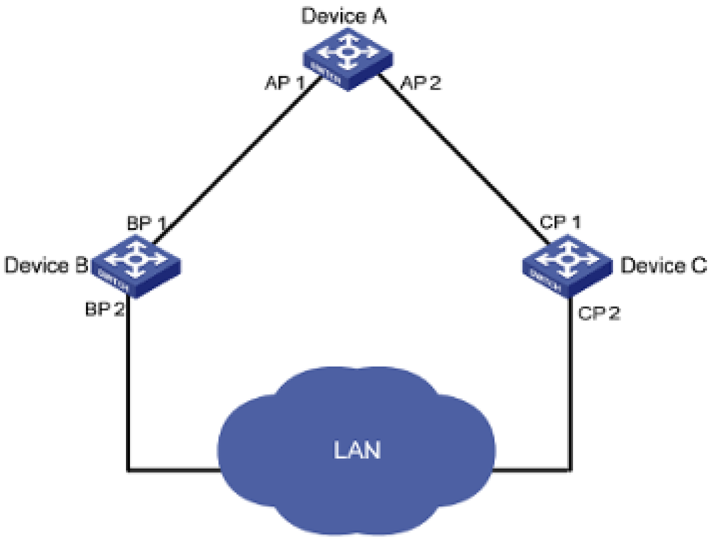
(3) Designated bridge and designated port

Refer to the following table for the description of designated bridge and designated port.

Classification	Designated bridge	Designated port
For a device	A designated bridge is a device that is directly connected to a switch and is responsible for forwarding BPDUs to this switch.	The port through which the designated bridge forwards BPDUs to this device
For a LAN	A designated bridge is a device responsible for forwarding BPDUs to this LAN segment.	The port through which the designated bridge forwards BPDUs to this LAN segment

The following figure shows designated bridges and designated ports. In the figure, AP1 and AP2, BP1 and BP2, and CP1 and CP2 are ports on Device A, Device B, and Device C respectively.

- If Device A forwards BPDUs to Device B through AP1, the designated bridge for Device B is Device A, and the designated port is the port AP1 on Device A.
- Two devices are connected to the LAN: Device B and Device C. If Device B forwards BPDUs to the LAN, the designated bridge for the LAN is Device B, and the designated port is the port BP2 on Device B.



(4) Bridge ID

A bridge ID consists of eight bytes, where the first two bytes represent the bridge priority of the device, and the latter six bytes represent the MAC address of the device.

(5) Path cost

STP uses path costs to indicate the quality of links. A small path cost indicates a higher link quality. The path cost of a port is related to the rate of the link connecting the port. The higher the link rate, the smaller the path cost.

By comparing the path costs of different links, STP selects the most robust links and blocks the other links to prune the network into a tree.

11.1 STP

Note: The default setting is **RSTP**.

11.1.1 Basic STP

The following factors should be considered when setting STP configuration:

Priority The priority of switch, it ranges from 0 to 65535, and the default value is 32768. The smaller the value is, the higher the priority is.

Hello Time The interval for sending hello packets. Hello packets are used to check link state. A switch sends hello packets to its neighboring devices at a regular interval (the hello time) to check whether the links are faulty. It ranges from 1 to 10 seconds, and the default value is 2 seconds.

Max Age Lifetime for the configuration BPDUs to be kept in a switch. Switches use max age parameter to determine whether a received configuration BPDU times out. Spanning trees will be recalculated if a configuration BPDU received by a port times out. This value is in the range of 6 to 40 seconds, and is 20 seconds by default.

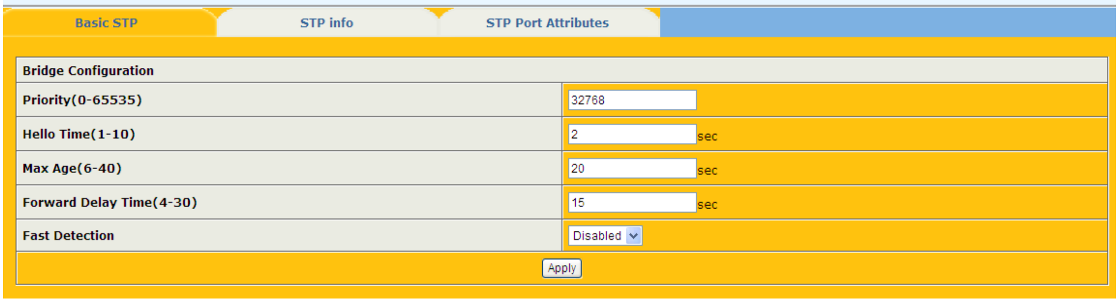
Forward Delay Time This value is in the range of 4 to 30 seconds, and is 15 seconds by default. To prevent the occurrence of a temporary loop, when a port changes its state from discarding to forwarding, it undergoes an intermediate state and waits for a specific period of time to synchronize with the state transition of the remote switches. This state transition period is determined by **Forward Delay Time** configured on the root bridge, and applies to all non-root bridges.

Fast Detection Enable or disable Fast Detection, it is disabled by default.

To prevent temporary loopback, when a port status changes from discarding to forwarding, it will experience an intermediate state and wait for a specified time to synchronize with remote switched. Forward Delay Time configured in the root bridge determines the intermediate state time.

As for the configuration of the three time-related parameters (that is, the hello time, forward delay, and max age parameters), the following formulas must be met to prevent frequent network jitter.

2 x (forward delay – 1 second) >= max age
Max age >= 2 x (hello time + 1 second)



Bridge Configuration	
Priority(0-65535)	32768
Hello Time(1-10)	2 sec
Max Age(6-40)	20 sec
Forward Delay Time(4-30)	15 sec
Fast Detection	Disabled

11.1.2 STP Information

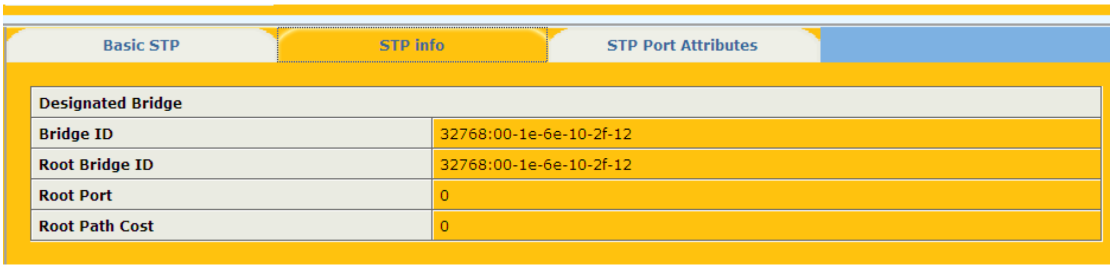
This page lists basic information of **Designated Bridge**, including Bridge ID, Root Bridge ID, Root Port, and Root Path Cost.

Bridge ID ID of designated switch, designated bridge priority plus MAC address

Root Bridge ID ID of the root bridge, consisting of root bridge priority and MAC address

Root Port The spanning tree root port.

Root Path Cost The cost of the shortest path to the root bridge.



Designated Bridge	
Bridge ID	32768:00-1e-6e-10-2f-12
Root Bridge ID	32768:00-1e-6e-10-2f-12
Root Port	0
Root Path Cost	0

11.1.3 STP Port Attributes

On this page, you can configure STP attributes for each port.

Port Specify a port to configure

STP Enable or disable STP status for a specific port

Port Fast An attribute of STP, it can make switch directly change to forwarding state. Post Fast only takes effect on the port not connected to switch. It takes 30 seconds for STP to change a normal port to forwarding state, which will cause some system using DHCP time out, thus fails to get IP address. While enabling port fast can avoid this problem.

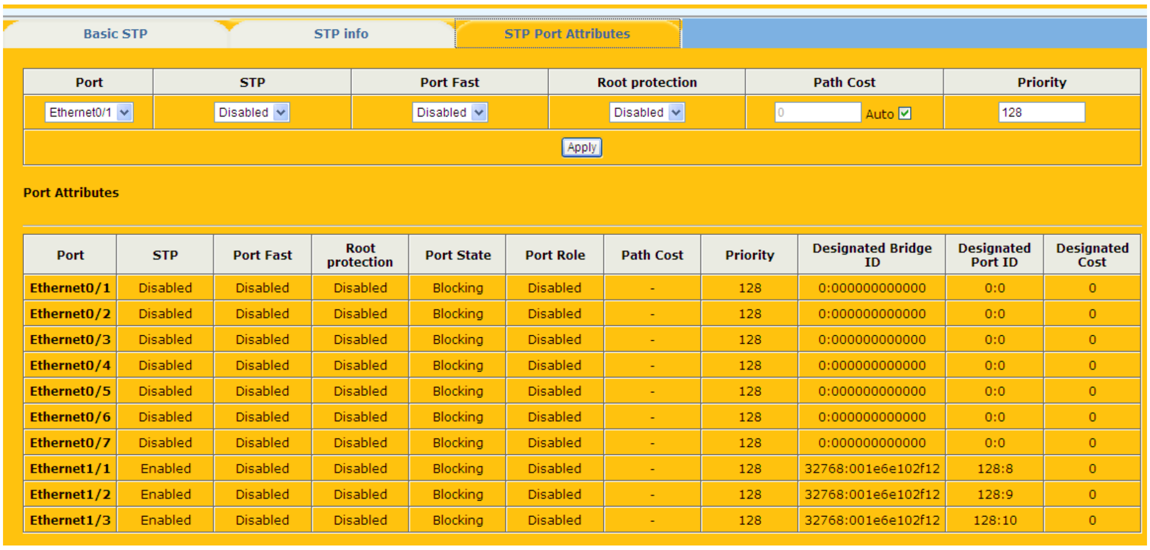
Root protection By default, the root protection function is disabled.

Due to configuration error or malicious attack, the root bridge in the network may receive configuration BPDUs with priorities higher than that of a root bridge, which will cause a new root bridge to be elected and network topology jitter will occur. In this case, data flows that should have been transmitted along a high-speed link may be led to a low-speed link. This problem can be resolved by enabling the root protection function. Root-protection-enabled ports can only be kept as designated ports. When a port of this type receives configuration BPDUs with higher priorities, that is, when it is to become a non-designated port, it turns to the discarding state and stops forwarding packets (as if it were disconnected from the link).

Path Cost Set the path cost of a specified port. It ranges from 1 to 200000000, by default, it is 55.

Priority Port priority, it is in the range of 0 to 255; the default value is 128.

The lower part of the interface shows the port attributes.



Port	STP	Port Fast	Root protection	Path Cost	Priority
Ethernet0/1	Disabled	Disabled	Disabled	0 Auto ☑	128

Port Attributes

Port	STP	Port Fast	Root protection	Port State	Port Role	Path Cost	Priority	Designated Bridge ID	Designated Port ID	Designated Cost
Ethernet0/1	Disabled	Disabled	Disabled	Blocking	Disabled	-	128	0:000000000000	0:0	0
Ethernet0/2	Disabled	Disabled	Disabled	Blocking	Disabled	-	128	0:000000000000	0:0	0
Ethernet0/3	Disabled	Disabled	Disabled	Blocking	Disabled	-	128	0:000000000000	0:0	0
Ethernet0/4	Disabled	Disabled	Disabled	Blocking	Disabled	-	128	0:000000000000	0:0	0
Ethernet0/5	Disabled	Disabled	Disabled	Blocking	Disabled	-	128	0:000000000000	0:0	0
Ethernet0/6	Disabled	Disabled	Disabled	Blocking	Disabled	-	128	0:000000000000	0:0	0
Ethernet0/7	Disabled	Disabled	Disabled	Blocking	Disabled	-	128	0:000000000000	0:0	0
Ethernet1/1	Enabled	Disabled	Disabled	Blocking	Disabled	-	128	32768:001e6e102f12	128:8	0
Ethernet1/2	Enabled	Disabled	Disabled	Blocking	Disabled	-	128	32768:001e6e102f12	128:9	0
Ethernet1/3	Enabled	Disabled	Disabled	Blocking	Disabled	-	128	32768:001e6e102f12	128:10	0

11.2 RSTP

Note: Enable STP in 3 Advanced Configuration, the STP parameters are still effective.

Rapid spanning tree protocol (RSTP) is an optimized version of STP. RSTP allows a newly elected root port or designated port to enter the forwarding state much quicker under certain conditions than in STP. As a result, it takes a shorter time for the network to reach the final topology stability.

Point to Point: Enable or disable Point to Point. It is the link directly connected with two switches. If it is enabled, it means the link connected to the current port is point to point link, which enables the port to change to forwarding status.

Migration: For backward compatibility with switches running 802.1d, RSTP selectively sends 802.1d configuration BPDUs and TCN BPDUs on per-port basis.

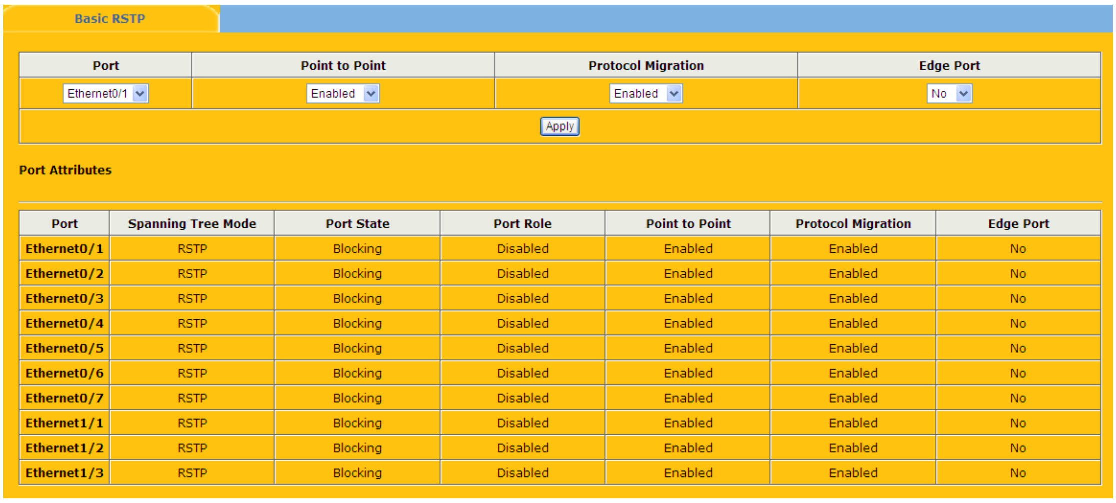
When a port is initialized, the migration-delay timer is started, and RSTP BPDUs are sent in this time interval. When this timer is active, the switch processes all BPDUs received on the port and ignores the protocol type.

If the switch receives an 802.1d BPDU after the port's migration-delay timer is expired, it assumes that it is connected to an 802.1d switch and starts using only 802.1d BPDUs. However, if the RSTP switch is using 802.1d BPDUs on a port and receives an RSTP BPDU after the timer is timed out, it restarts the timer and starts using RSTP BPDUs on that port.

Edge Port: selects **Enabled** to configure the specified Ethernet port as an edge port. By default, all Ethernet ports are non-edge ports.

An edge port is such a port that is directly connected to a user terminal instead of another switch or network segment. Rapid transition to the forwarding state is applied to edge ports, because no loop can be incurred by network topology change on edge ports. The spanning tree protocol allows a port to enter the forwarding state rapidly by setting it to be an edge port, and it is recommended to configure the Ethernet ports connected directly to user terminals as edge ports, so that they may enter the forwarding state immediately.

Normally, configuration BPDUs cannot reach an edge port because the port is not connected to another switch. But, in case that BPDU protection function is disabled on an edge port, configuration BPDUs sent deliberately by a malicious user may reach the port. If an edge port receives a BPDU, it changes itself to be a non-edge port.



Port	Point to Point	Protocol Migration	Edge Port
Ethernet0/1	Enabled	Enabled	No

Port Attributes

Port	Spanning Tree Mode	Port State	Port Role	Point to Point	Protocol Migration	Edge Port
Ethernet0/1	RSTP	Blocking	Disabled	Enabled	Enabled	No
Ethernet0/2	RSTP	Blocking	Disabled	Enabled	Enabled	No
Ethernet0/3	RSTP	Blocking	Disabled	Enabled	Enabled	No
Ethernet0/4	RSTP	Blocking	Disabled	Enabled	Enabled	No
Ethernet0/5	RSTP	Blocking	Disabled	Enabled	Enabled	No
Ethernet0/6	RSTP	Blocking	Disabled	Enabled	Enabled	No
Ethernet0/7	RSTP	Blocking	Disabled	Enabled	Enabled	No
Ethernet1/1	RSTP	Blocking	Disabled	Enabled	Enabled	No
Ethernet1/2	RSTP	Blocking	Disabled	Enabled	Enabled	No
Ethernet1/3	RSTP	Blocking	Disabled	Enabled	Enabled	No

⚠ Caution : Ky-Anillo and STP cannot be configured at the same time.

12 Ky-Anillo Configuration

Note:

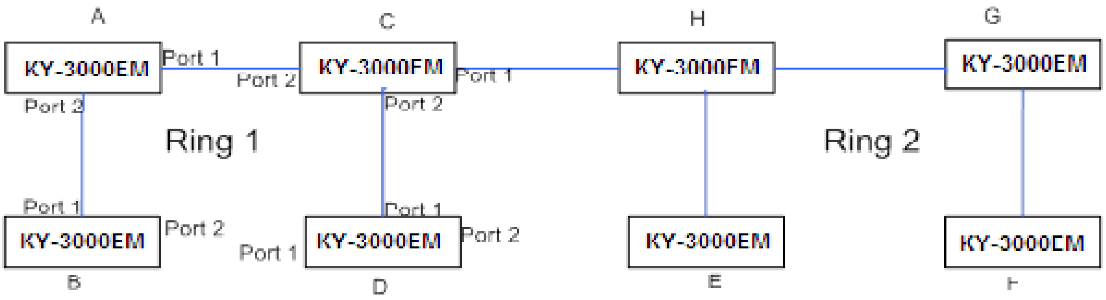
Enable Ky-Anillo in 3 Advanced Configuration. But STP cannot be enabled with Ky-Anillo at the same time.

Ky-Anillo is a link layer protocol. It can prevent broadcast storm when the Ethernet ring is complete, while it can recover the communication among each nodes when one link is down on the Ethernet ring.

At present, STP and Ky-Anillo can solve the ring problem in layer 2 Ethernet. STP is used maturely, but the recovery time is in second; while Ky-Anillo can cover the communication more quickly, and the nodes in the ring don't affect the recovery time of Ky-Anillo, so it can used in large-diameter network.

Ky-Anillo network:

Coupling network:



The devices with the same ring ID and control VLAN are connected to form a Ky-Anillo domain.

A Ky-Anillo domain has aKy-Anillo primary ring, control VLAN, mater node, transit node, primary port, secondary port, public port and edge port and so on.

As shown in the above figure, there are two rings: ring 1 and ring 2. They can comprise network with coupling and dual homing.

In the Ky-Anillo protocol, at most two level ring is permitted, and each ring has an ID. A switch can be a node in a ring.

12.1 Ky-Anillo

This page sets Ky-Anillo configuration: Ring ID, Ring Status, Control VLAN, Protect VLAN, Fast detection status, Node mode, Primary port and Secondary port.

Ring ID The ring ID identifies which ring this switch belongs to. In Ky-Anillo protocol, there are two levels of rings: Ring 1 and Ring 2.

Ring Status To enable/disable the ring for the specified switch. Note that a switch can only be enabled in one ring.

Note: A switch can be enabled in only one ring.

Control VLAN This is the VLAN used for transferring Ky-Anillo protocol packets within the Ky-Anillo.

Protect VLAN It is used for transferring data packets. When a VLAN is created in a ring, this VLAN must be configured as a **Protect VLAN** or **Control VLAN**.

Fast detection status When enabled, the Ky-Anillo will use the **FastHelloTime** and **FastFailTime** instead of **HelloTime** and **FailTime** to send packets periodically to detect ring connect status.

Node mode Each switch on an Ky-Anillo is called a node. There are two types of nodes: **Master** and **Transit**. The master node sends HELLO (healthy detect) packet periodically from its primary port. This packet is transmitted on the ring by the transit nodes in turn. If the secondary port of the master receives the HELLO packet sent by itself, this indicates the ring is completed. Otherwise, the HELLO packet cannot reach itself, and the master node will consider a link failure has occurred in the ring.

The transit nodes are responsible for monitoring the states of the Ky-Anillo links they are directly connected to, and notify the master node of the link changes.

Caution: A ring should have, and can only have one Master node.

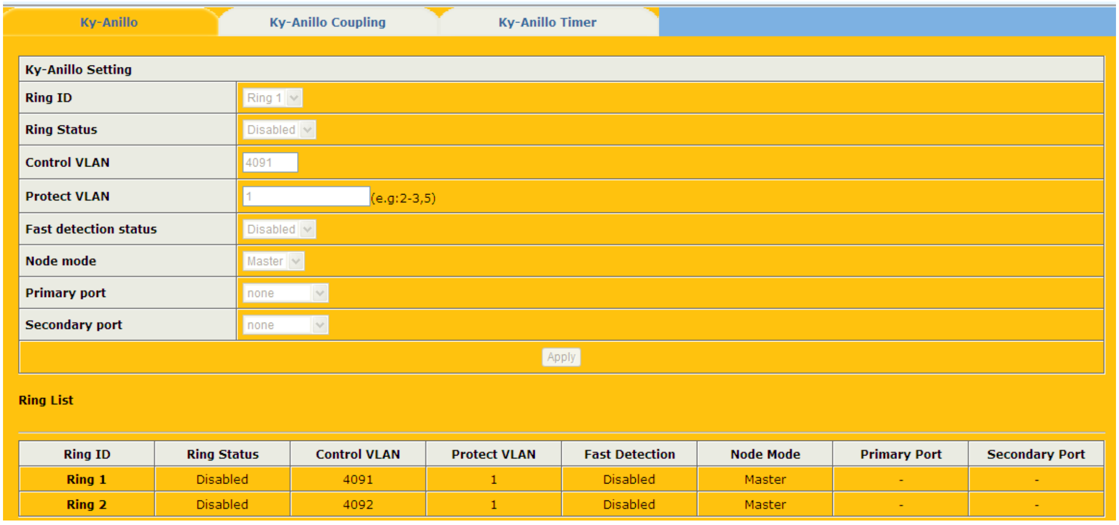
Primary port The master node sends Ky-Anillo packets via its primary port.

Secondary port The master node uses it to receive Ky-Anillo packets. Block it to prevent flooding, while unblock it when a link failure has occurred.

The primary and secondary ports of a transit node have the same functions.

The bottom part of this page lists the configuration of each of the two rings.

Caution: A port with STP enabled cannot act as primary port or secondary port.



Ky-Anillo Setting

Ring ID	Ring 1
Ring Status	Disabled
Control VLAN	4091
Protect VLAN	1 (e.g:2-3,5)
Fast detection status	Disabled
Node mode	Master
Primary port	none
Secondary port	none

Ring List

Ring ID	Ring Status	Control VLAN	Protect VLAN	Fast Detection	Node Mode	Primary Port	Secondary Port
Ring 1	Disabled	4091	1	Disabled	Master	-	-
Ring 2	Disabled	4092	1	Disabled	Master	-	-

12.2 Ky-Anillo Coupling

This page sets Ky-Anillo coupling configuration: Ring, Coupling Status, Coupling Mode, Coupling Control Port and Coupling Backup Port.

Ring: The ring ID associated with coupling functions.

Coupling Status: To enable/disable the coupling function of the selected ring. To enable this function, the associated ring must be enabled first.

Coupling Mode: There are four coupling modes: Dual homing, Coupling Primary, Coupling Backup, and Peer Coupling. Coupling Control Port and Coupling Backup Port play different roles in different modes. There is a coupling control port and a coupling backup port in Dual homing mode; there is only a coupling control port In Coupling Primary and Peer Coupling modes; there is only a coupling backup port in Coupling Backup mode.

Coupling Control Port: Assign the port that is connected to the other ring as primary connection between rings. The status of this port is generally set to forwarding.

Coupling Backup Port: Assign the port that is connected to the other ring for backup. In case that the **Coupling Control Port** is broken, this port is unblocked.

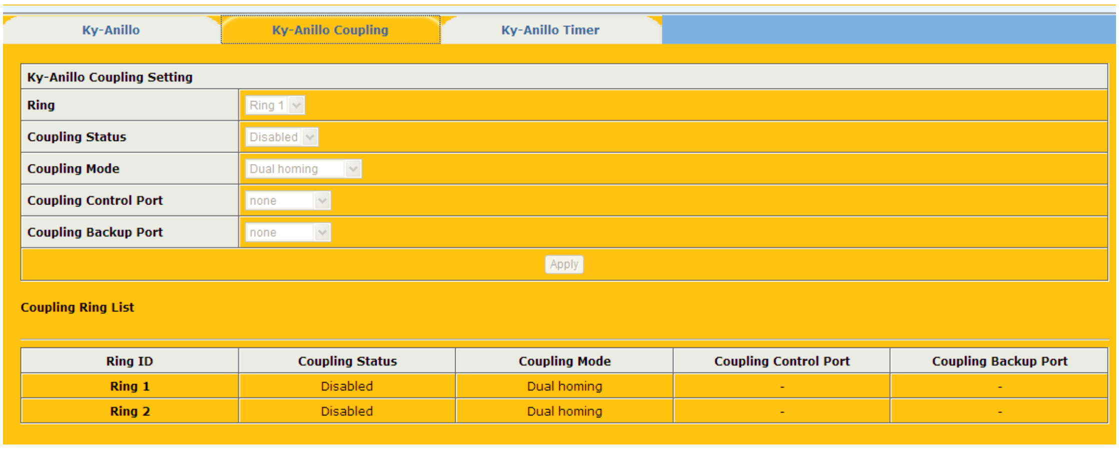
Coupling Mode configuration rules:

1. Two directly connected rings cannot have the same **Ring ID**.
2. Within a ring, only one switch can be set as **Coupling Primary**, and the other one as **Coupling Backup**.
3. Within the same level ring, more than one switch can be set as **Dual homing**.

The bottom part of this page lists the configuration of two coupling rings.

Caution:

- Coupling control port cannot be the same with primary port or secondary port.
- A port with STP enabled cannot act as coupling control port.



Ky-Anillo Coupling Setting	
Ring	Ring 1
Coupling Status	Disabled
Coupling Mode	Dual homing
Coupling Control Port	none
Coupling Backup Port	none

Coupling Ring List

Ring ID	Coupling Status	Coupling Mode	Coupling Control Port	Coupling Backup Port
Ring 1	Disabled	Dual homing	-	-
Ring 2	Disabled	Dual homing	-	-

12.3 Ky-Anillo Timer

This page sets Ky-Anillo timer configurations: HelloTime, FailTime, FastHelloTme and FastFailTime.

HelloTime Sets hello time of the switch. It is in the range of 1 to 10 seconds. The default value is 1 second.

FailTime Sets fail time of the switch. It is in the range of 3 to 30 seconds, and the default value is 3 seconds.

FastHelloTime Sets fast hello time of the switch. It is in the range of 10 to 500 milliseconds, and the default value is 10 milliseconds.

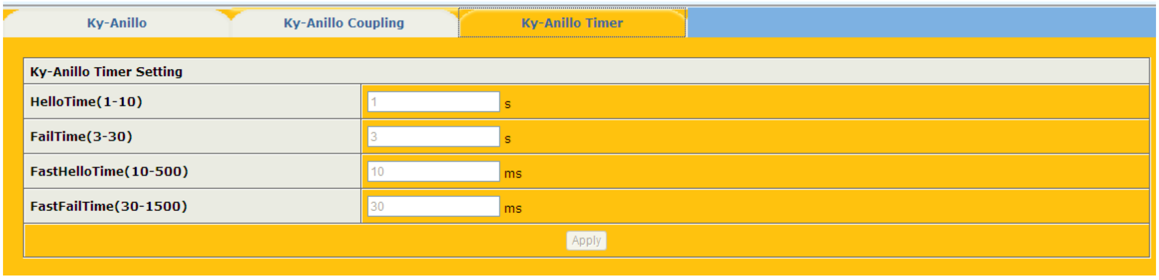
FastFailTime Sets fast fail time of the switch. It is in the range of 30 to 1500 milliseconds. The default value is 30 milliseconds.

These timer values are used in master node. When the hello timer times out, the master node will send out a hello packet. If the fail timer times out, it indicates that a link failure has occurred in the ring.

If **Fast detection status** in Ky-Anillo tab page is enabled, the master node will use the **FastHelloTime** and **FastFailTime** instead of **HelloTime** and **FailTime** to set the hello timer and fail timer.

To set those parameters, the following rules shall be met:

3* **HelloTime** < =**FailTime** and **3* FastHelloTime** <= **FastFailTime.**



Ky-Anillo Timer Setting	
HelloTime(1-10)	1 s
FailTime(3-30)	3 s
FastHelloTime(10-500)	10 ms
FastFailTime(30-1500)	30 ms

13 SNMP Manager

The Simple Network Management Protocol (SNMP) is an Internet standard protocol, widely used for a network management station (NMS) to access and operate the devices (SNMP agents) on a network, regardless of their vendors, physical characteristics and interconnect technologies.

SNMP enables network administrators to read and set the variables on managed devices to monitor their operating and health state, diagnose network problems, and collect statistics for management purposes.

KY-3000EM industrial switch SNMP agents support three SNMP versions: SNMPv1, SNMPv2c, and SNMPv3.

SNMPv1 uses Community Name authentication to control access to SNMP agents. SNMPv1 Community Name falls into “read only” passwords and “read and write” passwords.

A read Community Name enables reading data from an SNMP agent.
A read and write Community Name enables reading data and setting variables on an SNMP agent.

SNMPv2c also uses Community Name authentication for SNMP agent access control. It is compatible with SNMPv1, but supports more operation modes, data types, and error codes.

SNMPv3 uses a user-based security model (USM) to secure SNMP communication. You can configure authentication and privacy mechanisms to authenticate access and encrypt SNMP

📖 Note:

An NMS and an SNMP agent must use the same SNMP version to communicate with each other.

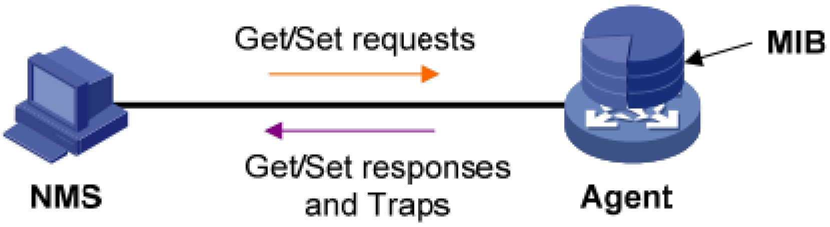
SNMP management frame includes three network elements: SNMP Management Station, SNMP Agent and MIB (Management Information Base).

SNMP Management Station: SNMP Management Station is the workstation for running the SNMP client program, providing a friendly management interface for the administrator to manage the most network devices conveniently.

SNMP Agent: Agent is the server software operated on network devices with the responsibility of receiving and processing the request packets from SNMP Management Station. In the meanwhile, Agent will inform the SNMP Management Station of the events whenever the device status changes or the device encounters any abnormalities such as restarting the device.

MIB: MIB is the set of the managed objects. MIB defines a few attributes of the managed objects, including the names, the access rights, and the data types. Every SNMP Agent has its own MIB. The SNMP Management station can read/write the MIB objects basing on its management right.

SNMP Management Station is the manager of SNMP network while SNMP Agent is the managed object. The information between SNMP Management Station and SNMP Agent are exchanged through SNMP (Simple Network Management Protocol). The relationship among SNMP Management Station, SNMP Agent and MIB is illustrated in the following figure.



13.1 SNMP Account

13.1.1 SNMP Community

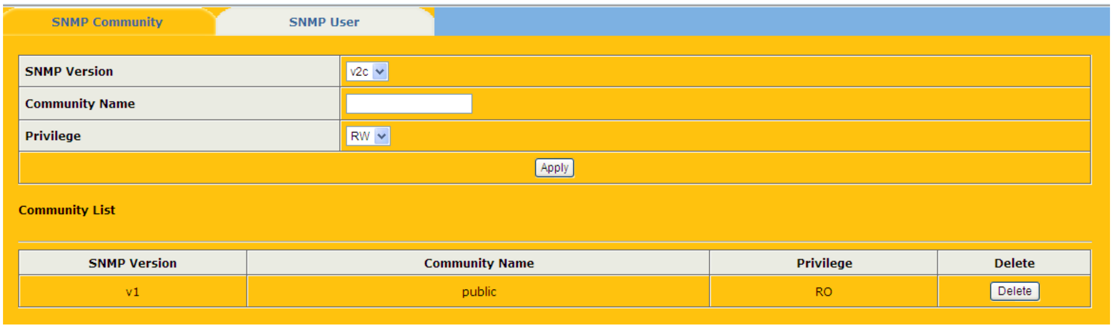
Create SNMP account.

- Select SNMP version (v1 and v2c)
- Type a community name; it is a string of 3 to 16 characters.
- Select the privilege (RW and RO)

  RO: Specifies the community that has been created has read-only permission to access MIB objects. Communities of this type can only query MIBs for device information.

  RW: Specifies the community that has been created has read-write permission to access MIB objects. Communities of this type are capable of configuring devices.

The community list is shown at the lower part of the interface.



SNMP Version	v2c
Community Name	
Privilege	RW

Community List

SNMP Version	Community Name	Privilege	Delete
v1	public	RO	Delete

13.1.2 SNMP User

The User can manage the device via the management station software. You can configure the SNMP User on this page.

User Name: Type the User Name here. It is a string of 3 to 16 characters.

Privilege: Select the privilege to be RO or RW.

SNMP V3 Encryption: Click to enable SNMP V3 Encryption. If SNMP V3 Encryption is not selected, neither encryption nor authentication will be performed.

Auth Algorithm: Select the Authentication Algorithm for the SNMP v3 User.

MD5	The authentication is performed via HMAC-MD5 algorithm.
SHA	The authentication is performed via SHA (Secure Hash Algorithm). This authentication mode has a higher security than MD5 mode.

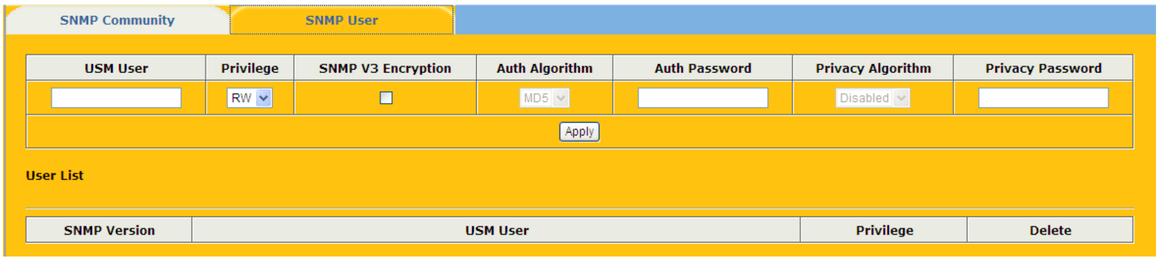
Auth Password: Type the password for authentication. It is a string of 9 to 15 characters in plain text, or a 32-bit hexadecimal number in cipher text if MD5 algorithm is used, or a 40-bit hexadecimal number in cipher text if SHA algorithm is used.

Privacy Algorithm: Select the Privacy Algorithm for the SNMP v3 User.

Disable: No privacy method is used.
DES: DES encryption method is used.
AES: AES encryption method is used.

Privacy Password Type the privacy password. It is a string of 9 to 15 characters in plain text, or a 32-bit hexadecimal number in cipher text if MD5 algorithm is used, or a 40-bit hexadecimal number in cipher text if SHA algorithm is used.

The user list is displayed at the bottom, the users can be deleted.



USM User	Privilege	SNMP V3 Encryption	Auth Algorithm	Auth Password	Privacy Algorithm	Privacy Password
	RW	☐	MD5		Disabled	

User List

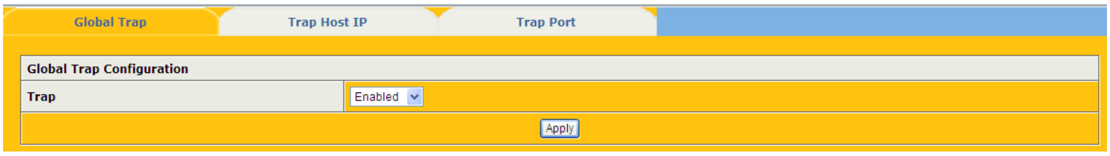
SNMP Version	USM User	Privilege	Delete

13.2 SNMP Trap

Agent use SNMP Trap to send traps to NMS.

13.2.1 Global Trap

On this page, you can enable or disable Trap globally.

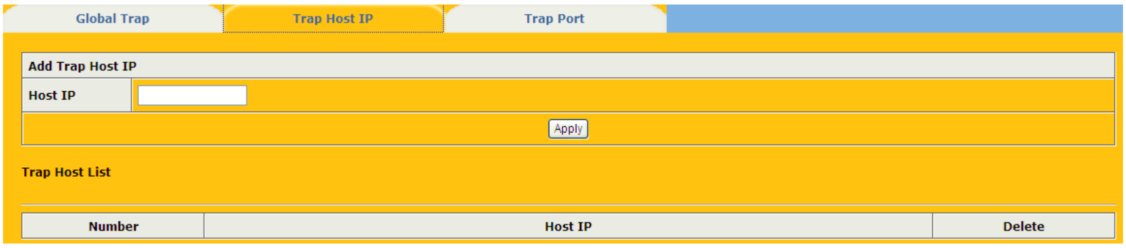


Global Trap Configuration	
Trap	Enabled

13.2.2 Trap Host IP

This tab page specifies SNMP trap Host IP. Host IP is the IPv4 address of the host to receive the traps.

The bottom part of this page lists all existing trap host IP addresses. They can be deleted.



Add Trap Host IP	
Host IP	

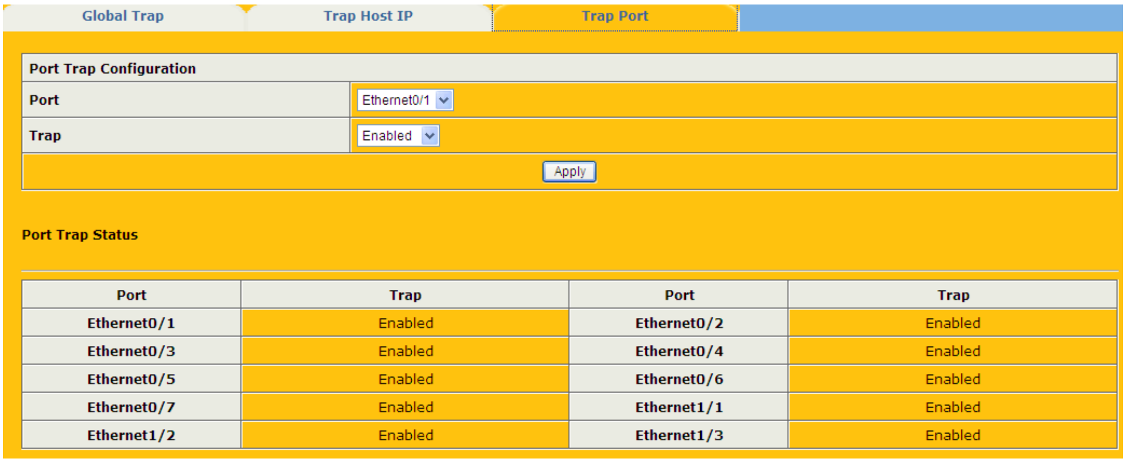
Trap Host List

Number	Host IP	Delete

13.2.3 Trap Port

Enable or disable the trap function for each port. The trap information refers to linkup or link-down.

The bottom part of this page lists the trap status of all ports.



Port Trap Configuration	
Port	Ethernet0/1
Trap	Enabled

Port Trap Status

Port	Trap	Port	Trap
Ethernet0/1	Enabled	Ethernet0/2	Enabled
Ethernet0/3	Enabled	Ethernet0/4	Enabled
Ethernet0/5	Enabled	Ethernet0/6	Enabled
Ethernet0/7	Enabled	Ethernet1/1	Enabled
Ethernet1/2	Enabled	Ethernet1/3	Enabled

14 RMON

Remote Monitoring (RMON) is used to realize the monitoring and management from the management devices to the managed devices on the network by implementing such functions as statistics and alarm. The statistics function enables a managed device to periodically or continuously track various traffic information on the network segments connecting to its ports, such as total number of received packets or total number of oversize packets received. The alarm function enables a managed device to monitor the value of a specified MIB variable, log the event and send a trap to the management device when the value reaches the threshold, such as the port rate reaches a certain value or the potion of broadcast packets received in the total packets reaches a certain value.

Both the RMON protocol and the Simple Network Management Protocol (SNMP) are used for remote network management:

- RMON is implemented on the basis of the SNMP, which is thus enhanced. RMON sends traps to the management device to notify the abnormality of the alarm variables by using the SNMP trap packet sending mechanism. Although trap is also defined in SNMP, it is usually used to notify the management device whether some functions on managed devices operate normally and the change of physical status of interfaces. Traps in RMON and those in SNMP have different monitored targets, triggering conditions, and report contents.
- RMON provides an efficient means of monitoring subnets and allows SNMP to monitor remote network devices in a more proactive and effective way. The RMON protocol defines that when an alarm threshold is reached on a managed device, the managed device sends a trap to the management device automatically, so the management device has no need to get the values of MIB variables for multiple times and compare them, and thus greatly reducing the communication traffic between the management device and the managed device. In this way, you can manage a large scale of network easily and effectively.

14.1 Statistics

This page shows the statistics of Stats Octets, Stats Pkts, Broadcastkts, MulticastPkts, CRC Align Errors, Under size Pkts, Over size Pkts, Fragments, Jabbers, Collisions, Pkts 64 Octets, Pkts 64 to 127 Octets, Pkts 128 to 255 Octets, Pkts 256 to 511 Octets, Pkts512 to 1023 Octets, Pkts1024 to 1518 Octets, and Drop Events of each ethernet port.

Stats Octets The total number of octets of received and sent data, including bad packets, received from network; it excludes framing bits but includes Frame Check Sequence (FCS) octets.

Stats Pkts The total number of packets received and sent, including bad packets, broadcast packets and multicast packets.

Broadcastkts The total number of the received good packets that are directed to the broadcast address, except the multicast packets.

MulticastPkts The total number of the received good packets that are directed to a multicast address, except the packets directed to the broadcast address.

CRC Align Errors
The total number of the received packets that has a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets (both inclusive), and has either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).

Under size Pkts
The total number of the received packets that are less than 64 octets long (excluding framing bits, but including FCS octets).

Over size Pkts
The total number of the received packets that are longer than 1518 octets (excluding framing bits, but including FCS octets).

Fragments
The total number of the received packets that are less than 64 octets in length (excluding framing bits, but including FCS octets), and has either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).

Jabbers
The total number of the received packets that are longer than 1518 octets (excluding framing bits, but including FCS octets), and has either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).

Collisions
The best estimate of the total number of collisions on this Ethernet segment.

Pkts 64 Octets
The total number of received packets, that are 64 octets in length (excluding framing bits, but including FCS octets), including bad packets.

Pkts 65 to 127 Octets
The total number of received packets, that are between 65 and 127 octets in length inclusive (excluding framing bits, but including FCS octets), including bad packets.

Pkts 128 to 255 Octets
The total number of received packets, that are between 128 and 255 octets in length inclusive (excluding framing bits, but including FCS octets), including bad packets.

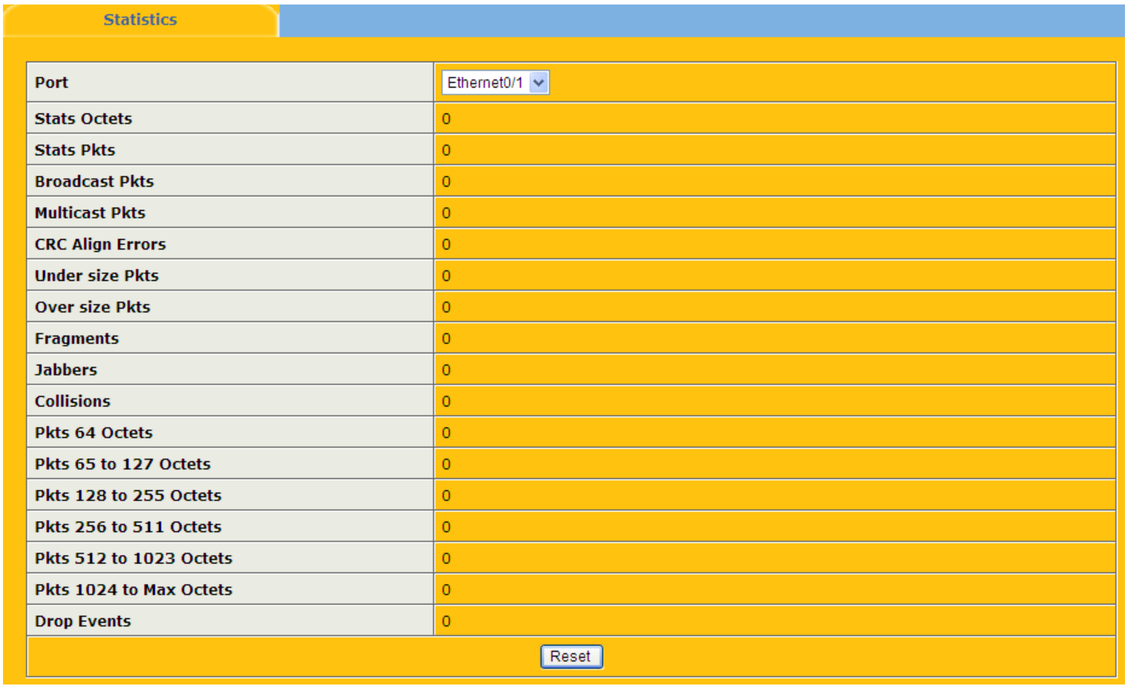
Pkts 256 to 511 Octets
The total number of packets, including bad packets, received that are between 256 and 511 octets in length inclusive (excluding framing bits, but including FCS octets).

Pkts 512 to 1023 Octets
The total number of received packets, that are between 512 and 1023 octets in length inclusive (excluding framing bits, but including FCS octets), including bad packets.

Pkts 1024 to 1518 Octets
The total number of received packets, that are between 102 4 and 1518 octets in length inclusive (excluding framing bits, but including FCS octets), including bad packets.

Drop Events
The total number of events when packets are dropped by the probe due to lack of resources.

All of the statistics for each Ethernet port can be reset.



Port	Ethernet0/1
Stats Octets	0
Stats Pkts	0
Broadcast Pkts	0
Multicast Pkts	0
CRC Align Errors	0
Under size Pkts	0
Over size Pkts	0
Fragments	0
Jabbers	0
Collisions	0
Pkts 64 Octets	0
Pkts 65 to 127 Octets	0
Pkts 128 to 255 Octets	0
Pkts 256 to 511 Octets	0
Pkts 512 to 1023 Octets	0
Pkts 1024 to Max Octets	0
Drop Events	0

14.2 History

14.2.1 History control

This page sets a history control entry on each port. And then the port will be sampled with the specified interval and the specified sample number about its transmitting situation.

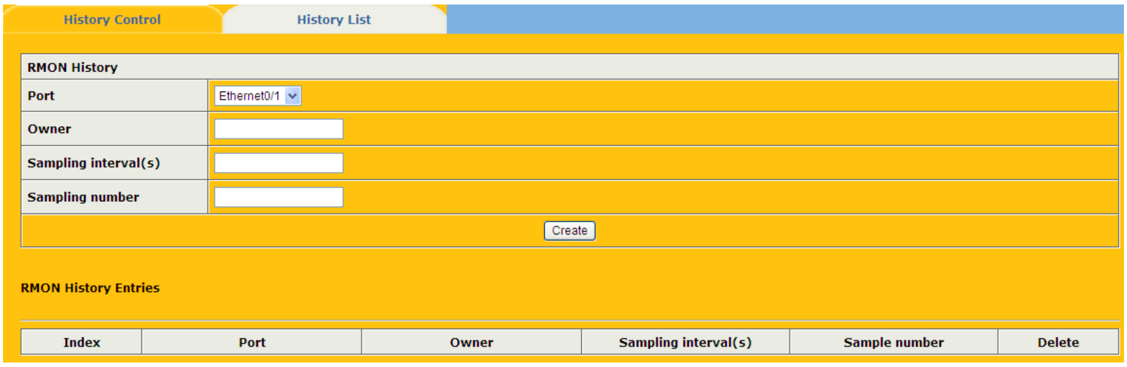
Port The Ethernet port for collecting statistics.

Owner The entity that configured this entry and is therefore using the resources assigned to it.

Sampling interval(s) The data sample time interval of each group. The interval range is from 1 and 3600(1 hour).

Sampling number The number of discrete sampling intervals over which data shall be saved in the part of the media-specific table associated with this history control entry.

The lower part of the interface will list the RMON history entries, which can be deleted.



RMON History	
Port	Ethernet0/1
Owner	
Sampling interval(s)	
Sampling number	

RMON History Entries

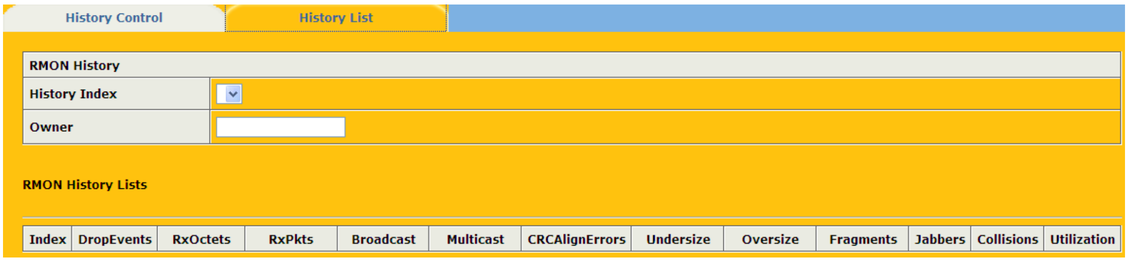
Index	Port	Owner	Sampling interval(s)	Sample number	Delete

14.2.2 History List

On this page, one of the history can be selected to show the relate statistics.

The lower part of this page shows the related statistics information: DropEvents RxOctets, RxPkts, Broadcast, Multicast, CRC AlignErrors, Undersize, Oversize, Fragments, Jabbers, Collisions and Utilization.

Take history index 1 as an example, from the history control, it is clear that it is sampled every 5 seconds, and 5 items are collected each time, and only the latest are shown.



RMON History

History Index	
Owner	

RMON History Lists

Index	DropEvents	RxOctets	RxPkts	Broadcast	Multicast	CRCAlignErrors	Undersize	Oversize	Fragments	Jabbers	Collisions	Utilization

14.3 Alarm

This page sets an alarm entry.

Port: The ethernet port to collect statistics of **Variable**.

Variable: The drop-down list includes In Octets, In Unicast Pks, In None Unicast Pks,

In Discarded Pks, In Error Pks, In Unknown Protocol Pks, Out Octets, Out Unicast Pks, Out None Unicast Pks, Out Discarded Pks, Out Error Pks, RMON Drop Events, RMON Received Octets, RMON Received Pks, RMON Broadcast Pks, RMON Multicast Pks, RMON CRC Align Pks, RMON Undersize Pks, RMON Oversize Pks, RMON Fragments, RMON Jabbers, RMON Collisions, 64 Octets Pks, 65 to 127 Octets Pks, 128 to 255 Octets Pks, 256 to 511 Octets Pks, 512 to 1023 Octets Pks, 1024 to 1518 Octets Pks, In Dot1d Topology Port Frames, Out Dot1d Topology Port Frames and In Dot1d Topology Discards.

Sample Type: Sets the type of sampling, the method of sampling the selected variable and calculating the value to be compared against the thresholds is as follows: If the value of this object is absoluteValue (1), the value of the selected variable will be compared directly with the thresholds at the end of the sampling interval. If the value of this object is deltaValue (2), the value of the selected variable at the last sample will be subtracted from the current value, and the difference will be compared with the thresholds.

RMON alarm can monitor the specified alarm variables. The monitored alarm variables are greater than the rising threshold, a rising alarm will be triggered; and if the variables are smaller than the specified falling threshold, a falling alarm will be triggered.

When you define the alarm entries, the system will deal with the alarm entries in the following ways:

(1) Sample the defined alarm variables with the specified sampling interval

(2) Compare the sampling value with the thresholds, a corresponding event will be triggered when the sampling value is beyond the threshold.

Configuration Steps:

Step 1 Specify the port to collect the statistics

Step 2 Select a variable

Step 3 Select sample type: Absolute and Delta. Sets the type of sampling, the method of sampling the selected variable and calculating the value to be compared against the thresholds is as follows: If the value of this object is absoluteValue (1), the value of the selected variable will be compared directly with the thresholds at the end of the sampling interval. If the value of this object is deltaValue (2), the value of the selected variable at the last sample will be subtracted from the current value, and the difference will be compared with the thresholds.

Step 4 Type the Rising Threshold, ranging from 1 to 2147483640. And select Rising Event Index, which is set in 14.4 Event.

Rising Threshold: The rising threshold of the sampled statistic. When the current sampled value is greater than or equal to this threshold, and the last sample value is less than this threshold, a single event will be generated. A single event will also be generated if the first sample, after this entry becomes valid, is greater than or equal to this threshold and the associated StartupAlarm is equal to risingAlarm(1) or risingOrFallingAlarm(3). After a rising event is generated, another such event will not be generated until the sampled value reaches the FallingThreshold or falls below this threshold.

Rising Event Index: The index of the eventEntry is used when a rising threshold is crossed. The eventEntry identified by a particular value of this index is the same as identified by the same value of the event Index object.

Step 5 Type the Falling Threshold, ranging from 1 to 2147483640. And select Rising Event Index, which is set in 14.4.

Falling Threshold: A threshold for the sampled statistic. When the current sampled value is less than or equal to this threshold, and the last sample value was greater than this threshold, a single event will be generated. A single event will also be generated if the first sample, after this entry becomes valid, is less than or equal to this threshold and the associated StartupAlarm is equal to fallingAlarm (2) or risingOrFallingAlarm (3). After a falling event is generated, another such event will not be generated until the sampled value rises above this threshold and reaches the Rising Threshold.

Falling Event Index: The index of the eventEntry is used when a falling threshold is crossed. The eventEntry identified by a particular value of this index is the same as identified by the same value of the event Index object.

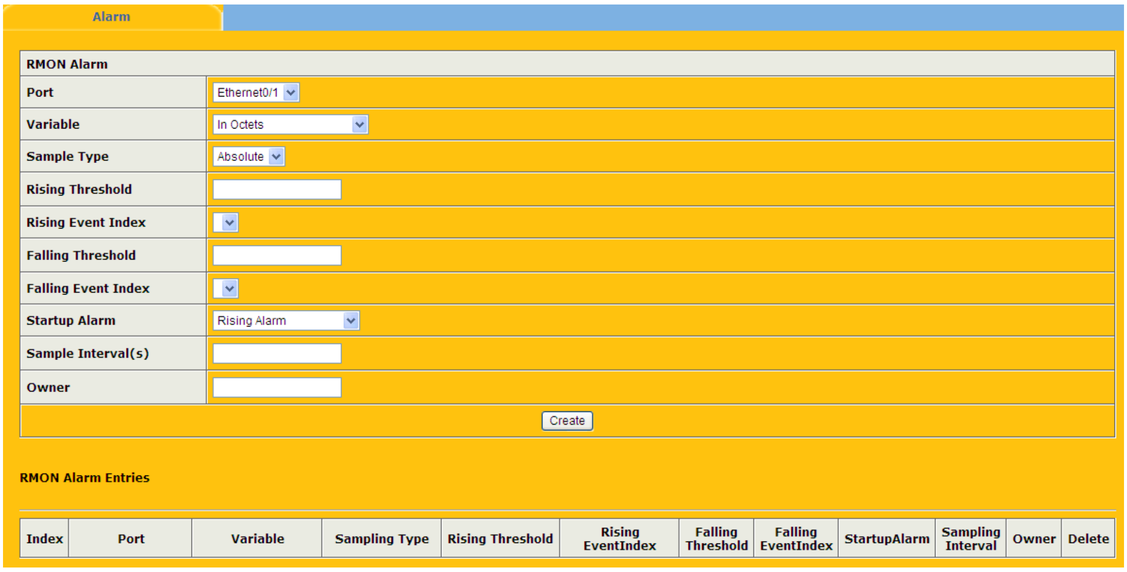
Step 6 Select Startup Alarm: rising alarm, falling alarm and rising or falling alarm.

Startup Alarm: The alarm that is sent when this entry is set to be valid for the first time. If the first sample, after this entry becomes valid, is greater than or equal to the Rising Threshold and alarm Startup Alarm is equal to rising Alarm (1) or rising Or Falling Alarm (3), then a single rising alarm will be generated. If the first sample, after this entry becomes valid, is less than or equal to the Falling Threshold and alarm Startup Alarm is equal to fallingAlarm (2) or risingOrFallingAlarm (3), then a single falling alarm will be generated.

Step 7 Set the Sample Interval over which the data is sampled and compared with the rising and falling thresholds (in seconds).

Step 8 Configure the Owner that configures this entry and is therefore using the resources assigned to it.

Step 9 Click <Create>, the lower part of the interface will show the RMON Alarm Entries.



RMON Alarm	
Port	Ethernet0/1
Variable	In Octets
Sample Type	Absolute
Rising Threshold	
Rising Event Index	
Falling Threshold	
Falling Event Index	
Startup Alarm	Rising Alarm
Sample Interval(s)	
Owner	

RMON Alarm Entries

Index	Port	Variable	Sampling Type	Rising Threshold	Rising EventIndex	Falling Threshold	Falling EventIndex	StartupAlarm	Sampling Interval	Owner	Delete

14.4 Event Configuration

The event group defines event indexes and controls the generation and notifications of the events triggered by the alarms defined in the alarm group.

14.4.1 Event

Configuration Steps:

Step 1 Specify the community. If an SNMP trap is to be sent, it will be sent to the SNMP community specified by this octet string.

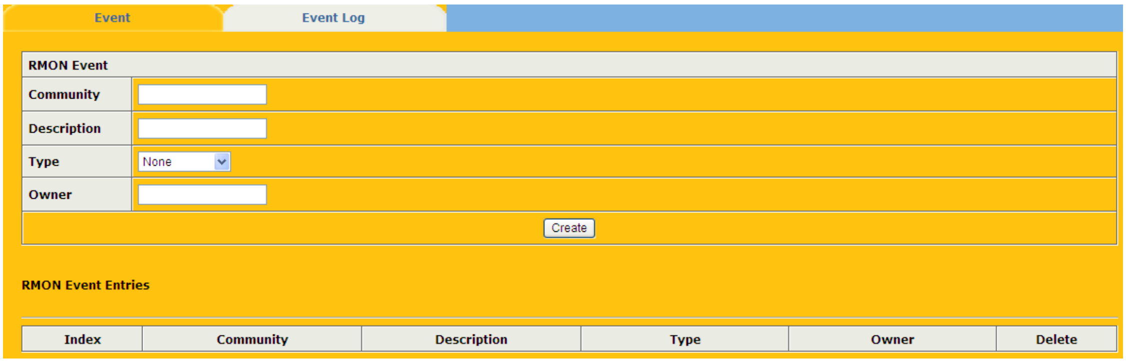
Step 2 Add description

Step 3 Select type of notification that the probe makes about this event.

- **None**: No action;
- **Log**: The result will be shown in Event Log;
- **Trap**: The switch will send trap to the specified trap host, refer to 13.2.2 Trap Host IP;
- **Log and trap**: The trap will be shown in Event Log and sent to the specified trap host.

Step 4 Specify the owner for available management in Event Log.

Step 5 Click <Create>. The bottom part of this tab page lists all existing event entries.



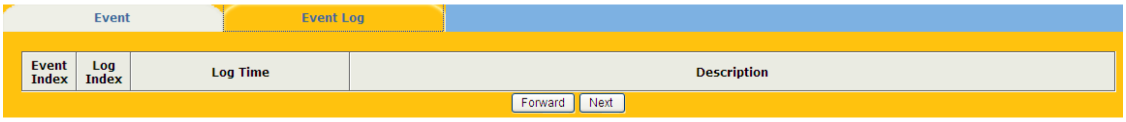
RMON Event	
Community	
Description	
Type	None
Owner	

RMON Event Entries

Index	Community	Description	Type	Owner	Delete

14.4.2 Event Log

This page shows information about event log entries, including **Event Index**, **Log Index**, **Log Time** and **Description**.

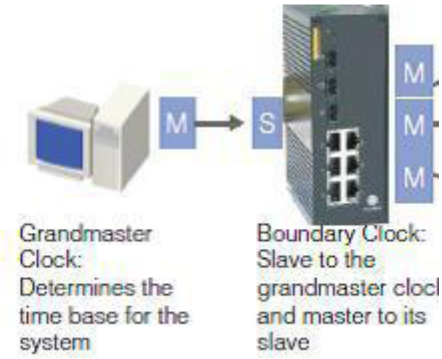


Event Index	Log Index	Log Time	Description

15 PTP

IEEE 1588, which was published in November 2002, expands the performance capabilities of Ethernet networks to control systems that operate over a communication network.

IEEE 1588 generates a master-slave relationship between the clocks, and enforces the specific timing requirements in such power systems. All devices ultimately get their time from a clock known as the grandmaster clock. In its basic form, the protocol is intended to be administration free.


M
S
M
M
M
Grandmaster Clock: Determines the time base for the system
Boundary Clock: Slave to the grandmaster clocl and master to its slave

The PTP of Ethernet switches is designed via soft control.

Note:
Please open the PTP in Advanced Configuration page before configuring PTP.

15.1 PTP Configuration

Clock Mode: Sets the switch's clock mode, there are 4 choices.

v2 P2P TC: Operates as a peer-to-peer IEEE 1588 v2 transparent clock.
v2 E2E TC: Operates as an edge-to-edge IEEE 1588 v2 transparent clock.
v2 P2P BC: Operates as a peer-to-peer IEEE 1588 v2 boundary clock.
v2 E2E BC: Operates as an edge-to-edge IEEE 1588 v2 boundary clock.

One Step：Enable/Disable one step method, default setting is Disable.

Sync Interval: Sets the synchronization message time interval. You can select one of 128ms, 256ms, 512ms, 1s, 2s, 4s, 8s or 16s, the default value is 1s.

Announce Interval (s): Sets the announce message interval. The unit of time is second, and you can select one value of 1, 2, 4, 8 or 16, the default value is 2.

Announce Receipt Timeout (s): The announce message receipt timeout. The unit of time is second, and it is in the range of 2~10, the default value is 3.

Min Delay Req Interval (s): Minimum delay request message interval. The unit of time is second, and it is in the range of 0~5, the default value is 3.

Domain Number：Subdomain name (IEEE 1588-2002) or the domain Number (IEEE 1588-2008) fields in PTP messages.

Priority 1: Set first priority value; 0 = highest priority, 255 = lowest priority. it is in the range of 0~255, the default value is 128.

Priority 2: Set second priority value; 0 = highest priority, 255 = lowest priority. it is in the range of 0~255, the default value is 128.

Clock Class: The clockClass attribute denotes the traceability of the time or frequency distributed by the grandmaster clock. It is in the range of 0~255, the default value is 248.

Timescale: Includes PTP and ARB two choices.

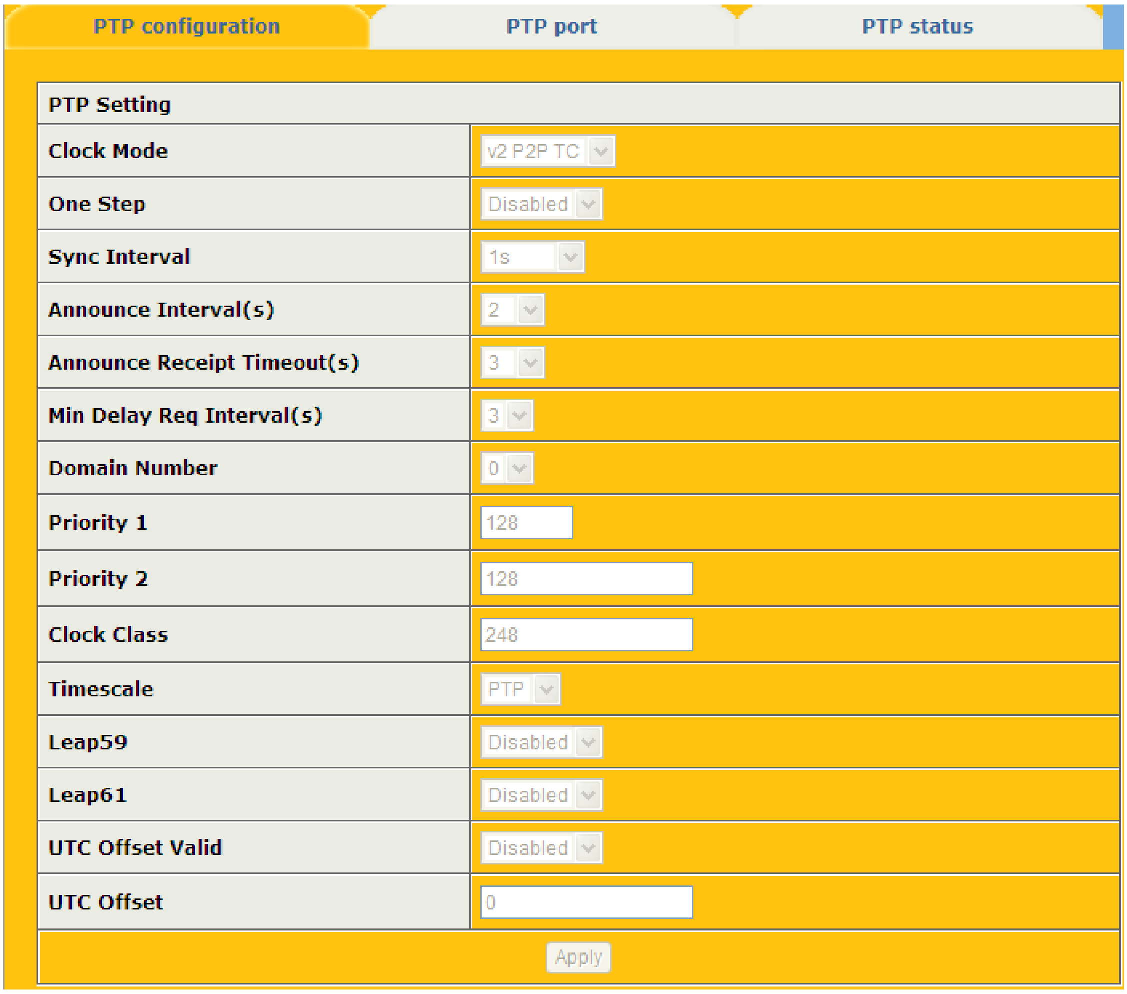
- **PTP timescale**: In normal operation, the epoch is the PTP epoch and the timescale is continuous. The time unit is SI seconds, as realized on the rotating geoid (SI: International System).
- **ARB timescale**: In normal operation, the epoch is set by an administrative procedure. The epoch can be reset during normal operation. Between invocations of the administrative procedure, the timescale is continuous. Additional invocations of the administrative procedure may introduce discontinuities in the overall timescale.

Leap59: The last minute of the current UTC day contains 59 seconds. If the epoch is not PTP, the value will be set to Disable.

Leap61: The last minute of the current UTC day contains 61 seconds. If the epoch is not PTP, the value will be set to Disable.

UTC Offset Valid: The initialization value will be Enable if the value of the current UTC offset is known to be correct; otherwise, it will be Disable.

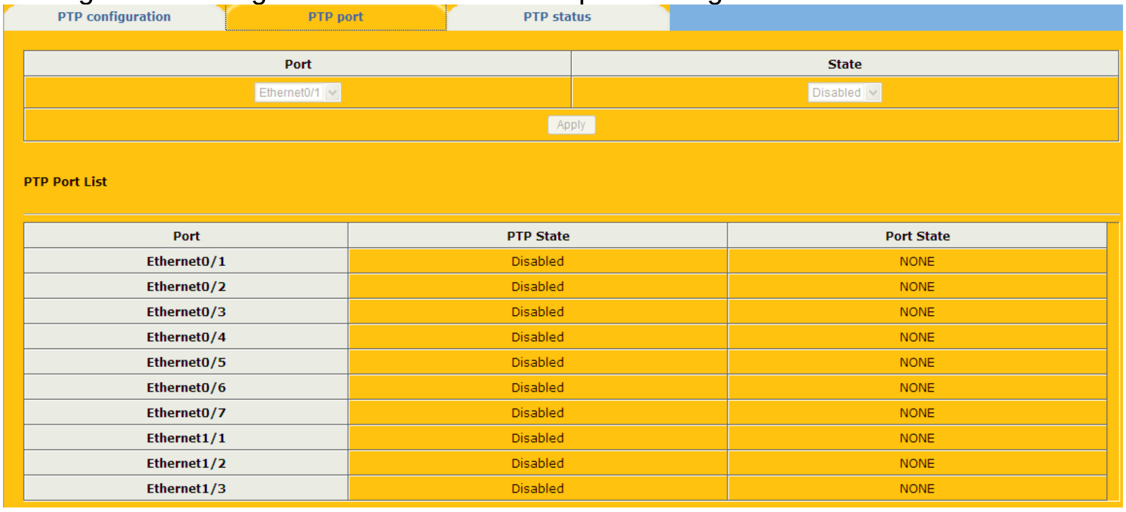
UTC Offset: The known UTC offset (seconds). It is in the range of 0~255, the default value is 0.



PTP Setting	
Clock Mode	v2 P2P TC
One Step	Disabled
Sync Interval	1s
Announce Interval(s)	2
Announce Receipt Timeout(s)	3
Min Delay Req Interval(s)	3
Domain Number	0
Priority 1	128
Priority 2	128
Clock Class	248
Timescale	PTP
Leap59	Disabled
Leap61	Disabled
UTC Offset Valid	Disabled
UTC Offset	0

15.2 PTP Port

Setting and showing the current switch PTP port settings.



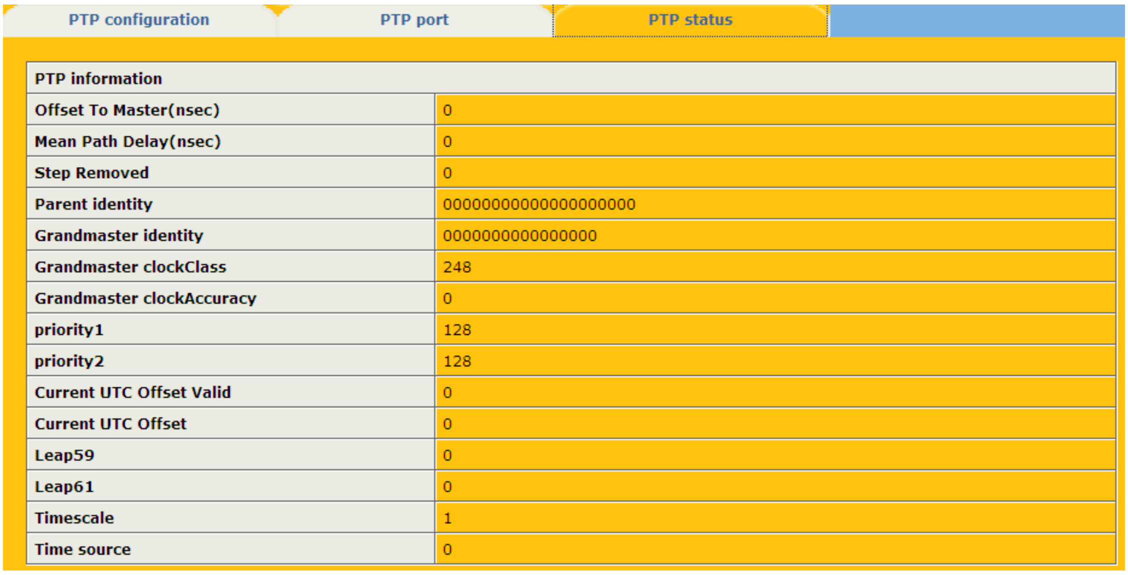
Port	State
Ethernet0/1	Disabled

PTP Port List

Port	PTP State	Port State
Ethernet0/1	Disabled	NONE
Ethernet0/2	Disabled	NONE
Ethernet0/3	Disabled	NONE
Ethernet0/4	Disabled	NONE
Ethernet0/5	Disabled	NONE
Ethernet0/6	Disabled	NONE
Ethernet0/7	Disabled	NONE
Ethernet1/1	Disabled	NONE
Ethernet1/2	Disabled	NONE
Ethernet1/3	Disabled	NONE

15.3 PTP Status

Showing the current switch PTP status.



PTP information	
Offset To Master(nsec)	0
Mean Path Delay(nsec)	0
Step Removed	0
Parent identity	00000000000000000000
Grandmaster identity	0000000000000000
Grandmaster clockClass	248
Grandmaster clockAccuracy	0
priority1	128
priority2	128
Current UTC Offset Valid	0
Current UTC Offset	0
Leap59	0
Leap61	0
Timescale	1
Time source	0

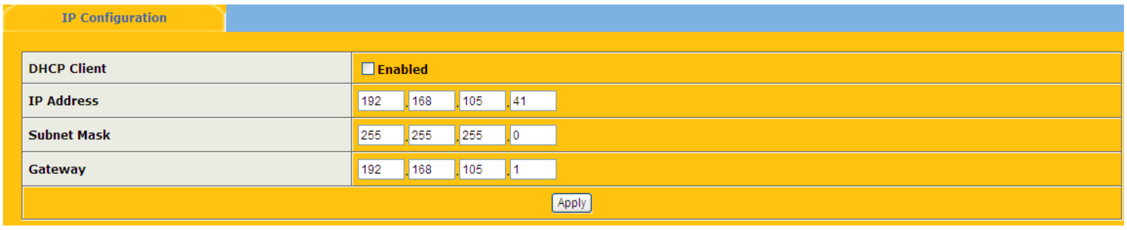
16 Administration

16.1 Language

There are two languages: Spanish and English. After clicking <Apply>, it will turn to the [System Information] page.

16.2 IP Configuration

The switch supports DHCP and Static IP. DHCP Client can be enabled by checking the Enabled checkbox, the switch get IP address from DHCP server. If static IP is used, IP Address, Subnet Mask, and Gateway shall be specified, after clicking <Apply>, you will be asked to re-login with the new IP.



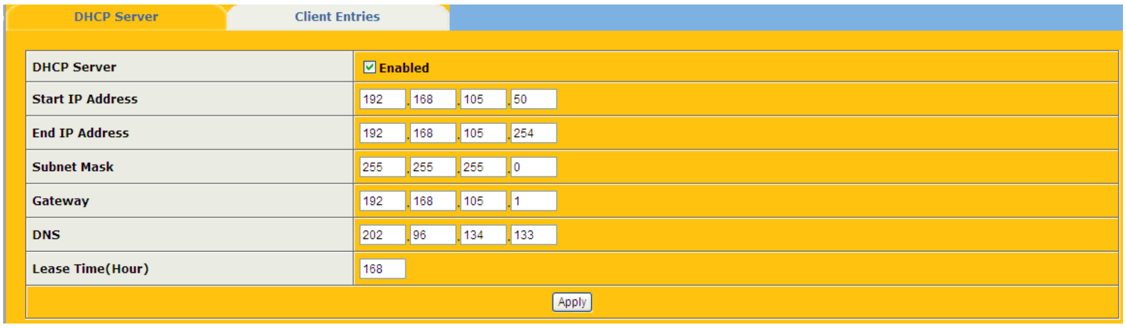
DHCP Client	□ Enabled
IP Address	192 . 168 . 105 . 41
Subnet Mask	255 . 255 . 255 . 0
Gateway	192 . 168 . 105 . 1

16.3 DHCP Server

DHCP stands for Dynamic Host Configuration Protocol. KY-3000EM by factory default acts as a DHCP server for your network, so it automatically dispatch related IP settings to any local user configured as a DHCP client. It is highly recommended that you leave KY-3000EM enabled as a DHCP server if you do not have a DHCP server for you network.

16.3.1 DHCP Server

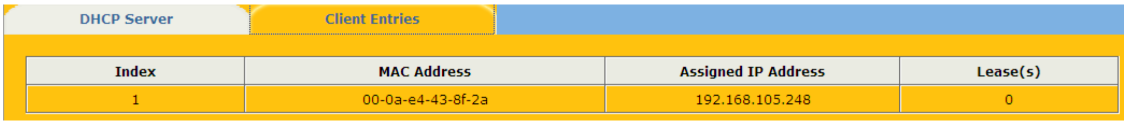
If DHCP Server is enabled, KY-3000EM assigns IP address to every host in the LAN.



DHCP Server	☑ Enabled
Start IP Address	192 . 168 . 105 . 50
End IP Address	192 . 168 . 105 . 254
Subnet Mask	255 . 255 . 255 . 0
Gateway	192 . 168 . 105 . 1
DNS	202 . 96 . 134 . 133
Lease Time(Hour)	168

16.3.2 DHCP Client

It displays the address information got via DHCP.



Index	MAC Address	Assigned IP Address	Lease(s)
1	00-0a-e4-43-8f-2a	192.168.105.248	0

16.4 SNTP

An administrator is unable to keep time synchronized among all the devices within a network by changing the system clock on each device, because this is a huge work and does not guarantee clock accuracy. NTP synchronizes timekeeping among distributed time servers and clients to ensure high clock accuracy.

SNTP Mode Select Service mode or Client mode. If you select Client mode, you need to specify the IP address of the NTP server. A client sends a clock synchronization message to the NTP servers. Upon receiving the message, the servers automatically operate in server mode and send a reply. If Service mode is selected, switch will be used as SNTP sever to offer time synchronization for other devices in the network.

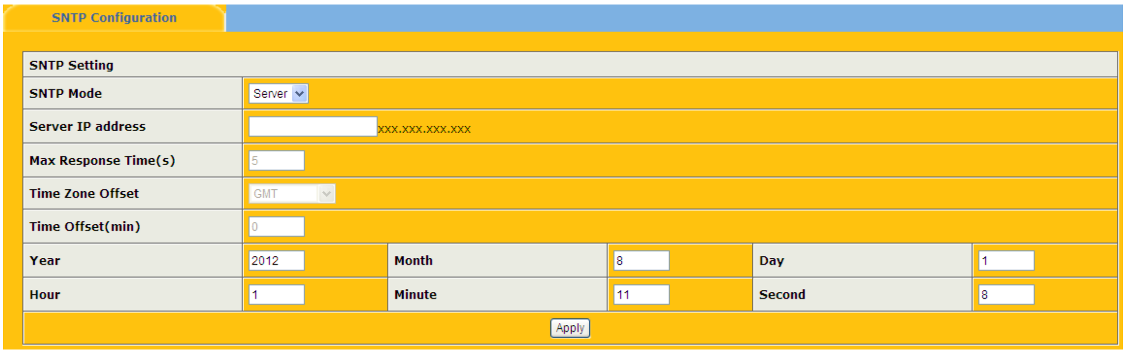
Service IP address IP address of SNTP server with the format of xxx.xxx.xxx.xxx.

Max Response Time Time interval for the switch to get a response from SNTP server. It ranges from 1 to 59 seconds, and the default value is 5 seconds.

Time Zone Offset Time difference between Greenwich standard time and local time.

Time Offset (min) Time difference in minute between Greenwich standard time and local time.

In Service Mode, system time can be set with year, month, day, hour, minute and second.



SNTP Setting					
SNTP Mode	Server				
Server IP address	xxx.xxx.xxx.xxx				
Max Response Time(s)	5				
Time Zone Offset	GMT				
Time Offset(min)	0				
Year	2012	Month	8	Day	1
Hour	1	Minute	11	Second	8

16.5 SMTP

This page sets SMTP configuration. When a pre-defined event occurs, an e-mail will be sent to the following destination mail address.

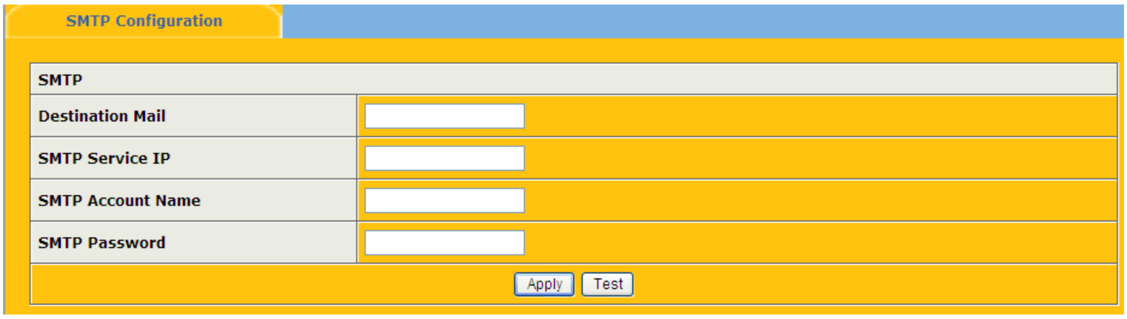
Destination Mail The e-mail address to receive the event information.

SMTP Service IP The IP address of SMTP server.

Source Account Name Source e-mail account on SMTP server.

SMTP Password The password for source e-mail account.

Click <Test> to check whether the configuration is correct. If it is correct, the destination mail will receive an e-mail.



SMTP	
Destination Mail	
SMTP Service IP	
SMTP Account Name	
SMTP Password	

16.6 E-mail Alarm

This page sets the events that will trigger an e-mail described in Section 16.4 SMTP, including system events and port events.

16.6.1 System Event

This page sets system event alarm configuration, including **Power A Failure**, **Power B Failure** and **Ky-Anillo Broken**.

This page sets the following system events. Select <Apply> for an event to trigger e-mail sending when this event occurs.

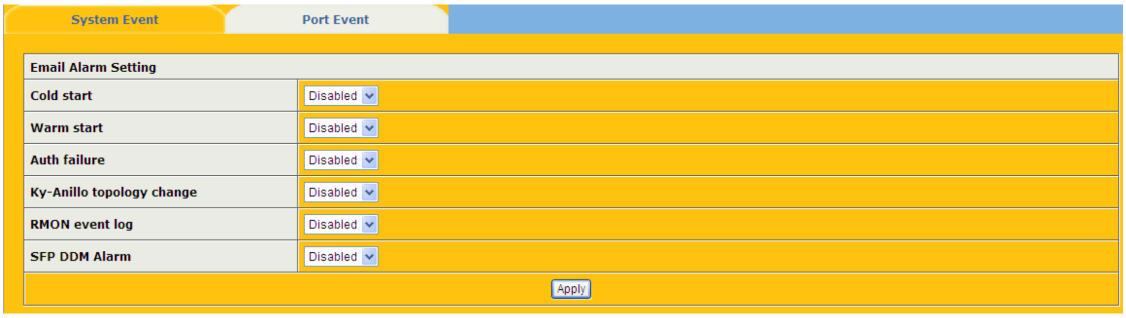
Onaccess cold start Enable or disable to trigger an e-mail alarm when the switch is booted up by turning on the power.

Onaccess warm start Enable or disable to trigger an e-mail alarm when the switch is restarted without turning off power.

Auth failure Enable or disable to trigger an e-mail alarm when it fails to login to the switch due to incorrect username or password.

FiRing topology change Enable or disable to trigger an e-mail alarm when the Ky-Anillo link status has been changed, for example, the Ky-Anillo port is down.

RMON event log Enable or disable to trigger an e-mail alarm when an event occurs mentioned in 14 RMON of this manual.



Email Alarm Setting	
Cold start	Disabled
Warm start	Disabled
Auth failure	Disabled
Ky-Anillo topology change	Disabled
RMON event log	Disabled
SFP DDM Alarm	Disabled

16.6.2 Port Event

This page sets port event alarm configuration, including **Port**, **Alarm Type**, **Traffic Overload**, **Traffic Threshold** and **Traffic Duration**.

Port Specify the port selected for port event configuration

Alarm Type If it is enabled, there are three alarm types for the event: Link Up, Link Down, and Up & Down.

Traffic Overload It means that the port traffic exceeds Traffic Threshold during a statistics time of Traffic Duration.

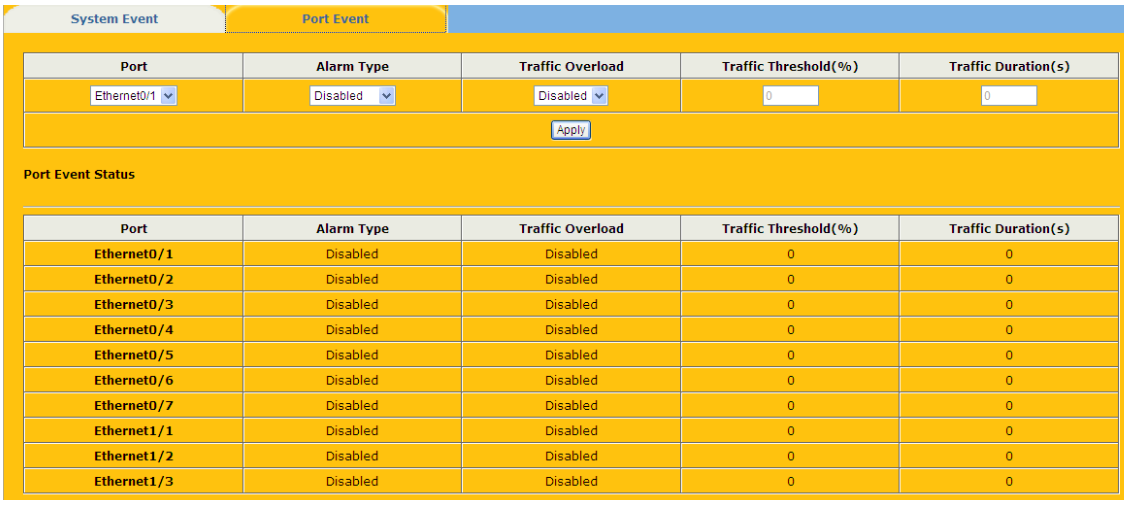
Traffic Threshold The threshold for port traffic (in percentage of the port speed).

Traffic Duration The statistics duration time for calculating port traffic.

Note:

Traffic Overload, **Traffic Threshold** and **Traffic Duration** are interrelated. When **Traffic Overload** is enabled, **Traffic Threshold** shall be set with a number between 1 and 99, and **Traffic Duration** shall be no less than 10 seconds.

The bottom part of this tab page lists all port events.



Port	Alarm Type	Traffic Overload	Traffic Threshold(%)	Traffic Duration(s)
Ethernet0/1	Disabled	Disabled	0	0

Port Event Status

Port	Alarm Type	Traffic Overload	Traffic Threshold(%)	Traffic Duration(s)
Ethernet0/1	Disabled	Disabled	0	0
Ethernet0/2	Disabled	Disabled	0	0
Ethernet0/3	Disabled	Disabled	0	0
Ethernet0/4	Disabled	Disabled	0	0
Ethernet0/5	Disabled	Disabled	0	0
Ethernet0/6	Disabled	Disabled	0	0
Ethernet0/7	Disabled	Disabled	0	0
Ethernet1/1	Disabled	Disabled	0	0
Ethernet1/2	Disabled	Disabled	0	0
Ethernet1/3	Disabled	Disabled	0	0

16.7 Relay Alarm

This page sets **Relay Alarm** event, including *System Event* and *Port Event*. When an event occurs, the relay output will be closed for external devices and an alarm indicator, for example, takes action.

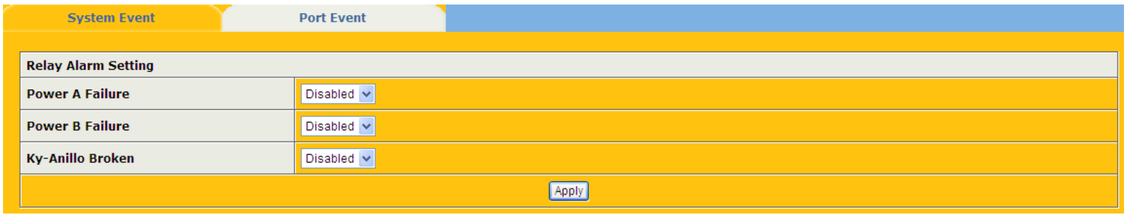
16.7.1 System Event

This page sets system event alarm configuration, including **Power A Failure**, **Power B Failure** and **Ky-Anillo Broken**.

Power A Failure Enable or disable to trigger relay alarm when power A is off.

Power B Failure Enable or disable to trigger relay alarm when power B is off.

Ky-Anillo Broken Enable or disable to trigger relay alarm when Ky-Anillo link status is broken.



Relay Alarm Setting	
Power A Failure	Disabled
Power B Failure	Disabled
Ky-Anillo Broken	Disabled

16.7.2 Port Event

This page sets port event alarm configuration, including **Port**, **Alarm Type**, **Traffic Overload**, **Traffic Threshold** and **Traffic Duration**.

Port Specify the port selected for port event configuration

Alarm Type If it is enabled, there are three alarm types for the event: Link Up, Link Down, and Up & Down.

Traffic Overload It means that the port traffic exceeds Traffic Threshold during a statistics time of Traffic Duration.

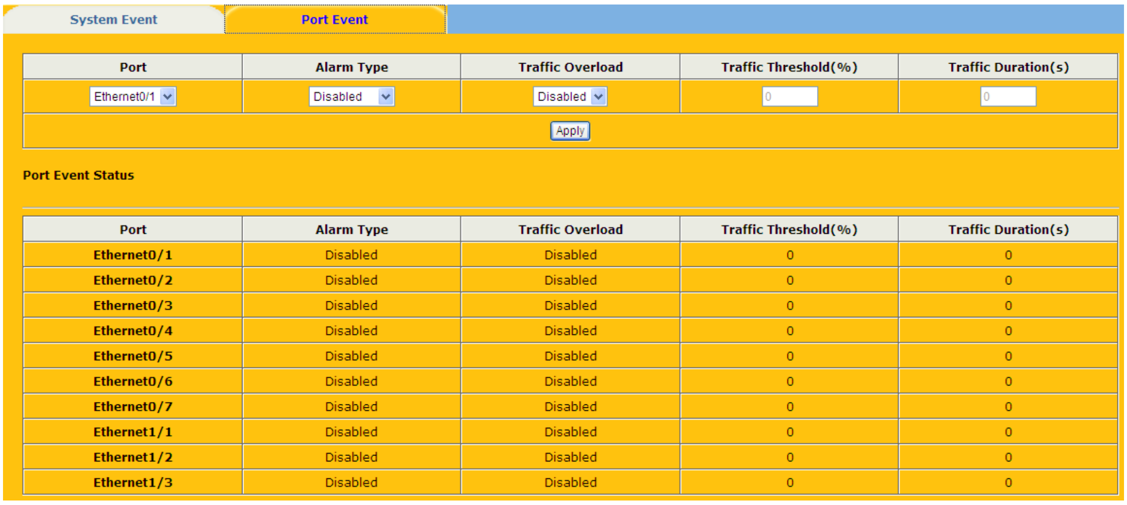
Traffic Threshold The threshold for port traffic (in percentage of the port speed).

Traffic Duration The statistics duration time for calculating port traffic.

Note:

Traffic Overload, **Traffic Threshold** and **Traffic Duration** are interrelated. When **Traffic Overload** is enabled, **Traffic Threshold** shall be set with a number between 1 and 99, and **Traffic Duration** shall be no less than 10 seconds.

The bottom part of this tab page lists all port events.



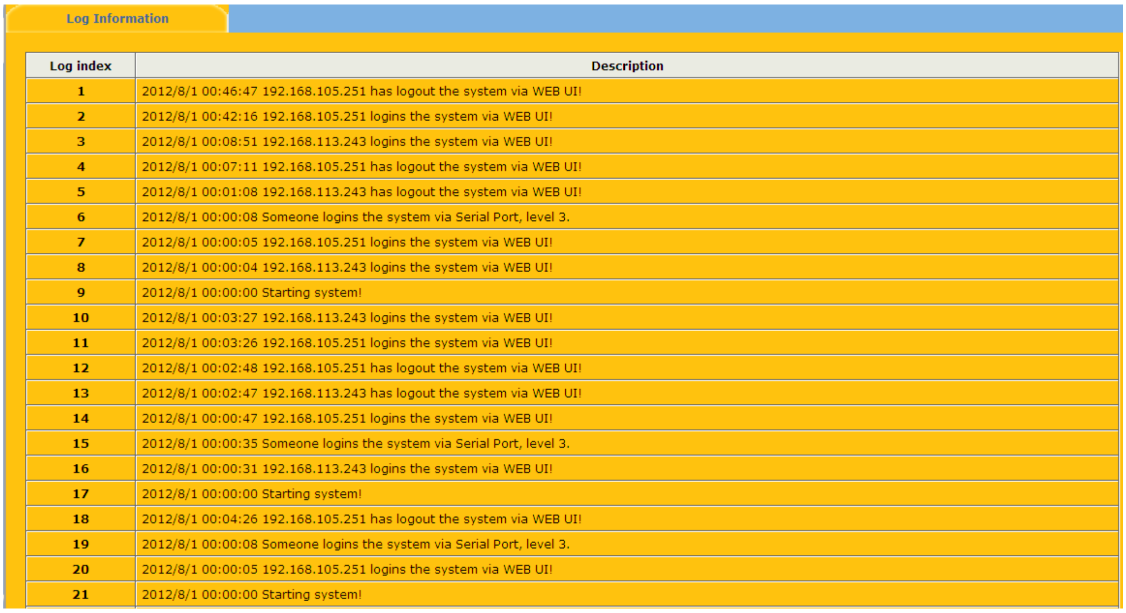
Port	Alarm Type	Traffic Overload	Traffic Threshold(%)	Traffic Duration(s)
Ethernet0/1	Disabled	Disabled	0	0

Port Event Status

Port	Alarm Type	Traffic Overload	Traffic Threshold(%)	Traffic Duration(s)
Ethernet0/1	Disabled	Disabled	0	0
Ethernet0/2	Disabled	Disabled	0	0
Ethernet0/3	Disabled	Disabled	0	0
Ethernet0/4	Disabled	Disabled	0	0
Ethernet0/5	Disabled	Disabled	0	0
Ethernet0/6	Disabled	Disabled	0	0
Ethernet0/7	Disabled	Disabled	0	0
Ethernet1/1	Disabled	Disabled	0	0
Ethernet1/2	Disabled	Disabled	0	0
Ethernet1/3	Disabled	Disabled	0	0

16.8 System Log

This page shows the switch system logs, 50 logs on each page. Click <Forward> and <Next> to return the previous page and turn to the next page. Click <Reset> to clear all the records of the system logs.



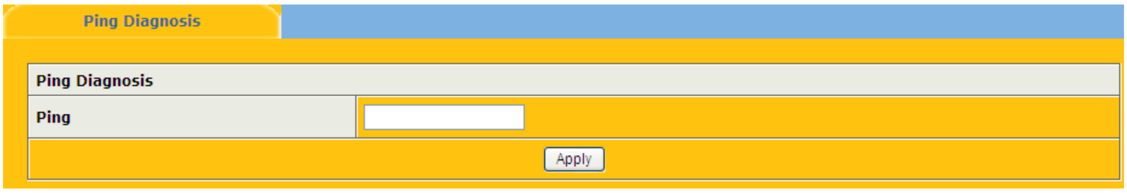
Log Information

Log index	Description
1	2012/8/1 00:46:47 192.168.105.251 has logout the system via WEB UI!
2	2012/8/1 00:42:16 192.168.105.251 logins the system via WEB UI!
3	2012/8/1 00:08:51 192.168.113.243 logins the system via WEB UI!
4	2012/8/1 00:07:11 192.168.105.251 has logout the system via WEB UI!
5	2012/8/1 00:01:08 192.168.113.243 has logout the system via WEB UI!
6	2012/8/1 00:00:08 Someone logins the system via Serial Port, level 3.
7	2012/8/1 00:00:05 192.168.105.251 logins the system via WEB UI!
8	2012/8/1 00:00:04 192.168.113.243 logins the system via WEB UI!
9	2012/8/1 00:00:00 Starting system!
10	2012/8/1 00:03:27 192.168.113.243 logins the system via WEB UI!
11	2012/8/1 00:03:26 192.168.105.251 logins the system via WEB UI!
12	2012/8/1 00:02:48 192.168.105.251 has logout the system via WEB UI!
13	2012/8/1 00:02:47 192.168.113.243 has logout the system via WEB UI!
14	2012/8/1 00:00:47 192.168.105.251 logins the system via WEB UI!
15	2012/8/1 00:00:35 Someone logins the system via Serial Port, level 3.
16	2012/8/1 00:00:31 192.168.113.243 logins the system via WEB UI!
17	2012/8/1 00:00:00 Starting system!
18	2012/8/1 00:04:26 192.168.105.251 has logout the system via WEB UI!
19	2012/8/1 00:00:08 Someone logins the system via Serial Port, level 3.
20	2012/8/1 00:00:05 192.168.105.251 logins the system via WEB UI!
21	2012/8/1 00:00:00 Starting system!

16.9 Ping Diagnosis

Ping Diagnosis is a commonly used tool for diagnosing a network problem. Type an IP address in the textbox, and then click <Apply>. The Ping result will be displayed in the following page.

If the IP can be reached, it says "This ip is alive!"; Otherwise it says "Cannot reach the destination host."



Ping Diagnosis

Ping Diagnosis	
Ping	

16.10 Account

This page can be used to add a new account. **Username**, **Password**, and **Privilege** for the new account are set on this page.

Username Username, a string of 3 to 16 characters

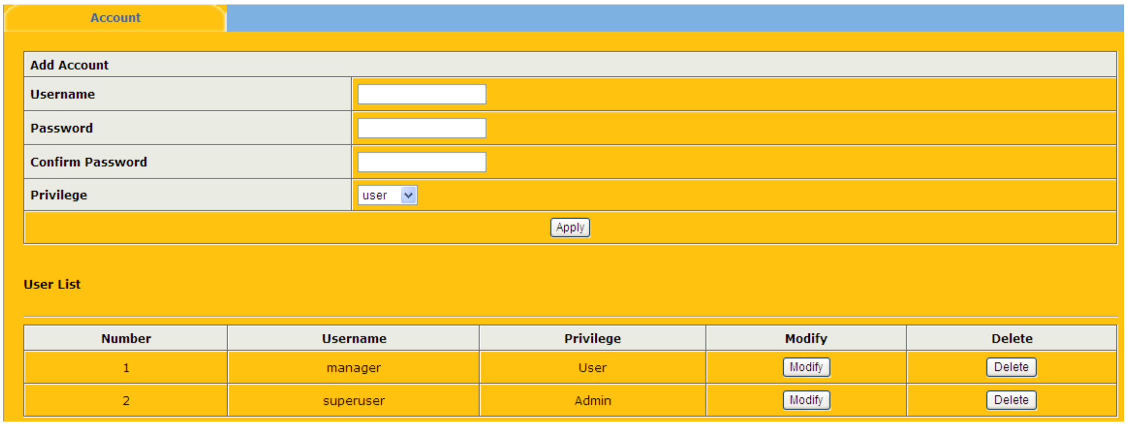
Password Password, a string of 1 to 16 characters

Privilege Choose **user** or **admin**. User cannot add or delete accounts, cannot use TFTP services or reset the switch; while admin can check and modify all the configuration of the switch.

The lower part of this page lists all accounts, including **Username** and **Privilege**. An account can be modified or deleted on this page.

Note: Check section 1.2.6 Default Configuration of this manual for privilege details of each level of users.

⚠ Caution: If there is only one admin, it cannot be deleted; while if there are multiple admins, they can be deleted but make sure there is at least one admin left.



Account

Add Account	
Username	
Password	
Confirm Password	
Privilege	user
Apply	

User List

Number	Username	Privilege	Modify	Delete
1	manager	User	Modify	Delete
2	superuser	Admin	Modify	Delete

16.11 TFTP and SSH FTP Services

Compared with FTP, TFTP (trivial file transfer protocol) features simple interactive access interface and no authentication control. Therefore, TFTP is applicable in the networks where client-server interactions are relatively simple. TFTP is implemented based on UDP. It transfers data through UDP port 69. Basic TFTP operations are described in RFC 1986. Basic SFTP operations are described in RFC 2246 / 4254

TFTP transmission is initiated by clients, as described in the following:

☒ To download a file, a client sends Read Request packets to the TFTP server, then receives data from the TFTP server, and sends acknowledgement packets to the TFTP server. This is also operational over SSH secure linkage.

☒ To upload a file, a client sends Write Request packets to the TFTP server, then sends data to the TFTP server, and receives acknowledgement packets from the TFTP server. This is also operational over SSH secure linkage.

The TFTP service mentioned in this section refers to TFTP client function of switch.

When an KY-3000EM Ethernet industrial switch serves as a TFTP client to download files from TFTP server and when you download a file that is larger than the free space of the switch’s memory:

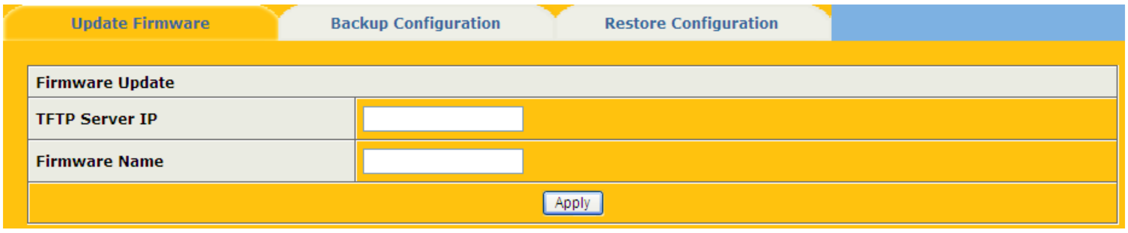
☒ If the TFTP server supports file size negotiation, file size negotiation will be initiated between the switch and the server and the file download operation will be aborted if the free space of the switch’s memory is found to be insufficient.

☒ If the TFTP server does not support file size negotiation, the switch will receive data from the server until the memory is full. If there is more data to be downloaded, the switch will prompt that the space is insufficient and delete the data partially downloaded. File download fails.

16.11.1 Update Firmware

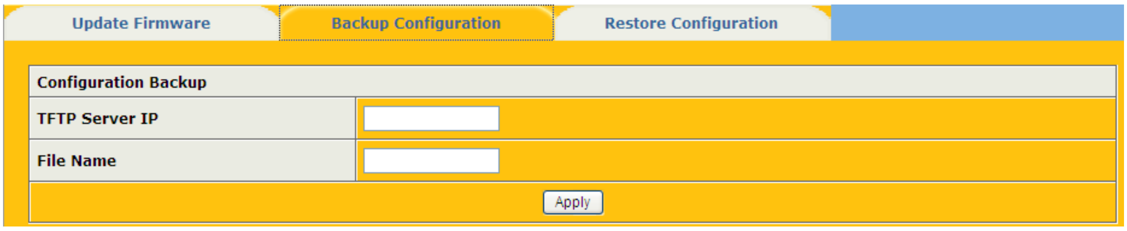
Before performing TFTP-related configurations, you need to configure IP addresses for the TFTP server, and specify the file name, and make sure a route exists between the two. **SFTP** is accomplished via cli setup.

This page sets a **TFTP Server IP** and **Firmware Name**. Before doing firmware upgrade, make sure the switch is connected to the TFTP server and firmware file exists on the server. The switch will begin to update firmware after <Apply> button is clicked.



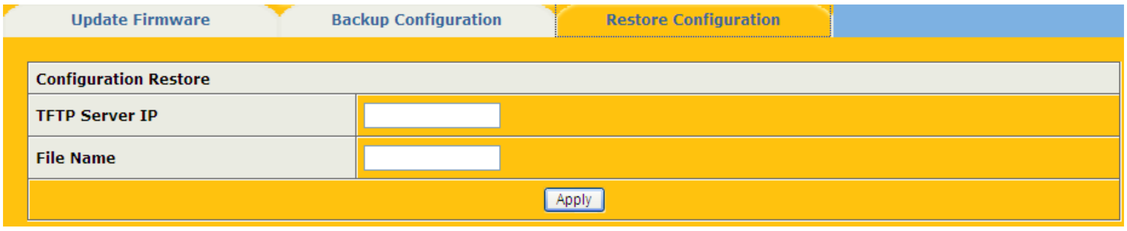
16.11.2 Backup Configuration

This page sets a **TFTP Server IP** and **File Name**. Before backing up configuration, make sure the switch is connected to the TFTP server. The switch configuration file will be uploaded to TFTP server with the specified **File Name** after <Apply> button is clicked.



16.11.3 Restore Configuration

This page sets a **TFTP Server IP** and **File Name**. Before restoring a configuration, make sure the switch is connected to the TFTP server. The switch will download the file with the specified **File Name** and use it as the configuration file after <Apply> button is clicked.



Caution:

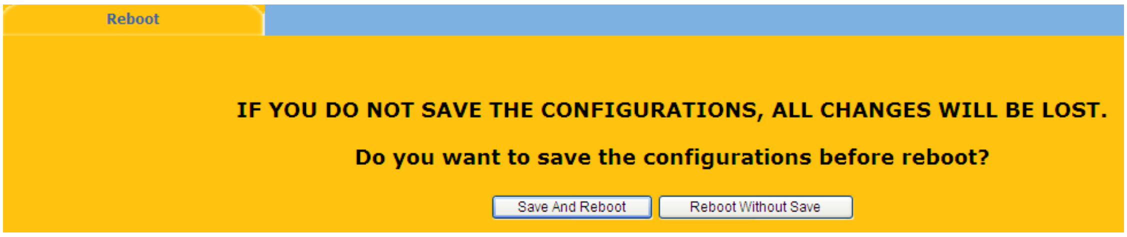
During updating firmware, uploading or downloading a configuration file, make sure the power is on.

16.12 Reboot

On this page, there are two buttons: <Save And Reboot> and <Reboot Without Save>.

Save And Reboot Saves the current configuration and then reboot

Reboot Without Save Directly reboots without saving the current configuration. All changes may be lost.



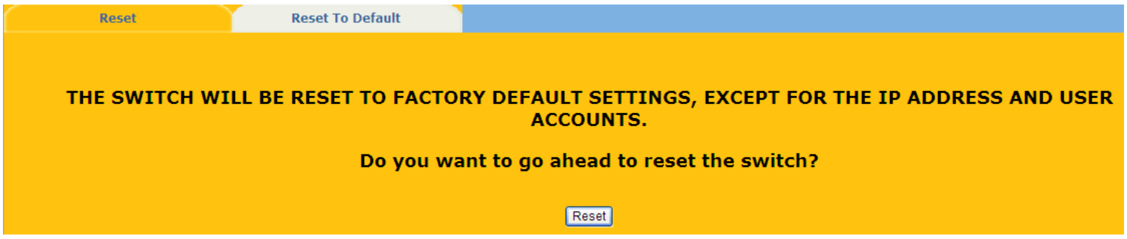
IF YOU DO NOT SAVE THE CONFIGURATIONS, ALL CHANGES WILL BE LOST.

Do you want to save the configurations before reboot?

16.13 Reset

There are two tab pages: *Reset* and *Reset To Default*.

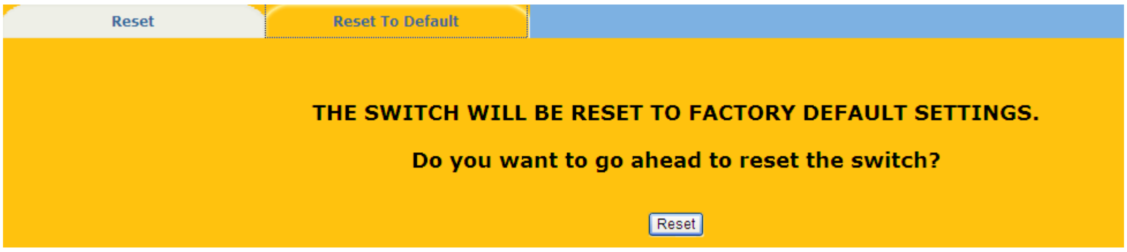
Reset: The switch will be reset to the factory default setting, except that the IP address and user accounts are kept unchanged.



THE SWITCH WILL BE RESET TO FACTORY DEFAULT SETTINGS, EXCEPT FOR THE IP ADDRESS AND USER ACCOUNTS.

Do you want to go ahead to reset the switch?

Reset To Default: The switch will be reset to the factory default setting.

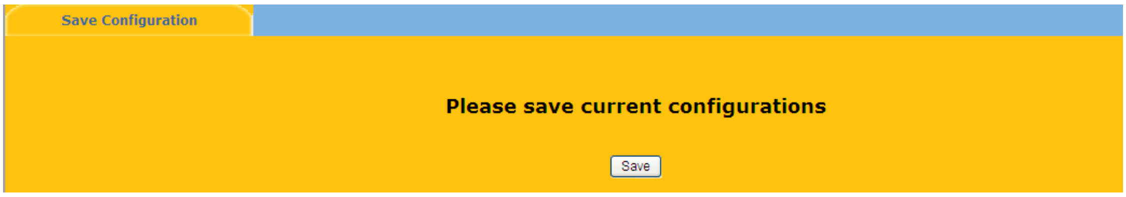


THE SWITCH WILL BE RESET TO FACTORY DEFAULT SETTINGS.

Do you want to go ahead to reset the switch?

16.14 Save Configuration

This page saves current configurations.



Please save current configurations

17 Logout

Click <Logout> on the left menu to log out from the switch and close the browser.

Appendix A Ordering Information

Model	Temperature Range
KY-3000EM	W -40°C ~ +85 °C S 0°C ~ +60 °C

Note: KY-3000EM supports up to 3 1000BaseX SFP slots, and please refer to Appendix C Compatible SFP Module.

Appendix B Supported MIBs

This appendix lists the supported Management Information Base (MIBs) for this release of the KY-3000EM Ethernet industrial switch.

MIB List

RFC1213-MIB

RFC1643-EtherLike-MIB

RFC1573-IF-MIB

RFC1493-BRIDGE-MIB

RFC2674-P-BRIDGE-MIB

FMC-SWITCH-MIB

RFC1757-RMON-MIB

RFC2674-Q-BRIDGE-MIB

FMC-IGMP-SNOOPING-MIB

RSTP-MIB

FMC-SWITCH-MAC-AUTHENTICATION-MIB.

FMC-SWITCH-RADIUS-MIB

IEEE8021-PAE-MIB

LLDP-MIB

Appendix C Compatible SFP Module

1.25G SFP Series

Dual Fibers Series

Part Number	MM/SM	Connector	Wavelength (nm)	Distance (km)	Temperature (°C)
KY- MGSFP-550M	MM	LC	850	0.5/0.275	-45 ~ +85
KY- MGSFP-LR2KM	MM	LC	1310	2.0	-45 ~ +85
KY- SGSFP-LX10K	SM	LC	1310	10	-45 ~ +85
KY- SGSFP-LX20K	SM	LC	1310	20	-45 ~ +85
KY- SGSFP-LX40K	SM	LC	1310	40	-45 ~ +85
KY- SGSFP-LX60K	SM	LC	1550	60	-45 ~ +85
KY- SGSFP-ZX80K	SM	LC	1550	80	-45 ~ +85

BiDi Series

Part Number	MM/SM	Connector	Wavelength (nm)	Distance (km)	Temperature (°C)
KY-BIDISGSFP-LX10K	SM	LC	T1310/R1550	10	-45 ~ +85
KY-BIDISGSFP-LX20K	SM	LC	T1550/R1310	20	-45 ~ +85
KY-BIDISGSFP-LX40K	SM	LC	T1310/R1550	40	-45 ~ +85
BSFP-S-3424L/S -20C	SM	LC or SC	T1310/R1490	20	-45 ~ +85
BSFP-S-4324L/S -20C	SM	LC or SC	T1490/R1310	20	-45 ~ +85
BSFP-S-3424L/S -20I	SM	LC or SC	T1310/R1490	20	-45 ~ +85
BSFP-S-4324L/S -20I	SM	LC or SC	T1490/R1310	20	-45 ~ +85

Copper SFP

Part Number	Rate	Connector	Distance (km)	Temperature (C)
KY-CGSFP-TXRJ	10/100/1000M	RJ45	0.1	-40 ~ +85