GigaX1024i+

Layer 2 Smart Plus Switch

User Manual

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Copyright Information

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1 Introduction

Thank you for buying a GigaX L2 Smart Plus Switch!

You can now manage your LAN through a friendly and powerful user interface. This user manual will show you how to set up the GigaX L2 Smart Plus Switch, and how to customize its configuration to get the most out of this product.

1.1 Conventions used in this manual

1.1.1 Notational conventions

- Acronyms are defined the first time they appear in the text.
- The Asus GigaX L2 Smart Plus Switch is simply referred to as "**the switch**".
- The terms ***LAN*** and ***network*** are used interchangeably to refer to a group of Ethernet-connected computers at one site.

1.1.2 Typographical conventions

- **Boldface** type text is used for items you select from menus and drop-down lists, and commands you type when prompted by the program.

1.1.3 Symbols

This document uses the following icons to call your attention to specific instructions or explanations.

Note: Provides clarification or non-essential information on the current topic.

Definition: Explains terms or acronyms that may be unfamiliar to many readers. These terms are also included in the Glossary.

Warning: Provides messages of high importance, including messages relating to personal safety or system integrity.

1.2 Package contents

Check the following items in your ASUS GigaX 1024i+ switch package. Contact your retailer if any item is damaged or missing.

- ☑ GigaX 1024i+ (28-port) L2 smart plus switch
- ☑ AC power cord
- ☑ Rack installation kit (two brackets with six #6-32 screws)
- ☑ User Manual
- ☑ Quick installation guide

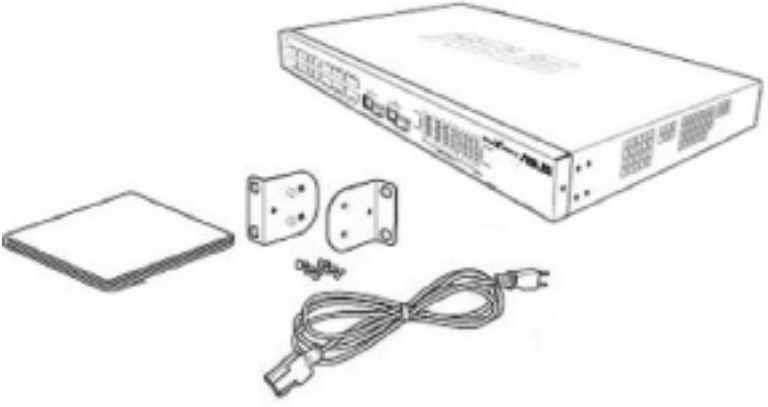


Figure 1. GigaX L2 smart plus switch package contents

1.3 Features

- 24 10/100 BASE-TX auto-sensing Fast Ethernet ports
- Two 10/100/1000BASE-T auto-sensing Gigabit Ethernet switching port
- Two small form factor (SFP) Gigabit interface converter (GBIC) slots
- 802.1D/802.1w transparent bridge/spanning tree protocol/rapid spanning tree protocol
- 8K MAC address cache with hardware-assisted aging
- 802.3x flow control
- 802.1Q-based tagged VLAN, up to 256 VLANs
- Port based VLAN
- Private VLAN
- 802.1p class of service, 4 queues per port
- IGMP snooping (v1/v2) support
- Static multicast group support
- 802.3ad link aggregation (manual and LACP), up to 15 trunk groups
- Port Mirroring
- 802.1X port-based network access control
- RADIUS remote authentication dial-in user service
- Ingress and egress bandwidth control
- Port security
- Ethernet cable diagnosis
- DHCP client
- Quality of service classification: DA/SA MAC priority, VLAN priority, IPv4 ToS/DiffServ, IPv6 Traffic Class
- RMON: support 4 groups (1, 2, 3, 9)
- SNMP v1, v2, v3
- MIB-II
- Enterprise MIB for system firmware version
- FTP for firmware update and configuration backup
- Syslog.
- Web GUI
- LEDs for port link status
- LEDs system status

1.4 Front panel features

The front panel includes LED indicators which show the system, and port status.

Figure 2. Front panel

Table 1: Front panel labels and LEDs

Label	Color	Status	Description
SYSTEM	Green	On	Unit is powered on
		Flashing	Self-test, INIT, or downloading
	Amber	On	Abnormal temperature or voltage
	Off		No power
10/100/1000 port status	Green	On	Link (RJ-45 or SFP) is present; port is enabled
		Flashing	Data is being transmitted/received
	Off		No Ethernet link.
10/100/1000 port speed	Green	On	1000Mbps on Giga port, or 100Mbps on 10/100 ports
	Amber	On	100Mbps on Giga port
	Off		10Mbps or link is not present

1.5 Rear panel features

The switch rear panel contains the ports for data and power connections.

Figure 3. Rear panel

Table 2: Rear panel labels

Label	Description
Power connector	Connects to the supplied power cord

1.6 Technical specifications

Table 3: Technical specifications

Physical Dimensions	43.5mm(H) X 444 mm(W) X 180mm(D)		
Power	Input: 100-240V AC/2A 50-60Hz		
	Consumption: <50 watts		
Environmental Ranges		Operating	Storage
	Temperature	0 to 40°C (32 to 104°C)	-25 - 70°C (-13 to 158°C)
	Humidity	5 to 90%	0 to 95%
	Altitude	up to 10,000 ft (3,000m)	40,000 ft (12,000m)

2 Quick Start

This section provides the basic instructions to set up the GigaX 1024i+ environment. Refer also to the GigaX 1024i Installation Guide.

- Part 1 shows you how to install the GigaX 1024i+ on a flat surface or on a rack.
- Part 2 provides instructions to set up the hardware.
- Part 3 shows you how to configure the basic settings on the GigaX 1024i+.

Before starting, obtain the following information from your network administrator:

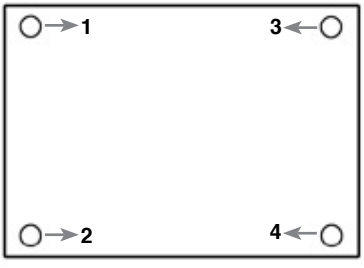
- IP address for the switch
- Default gateway for the network
- Network mask for this network

2.1 Part 1: Installing the switch

The switch can be installed either on a flat surface or on a rack.

2.1.1 Installing on a flat surface

The switch should be installed on a flat surface which can support the weight of the switches and their accessories. Attach four rubber pads on the four indented circles located at the bottom of the switch. See illustration below.



Indented circles 1, 2, 3, & 4. Attach rubber pads here.

2.1.2 Installing on a rack

1. With the front panel facing out, insert the switch between the rack posts and align the four mounting holes with that in the equipment rack.
2. Securely fasten the switch to the rack with two screws on each side.

2.2 Part 2: Connecting the hardware

In Part 2, you connect the device to the power outlet, and to your computer and to your network. Refer to Figure 4 for the overview of the hardware connections.

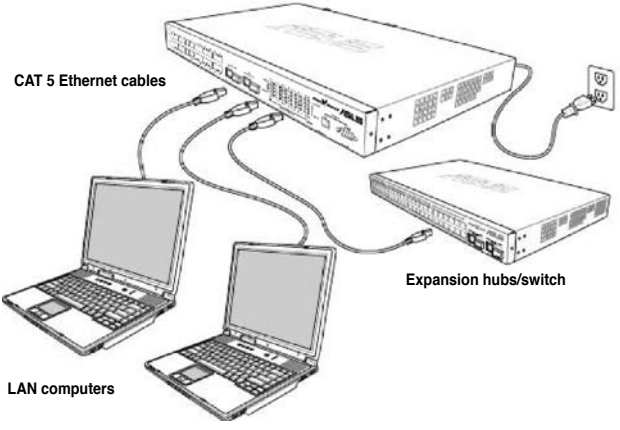


Figure 4. Overview of hardware connections

2.2.1 Connect to the computers or a LAN

You can use Ethernet cable to connect computers directly to the switch ports. You can also connect hubs/switches to the switch ports by Ethernet cables. You can use either the crossover or straight-through Ethernet cable to connect computers, hubs, or switches.

Use a twisted-pair Category 5 Ethernet cable to connect the 1000BASE-T port. Otherwise, the link speed cannot reach 1Gbps.

2.2.2 Attach the power adapter

1. Connect the AC power cord to the POWER receptacle located at the back of the switch. Plug the other end of the power cord into a wall outlet or a power strip.
2. Check the front LED indicators. If the LEDs light up as described in Table 4, the switch is working properly.

Table 4: LED indicators

No	LED	Description
1	System	Solid green indicates that the device is turned on. If this light is off, check if the power adapter is attached to the switch and plugged into a power source.
2	Switch ports [1] to [28]	Solid green indicates that the device can communicate with the LAN. If the light is flashing, it indicates that the device is sending or receiving data from your LAN computer.

2.3 Part 3: Basic switch settings

After completing the hardware setup, configure the basic settings for your switch. You can manage the switch either through the:

- **Configuration Manager**: The switch has a preinstalled web application to allow you to manage the switch using Java®-enabled IE5.0 or higher versions. Refer to Chapters 3 & 4 for more information.

2.3.1 Setting up thru the Configuration Manager

You can manage the switch through its preinstalled web software application called the **Configuration Manager**.

You can access the Configuration Manager through any web browser (Microsoft Internet Explorer® 5.0 or later versions. Netscape is not supported.) from any computer connected to the switch via the LAN ports.

1. By default, the switch's web authentication is disabled. You have to enable it to be able to manage the switch via the Configuration Manager. You can enable the web authentication function in the **System --> Administration** page.

2. In a web browser (IE 5.0 or later versions), enter this IP address: http://192.168.1.1 and press <**Enter**>. This is the switch's default IP address.

   A login screen appears as shown in Figure 5.

Figure 5. Login screen

3. Enter your username and password, and click <**OK**>. When logging in for the first time, use the following default settings:

   Username: admin

   Password: (no password)

You can change the password at any time.

4. To set up a new IP address, click **System --> IP Setup**. Fill in the IP address, the network mask, and the default gateway, then click <**OK**>.

Figure 6. IP setup

5. If your new address is different from the default, the browser can not update the switch status window or retrieve any page. This is normal. You have to retype the new IP address in the address/location box and press <**Enter**>. The web link returns.

6. To enable authentication for web access, click the **Administration** page, then select <**Enabled**>.

3 Using the Configuration Manager

The switch provides a preinstalled web software application called the **Configuration Manager**. It enables you to configure the device settings to meet the needs of your network. You can access it through your web browser from any PC connected to the switch via the LAN ports.

3.1 Login to the Configuration Manager

The Configuration Manager is preinstalled on the switch. To access the application, you need the following:

- A computer connected to the LAN port on the switch as described in the Quick Start Guide chapter.
- A web browser installed on the computer. The application is designed to work best with Microsoft Internet Explorer® 5.0 or later versions. It does not support Netscape.

You may access the program from any computer connected to the switch via the LAN ports.

3.1.1 Setting up the Configuration Manager

1. By default, the switch's web authentication is disabled. You have to enable it to be able to manage the switch via the Configuration Manager. You can enable the web's authentication function in the **System --> Administration** page.
2. In a web browser, enter this IP address: **http://192.168.1.1** and press <**Enter**>. This is the switch's default IP address. A login screen appears.

Figure 7. Config manager login screen

3. Enter your username and password, and then click <**OK**> to enter the Configuration Manager. When logging in for the first time, use the following default settings:

Username: admin
Password: (no password)

The home page appears at every log in to the system.

Figure 8. Home page

3.1.2 Setting up a new IP address

1. To set up a new IP address, click **System --> IP Setup**. Fill in the IP address, the network mask and the default gateway, then click <**OK**>**.** The IP setup screen appears after you click <**OK**>.
2. If your new address is different from the default, the browser can not update the switch status window or retrieve any page. This is normal. You have to retype the new IP address in the address/location box, and press <**Enter**>. This will refresh your web page.
3. To enable authentication for Web access, click **Administration** on the menu list, then select **Enabled** to start the password protection.

Figure 9. IP setup

3.2 Functional layout

A typical web page consists of three frames: the top, left, and right frames.

Figure 10. Functional layout

The **top frame** (or the banner frame) contains the switch's logo and the front panel. It shows periodic updates of the LED status. See the following for LED information:

- Table 4 for the LED definitions (on page 8).
- Table 5 for the color status description.

Table 5: Port color description

Port Color	Description
Green	Ethernet link is established
Black	No Ethernet link
Amber	Link is present but port is disabled manually or by spanning tree

Clicking on the port icon of the switch displays the port configuration in the lower right frame.

The **left frame** contains the menu bar containing all the features available for switch configuration. These features are grouped into categories, e.g. System, Bridge, etc. You can click on any of these to display a specific configuration page.

The **right frame** displays configuration pages or graphics for the statistics. See Chapter 4.8 for details.

Figure 11. Expanded menu list.

3.2.1 Menu navigation tips

• To expand a group of related menus, double-click the icon:

• To contract a group of related menus, double-click the icon:

3.2.2 Commonly used buttons and icons

Refer to the table for the function of each button and icon used in the application.

Table 5: Commonly used buttons and buttons

Button / Icon	Function
OK	Stores any changes made on the current page.
Add	Adds the existing configuration to the system, e.g., a static MAC address or a firewall ACL rule, etc.
Modify	Modifies an existing entry.
Remove	Deletes the selected item, e.g. a static route or a filter ACL rule and etc.
Reload	Re-displays the current page with updated statistics or settings.

4 Configuration Management

This chapter describes the features you can use in the Configuration Manager, the switch's preinstalled software application. These features are:

- System
- Physical Interface
- Bridge
- SNMP
- Security
- Cable Diagnosis
- Statistical Chart
- Save Configuration

To permanently save the changes or new settings made on any of the switch's features (or configuration), you must go to the Save Configuration page, and click on <Save>.

4.1 System

This section describes the tasks you can perform using the **System** feature in the Configuration Manager:

- Configuring the system name, contact, location, & other system info;
- Assigning IP addresses;
- Enabling / disabling web authentication;
- Rebooting the system; and
- Updating the firmware.

4.1.1 Management

The **Management** page contains the following information:

Figure 12. Management

• **Model Name**: The product's name.

• **MAC Address**: The switch's MAC address.

• **System Name**: The name to identify the system (editable).

• **System Contact**: The system's contact (editable).

• **System Location**: The location of the system (editable).

To save any changes you have made, click <**OK**>. Use <**Reload**> to refresh the settings.

4.1.2 IP Setup

The switch supports dynamic IP and static IP assignment. The dynamic IP is obtained from a DHCP server within the same VLAN. The IP Setup page contains the following editable parameters:

- **VLAN ID**: Specify a VLAN ID to system management interface. It is necessary that it should be within the same VLAN for management uses.
- **DHCP Client**: Enable DHCP to get a dynamic IP address, or disable DHCP to specify a static IP address. The DHCP server must be reachable within the management VLAN.
- **IP Address**: assign a static IP address to the switch management interface.
- **Network Mask**
- **Default Gateway**

To save any changes made, click <**OK**>. Use <**Reload**> to refresh the settings.

4.1.3 Administration

The **Administration** page allows you enable or disable the authentication for a web user, or add/ modify / remove a user in the user database. You

can set up to 8 users. The default settings for web access does not require any authentication.

- **Password Protection is**: Enable or Disable the web authentication.
- **User Name**: New user name.
- **Password**: Password for the new user.
- **Confirm Password**: Enter the password again for confirmation.

Figure 13. Administration

Click on <**Add**> to add the new user. Click on <**Modify**> when you are done with the modifications. Click on <**Remove**> when you want to remove the selected user.

To save any changes made, click<**OK**>. Use <**Reload**> to refresh the settings. When you enable the password protection, you have to login again immediately.

4.1.4 Reboot

To reboot the system:

1. Click on **System --> Reboot**. The Reboot page will be displayed.
2. Click on <**Reboot**>.

Figure 14. Reboot

Rebooting the system stops the network traffic and terminates the Internet connection.

4.1.5 Firmware Upgrade

From time to time, ASUS will provide you with an update to the firmware running on the GigaX L2 Managed Switch. All system software is contained in a single file called an image. The Configuration Manager provides an easy way to upload the new firmware image.

Figure 15. Firmware upgrade

To upgrade the firmware:

1. Click on **System --> Firmware Upgrade** to open the Firmware page. The Firmware page contains the following information:
   - **Hardware Version**: shows the hardware revision number.
   - **Boot ROM Version**: shows the version of the boot code.
   - **Firmware Version**: shows the current running firmware version. This number will be updated after the firmware update.
2. In the **Firmware or Auto-config file** text box, enter the path and name of the firmware image file. You may also click on <**Browse**> to search for the firmware image on your PC.
3. Click on <**Upload**> to update the firmware, and automatically reboots the system.

If automatic rebooting does not take place, refer to section 4.1.4: Reboot for steps on rebooting the system.

The filename of the auto-config file must be "config.bat", and the first line of the file must be "#autoconfig".

4.2 Physical Interface

The Physical Interface displays the Ethernet port status in real time.

You can configure the port in the following fields:

- **Port**: select the port to configure
- **Admin**: disable/enable the port
- **Mode**: set the speed and duplex mode

Figure 16. Physical Interface

- **Flow Control**: enable/disable 802.3x flow control mechanism
- **Port Status Window**: displays the following information for each port:

Link Status	the link speed and duplex for an existing link, otherwise link is down
State	the STP state
Admin	the setting value to disable or enable the port
Mode	the setting value to enable or disable 802.3x flow control mechanism
Flow Control	the setting value to enable or disable 802.3x flow control mechanism

To modify this page, select the corresponding port number and configure the port setting, then click <**Modify**>. The field you change will update the content of the display window. However, the new settings do not take effect until the **Save Configuration** (refer to Chapter 4.9: Save Configuration) is executed.

4.3 Bridge

The Bridge page group contains most layer 2 configurations such as the link aggregation, the STP, etc.

4.3.1 Spanning Tree

The configuration page for the Spanning Tree Protocol (STP) can disable and enable the feature in runtime. This page consists of three parts:

a) The root information;

b) The STP setting; and

c) The port setting.

Figure 17. Spanning Tree

The root information

The first part shows the root information. It tells the user the root switch's STP setting.

The STP Setting

The second part is the STP setting. The following options are available:

• **Disable/STP Enable/RSTP Enabled**: Turn the STP/RSTP off/on. When you turn the STP/RSTP on, STP/RSTP will use the following settings if the switch is the root switch.

• **Hello Time**: The interval between the generation of configuration BPDU

• **Max Age**: A timeout value to be used by all Bridges in the LAN

• **Forward Delay**: A timeout value to be used by all bridges in the LAN

• **Bridge Priority**: The switch priority in the LAN

The Port Setting

The third part is the port setting. It contains a display window showing each port's current configuration. Click <**Modify**> to change the port setting for STP/RSTP. The following fields are available:

• **Port**: Select the corresponding port to configure

• **Priority**: The port priority in the switch. Low numeric value indicates a high priority. The port with lower priority is more likely to be blocked by STP if a network loop is detected. The valid value is from 0 to 240.

• **Path Cost**: The valid value is from 1 to 200000000 or Auto. The path cost of the user configuration is displayed in the AdminCost, and the operation path cost is displayed in the OperCost. The higher cost is more likely to be blocked by STP if a network loop is detected.

• **Edge Port**: All ports are set to be edge ports by default. Edge port becomes STP port when BPDU is received. Also, it takes a very short time for an edge port to be in forwarding state.

• **Point to Point: Auto/Yes/No**: A full duplex link is considered as a point to point link. Otherwise, it is a shared link. Point to point link may have less convergence time. Auto is recommended in most cases.

Click <**OK**> to save any changes made to the settings. Click <**Reload**> to refresh the settings.

4.3.2 Link Aggregation

This page configures the link aggregation group (port trunking). The switch can have 15 link aggregation groups. It has the following configuration parameters:

Figure 18. Link aggregation

• **Show Trunk**: Select **Add a new Trunk** to create a new group. Or select an existing group to display on the following fields and port icons.

• **Name**: The group name.

• **Trunk ID**: A number to identify the trunk group besides the group name.

• **LACP**: Enable/Disable LCAP on selected trunk. LACP mode is fixed to be Active.

• **Remove Trunk**: Remove the selected trunk.

• **Port Icons**: These port icons are listed in a way like the front panel. You have to click on the icon the select the group members. The port can be removed from the group by clicking the selected port again.

Click <**OK**> to send the settings to the switch via the HTTP server. Click <**Reload**> to refresh the settings. To permanently save the new configuration, go to the **Save Configuration** page, then click <**Save**>.

All the ports in the link aggregation group MUST operate in full-duplex mode at the same speed.

All the ports in the link aggregation group MUST be configured in auto-negotiation mode or full duplex mode. This configuration will make the full duplex link possible. If you set the ports in full duplex force mode, then the link partner MUST have the same setting. Otherwise the link aggregation could operate abnormally.

All the ports in the link aggregation group MUST have the same VLAN setting.

All the ports in the link aggregation group are treated as a single logical link. That is, if any member changes an attribute, the others will change too. For example, a trunk group consists of port 1 and 2. If the VLAN of port 1 changes, the VLAN of port 2 also changes with port 1.

You have to check the runtime link speed and the duplex mode to make sure the trunk is physically active. Go to **Physical Interface** and check the link mode in the runtime status window for the trunk ports. If all the trunk members are in the same speed and full duplex mode, then the trunk group is set up successfully. If one of the members is not in the same speed or full duplex mode, the trunk is not set correctly. Check the link partner and change the settings to have the same speed and full duplex mode for all the members of your trunk group.

4.3.3 Mirroring

Mirroring, together with a network traffic analyzer, helps you monitor the network traffics. You can monitor the selected ports for egress or ingress packets.

Figure 19. Mirroring page

• **Mirror Mode**: Enables or disables the mirror function for the selected group.

• **Monitor Port**: Receives the copies of all the traffics in the selected mirrored ports.

The monitor port can not belong to any link aggregation group. The monitor port can not operate as a normal switch port. It does not switch packets or do address learning. Only supports 8 egress ports to be mirrored, and the monitored egress packets will be untag.

Click <**OK**> to send the new settings to the switch via the HTTP server. Click to <**Reload**> to refresh the settings.

4.3.4 Static Multicast

This page can add multicast addresses into the multicast table. The switch can hold up to 127 multicast entries. All the ports in the group will forward the specified multicast packets to other ports in the group.

Figure 20. Static multicast

• **Show Group**: Select **Add a new Group** to enter a new entry, or select an existing group address to display.

• **MAC Address**: Selects the multicast address

• **VLAN**: Selects the vlan group

Click <**OK**> to save any changes made. Click <**Reload**> to refresh the settings.

4.3.5 IGMP Snooping

The IGMP snooping function can be turned on or off. This helps reduce the multicast traffics on the network. When turned on, the switch snoops the IGMP packets and puts the new group into the multicast table. However, if the static entries occupy all 256 spaces, the IGMP snoop does not work normally. The switch only allows 256-layer 2 multicast group.

Figure 21. IGMP Snooping

4.3.6 Bandwidth Control

Bandwidth control limits the transmission rate of selected frames. The switch supports this on a per port basis by setting the configuration in the following fields:

Figure 22. Bandwidth Control

Ingress bandwidth control

- **Port**: Select the port to configure.
- **Control**: Disable/enable the ingress bandwidth control.
- **Mode**:
    - **Bcast**: Limit the broadcast packets.
    - **Bcast, Mcast**: Limit the broadcast and multicast packets.
    - **Bcast, Mcast, Dlf**: Limit the broadcast packets, multicast packets and unicast packets because of destination address lookup failure.
    - **All**: Limit all types of packets.
- **Limit Rate**: The threshold to limit the total number of the selected type of packet. For example, if broadcast/multicast is enabled, the traffic amount of each type will not exceed the limit value. The valid value is from 70 to 250000(Kbps).

Egress bandwidth control

- **Port**: Select the port to configure.
- **Bandwidth Control**: Disable/enable the bandwidth control.
- **Limit Rate**: Maximum egress transmission rate. The valid value is from 70 to 250000(Kbps).

Click <**OK**> to send the settings to the switch via the HTTP server. Click <**Reload**> to refresh the settings. To permanently save the configuration, go to the **Save Configuration** page, then click <**Save**>.

4.3.7 Dynamic Addresses

Figure 23. Dynamic Address

This page displays the result of the dynamic MAC address lookup by port, VLAN ID, or MAC address. The dynamic address, which is the MAC address specified in the lookup, will expire based on the configured "aging time". You can enter a valid number from 15 to 3825 (in seconds) to configure the expiry time (or aging time). To save any changes made to this page, click <**OK**>. To permanently save the new configuration, go to the **Save Configuration** page and click <**Save**>.

To lookup for MAC addresses, you can check the port, VLAN ID, or MAC address, and then click on <**Query**>. The address window will display the results.

4.3.8 Static Addresses

Figure 24. Static Address

MAC addresses entered in this page will not expire, and will remain static in the address table until you remove it from the address list.

The **Static Addresses** page has the following parameters:

- **MAC Address**: Enter the MAC address
- **VLAN ID**: Enter the VLAN ID that the MAC belongs to
- **Port Selection**: Select the port which the MAC belongs to
- **Discard on**: You can do packet filtering when the MAC address appears in the packets as destination address.

To create a new static MAC address

Click on <**Add**>. The new entry will be displayed on the address window. Up to 15 entries will be displayed in the first address window, and the other entries will be displayed in the succeeding pages. Click on **First**, **Previous**, **Next**, and **Last** links to navigate through the entries' list.

To modify a MAC address

Select the MAC address you want to modify, then click on <**Modify**>.

To remove a MAC address

Select the MAC address you want to remove, then click <**Remove**>.

To query a MAC address

Enter the MAC address and the VLAN ID, then click <**Query**>. Your query will be displayed in the address window.

To save the changes you have made on this page, click <**OK**>. Click <**Reload**> to refresh the settings. To permanently save the new configuration, go to the **Save Configuration** page, then click <**Save**>.

4.3.9 VLAN

4.3.9.1 VLAN Mode

There are two VLAN modes in our switch: (1) Port-Based VLAN, (2) 802.1Q Tagged VLAN. The switch supports this on a per port basis by setting the configuration in the following fields:

Figure 25. VLAN mode

a) **Port**: Select the port to configure.

b) **VLAN Mode**

- **802.1Q Tagged VLAN**: Forwarding decision follows the 802.1Q Tagged VLAN.
- **Port-Based VLAN**: if a port is in Port-Based VLAN mode: 1) when the port receives a tagged packet, the forwarding decision follows the 802.1Q Tagged VLAN; and 2) when it receives an untagged packet, the forwarding decision follows the Port-Based VLAN.

Restrictions

- If a port is in Port-Based VLAN Mode, it cannot be a promiscuous port, and cannot run 802.1x and IGMP snooping.
- Trunked members must in the same VLAN mode.

Click <**OK**> to send the settings to the switch via the HTTP server. Click <**Reload**> to refresh the settings. To save the configuration, go to the **Save Configuration** page, then click <**Save**>.

4.3.9.2 Tagged VLAN

Figure 26. Tagged VLAN

You can set up to 227 VLAN groups and show VLAN group in this page. There is a default VLAN created by the switch. This feature prevents the switch from malfunctions. You can remove any existing VLAN except the default VLAN.

You can assign the port to be either a tagged port or an untagged port by toggling the port button. There are three types of button:

• **"U" type**: Untagged port, which will remove VLAN tags from the transmitted packets.

• **"T" type**: All packets transmitted from this port will be tagged.

• **"blank" type**: This port is not a member of the VLAN group.

The other fields that you can configure are as follows:

• **Show VLAN**: Select the existing VLAN to display or select **Add a new VLAN** to create a new VLAN group.

• **Name**: the VLAN name.

• **VLAN ID**: This field requires user to enter the VLAN ID when a new VLAN is created.

• **Remove VLAN**: Remove an existing VLAN. This field disappears in VLAN creation page.

• **Private VLAN**: Set this VLAN to be a Private VLAN(PVLAN). PVLAN is to provide LAN security with the simplicity of VLAN configuration. The system administrator can reduce the VLAN and IP consumption but provide the same security to LAN. We cannot use default VLAN (VLAN 1) as the PVLAN. In our system, the total number of PVLAN is four. Mirror-to port cannot be a PVLAN member. Static Multicast cannot be a PVLAN. There are two port types in a PVLAN: 1) Promiscuous Port and 2) Isolated Port.

a) **Promiscuous Port**: A PVLAN must and only can have one promiscuous

port. It communicates with all interfaces within a PVLAN. Some restrictions in a promiscuous port are as follows:

• Promiscuous port must be an untagged port.

• Trunked port cannot be a promiscuous port.

• Promiscuous port cannot be in Port-Based VLAN Mode.

b) **Isolated Port**: The non-promiscuous port in a PVLAN. It has complete Layer 2 separation from the other ports within the same PVLAN, but not from the promiscuous port. PVLANs block all traffic to isolated ports except traffic from promiscuous port. Traffic from isolated port is forwarded only to promiscuous port. Traffic control does not work for isolated port. Some restrictions in an isolated port are as follows:

• Isolated port only process untagged packets. If isolated port receives tagged packets, they will be dropped.

• Isolated port only can belong to one VLAN, and the VLAN is a Private VLAN.

• Isolated port cannot run IGMP snooping.

• **Priority Override**: When priority override is checked, the priority override based on the VLAN ID can only occur on the members of this VLAN. When this occurs, the priority field of any packets with this VLAN ID will be overridden with the priority value. The VLAN priority override has higher priority than the port's default priority, and IP priority.

• **Priority**: The priority value is used to override the priority on any frames associated with this VLAN ID, if priority override is checked.

If you want the VLAN members' forwarding decision to follow the 802.1Q Tagged VLAN, you must go to the **VLAN Mode** page and select "**802.1Q Tagged VLAN**" mode as the VLAN Mode of these port members.

Click <**OK**> to send the settings to the switch via the HTTP server. Click <**Reload**> to refresh the settings. To permanently save the configuration, please go to the **Save Configuration** page, then click <**Save**>.

4.3.9.3 Port-Based VLAN

Port-Based VLAN is VLAN where the packet forwarding decision is based on the destination MAC address and its associated port. It is the simplest and most common form of VLAN. In a Port-Based VLAN, the system administrator assigns the switch's ports to a specific VLAN group. You can set up to 28 Port-Based VLAN groups and show VLAN group in this page.

Figure 27. Port-Based VLAN

• **Show Port-Based VLAN**: Select **Add a new VLAN** to create a new group, or select an existing group to display on the following fields and port icons:

• **Name**: the group name.

• **Group ID**: this field requires you to enter the Group ID when a new Port-Based VLAN is created. The valid Group ID is from 1 to 28.

• **Remove Group**: Remove an existing Port-Based VLAN Group. This field disappears in Port-Based VLAN Group creation page.

If you want the Port-Based VLAN group that you created to be effective, you must go to **VLAN Mode** page to select **Port-Based VLAN** mode as the VLAN Mode of these port members.

Click <**OK**> to send the settings to the switch via the HTTP server. Click <**Reload**> to refresh the settings. To permanently save the configuration, go to the **Save Configuration** page, then click <**Save**>.

4.3.10 Default Port VLAN and CoS

Figure 28. Default Port VLAN & CoS

This page includes some VLAN tags' related field settings for each port. These are as follows:

• **Port**: Select the port to configure

• **PVID**: Port-based VLAN ID. Every untagged packet received from this port will be tagged with this VLAN group ID

• **CoS (Class of Service) value**:
Every untagged packet received from this port will be assigned to this CoS in the VLAN tagged.

Click <**Modify**> to change the content in the port list window. Click <**OK**> to send the settings the switch via the HTTP server. Click <**Reload**> to refresh the settings. To permanently save the configuration, go to the **Save Configuration** page, then click <**Save**>.

4.4 SNMP

Simple Network Management Protocol (SNMP) is used to manage the network. You may use the SNMP configuration page to enable or disable the SNMP support.

To provide more secure management and access control, SNMPv3 is supported. SNMP has the following configuration parameters:

4.4.1 Community Table

You can enter different community names and specify a write-access privilege to the community by checking the checkbox. Click <**OK**> to save the configuration or <**Reload**> to refresh the page.

Figure 29. Community Table

4.4.2 Host Table

This page links the host IP address to the community name that is entered in Community Table page. Type an IP address and select the community name from the drop-down list. Click <**OK**> to save the configuration or <**Reload**> to refresh the page.

Figure 30. Host Table

4.4.3 Trap Setting

By setting the trap destination IP addresses and community names, you can enable SNMP trap function to send trap packets in different versions (v1 or v2c). Click <**OK**> to save the configuration or <**Reload**> to refresh the page.

Figure 31. Trap Setting

4.4.4 VACM Group

Figure 32. VACM Group

VACM (View-based Access Control Model) Group is used to configure the information of SNMPV3 VACM Group.

The VACM Group page has the following configuration parameters:

• **Group Name**: Enter the security group name.

• **Read View Name**: Enter the Read View Name that the Group belongs to. The related SNMP messages are Get, GetNext, GetBulk.

• **Write View Name**: Enter the Write View Name that the Group belongs to. The related SNMP message is Set.

• **Notify View Name**: Enter the Notify View Name that the Group belongs to. The related SNMP messages are Trap, Report.

• **Security Model**: Enter the Security Model Name that the Group belongs to. Any is suitable for v1,v2,v3. USM is SNMPv3 related.

• **Security level**: Enter the Security level Name that the Group belongs to. Only NoAuth, AuthNopriv, AuthPriv can be chosen.

Click <**Add**> to create a new VACM group. To remove an existing VACM Group, select the group and click <**Remove**>. To update an existing entry, select the group and click <**Modify**>. Click <**OK**> to save the changes on this page. Click <**Reload**> to refresh the settings. To permanently save the new configuration, go to the **Save Configuration** page, then click <**Save**>.

4.4.5 VACM View

Figure 33. VACM View

VACM (View-based Access Control Model) View is used to view the information of SNMPV3 VACM Group.

The VACM View has the following parameters:

• **View Name**: Enter the security group name.

• **View Type**: Select the View Type that the View belongs to. Included or Excluded when View Subtree

matches the Oid in the SNMPv3 message.

• **View Subtree**: Enter the View Subtree that the View belongs to. The Subtree is the Oid to match the Oid in the SNMPv3 message. The match is good when the subtree is shorter than the Oid in the SNMPv3 message.

• **View Mask**: Enter the View Mask that the View belongs to. Each bit in the mask represents the digit between the dots of View Subtree from left side. Bit '0' means 'nothing'.

Click <**Add**> to create a new VACM View entry. To remove an existing entry, select the view and click <**Remove**>. To update an existing entry, select the view and click <**Modify**>. Click <**OK**> to save the changes on this page. Click <**Reload**> to refresh the settings. To permanently save the new configuration, go to the **Save Configuration** page, then click <**Save**>.

4.4.6 USM User

Figure 34. USM User

USM (User-based Security Model) User is used to configure the information of SNMPV3 USM User.

The USM User page has the following parameters:

• **Engine Id**: Enter the Engine Id that matches the ID in the Manager.

• **Name**: Enter Name combined with Engine ID that should match the Name and Engine ID in the Manager.

• **Auth Protocol**: Enter the Auth Protocol that Engine ID and Name belong to. Only NoAuth, MD5, SHA1 can be chosen. If the NoAuth is chosen, there is no need to enter the password.

• **Auth Password**: Enter the password that the Auth Protocol belongs to. The password needs at least 8 characters or digits.

• **Priv Protocol**: Enter the Priv Protocol that Engine ID and Name belong to. Only NoPriv ,DES can be chosen. If the NoPriv is chosen, there is no need to enter password.

• **Priv Password**: Enter the password that the Priv Protocol belongs to. The password needs at least 8 characters or digits.

Click <**Add**> to create a new USM User entry. To remove an existing entry, select the entry and click <**Remove**>. To update an existing entry, select the entry and click <**Modify**>. Click <**OK**> to save the changes on this page. Click <**Reload**> to refresh the settings. To permanently save the new configuration, go to the **Save Configuration** page, then click <**Save**>.

4.5 Security

The switch has the 802.1x port-based security feature. Only authorized hosts are allowed to access the switch port. Traffic is blocked for unauthorized hosts. The authentication service is provided by a RADIUS server or the local database in the switch.

The switch also supports dynamic VLAN assignment through the 802.1x authentication process. The VLAN information for the users/ports should be properly configured in the authentication server before enabling this feature.

4.5.1 Port Access Control

Port Access Control is used to configure various 802.1x parameters. 802.1x uses either a RADIUS server or a local database to authenticate port users.

Port Access Control has two settings: the Bridge (Global) settings and the port settings.

Figure 35. Port Access Control

Bridge (Global) settings

The Bridge (Global) settings page has the following configuration parameters:

• **Reauthentication**: Once enabled, the switch will try to authenticate the port user again when the reauthentication time is up.

• **Reauthentication Time**: If 'Reauthentication' is enabled, this is the interval for the switch to re-send authentication request to the port user.

• **Authentication Method**: RADIUS or Local database can be used to authenticate the port user.

• **Quiet Period**: If authentication failed either from the RADIUS or the local database, the switch waits upon this time period before sending another authentication request to the port user.

• **Retransmission Time**: If the port user failed to respond to authentication request from the switch, the switch waits upon this time period before sending another authentication request to the port user.

• **Max Reauthentication Attempts**: Retry count if the port user failed to respond to authentication requests from the switch.

Port settings

The port settings page has the following configuration parameters:

• **Port**: Specify which port to be configured.

• **AuthMode (Authentication Mode)**: If **Port_based** is selected, it requires only one host to be authenticated per port by a remote RADIUS server, a remote TACACS+ server, or a local user database. 'Port_based' supports Multi-host and GuestVID. Otherwise, if **MAC_based** is selected, each host must be authenticated before accessing to the nerwork. 'MAC_based' doesn't support Multi-host and GuestVID. The system supports up to 256 hosts that try to be authenticated by 'MAC_based'. If 'MAC_based' is selected, enabling the 'Reauthentication' in bridge settings is recommended.

• **AuthCtrl (Authentication Control)**: If **Force_authorized** is selected, the selected port is forced to be authorized. Thus, traffic from all hosts is allowed to pass. Otherwise, if **Force_unauthorized** is selected, the selected port is blocked and no traffic can go through. If 'Auto' is selected, the behavior of the selected port is controlled by the 802.1x protocol.

• **Multi-host**: If enabled, all hosts connected to the selected port are allowed to use the port if ONE of the hosts passed the authentication. If disabled, only ONE host among other hosts passed the authentication is allowed to use the port.

• **GuestVID**: Guest VLAN allows guest users that without 802.1x clients to have limited network access.

Click <**OK**> to save the settings. Click <**Reload**> to refresh the settings. To save the configuration, go to the **Save Configuration** page and click <**Save**>.

4.5.2 Dial-In User

Dial-in User is used to define users in the local database of the switch. It has the following configuration parameters:

• **User Name**: New username.

• **Password**: Password for the new user.

• **Confirm Password**: Enter the

Figure 36. Dial-In User

password again for confirmation.

• **Dynamic VLAN**: Specify the VLAN ID assigned to the 802.1x-authenticated clients.

Click <**Add**> to create the new user. Click <**Modify**> when want to make some modifications. Click <**Remove**> when you want to remove the selected user. Click <**OK**> to save the settings. Click <**Reload**> to refresh the settings.

4.5.3 RADIUS

In order to use external RADIUS server, the following parameters are required to be setup:

Figure 37. Radius

• **Authentication Server IP**: The IP address of the RADIUS server.

• **Authentication Server Port**: The port number that the RADIUS server is listening to.

• **Authentication Server Key**: The key is used for communications between the GigaX and the RADIUS server.

• **Confirm Authentication Key**: Re-type the key for confirmation.

Click <**OK**> to save the settings. Click <**Reload**> to refresh the settings. To permanently save the configuration, go to the **Save Configuration** page,

The VLAN of the RADIUS server connected to the switch must be the same VLAN of the system management interface.

then click <**Save**>.

4.5.4 Port Security

Port security pages include port configuration, port status, and secure MAC addresses function.

4.5.4.1 Port Configuration

This page is used to configure various Port Security parameters. The total number of available secure MAC addresses on the switch is 1024. Users can configure the port in the following fields:

Figure 38. Port Configuration

• **Port**: Select the port to make the configuration.

• **Admin**: Disable/enable port security feature on the port.

• **Violation Mode**: Set the violation mode. This action will be taken when a violation occurs. It is a security violation when one of these situations occurs:

1) It is a security violation when the maximum numbers of secure MAC addresses have been added to the address table, and a station whose MAC addresses is not in the address table attempts to access the interface.

2) An address learned or configured on one secure interface is seen on another secure interface in the same VLAN. You can configure the interface for one of the three violation modes:

a) **Protect**: In this mode, you are not notified that a security violation has occurred.

b) **Restrict**: In this mode, you are notified that a security violation has occurred. Specifically, an SNMP trap is sent, a syslog message is logged, and the violation counter increments.

c) **Shutdown**: In this mode, a port security violation causes the interface to become blocking state immediately. It also sends an SNMP trap, logs a syslog message, and increments the violation counter.

• **Max MAC Addresses**: Set the maximum numbers of secure MAC addresses. The valid value is from 1 to 132. The sum of this value for all ports is less than or equal to the maximum number of secure MAC address allowed in the switch.

• **Aging Time**: Set the aging time. The valid value is from 0 to 1440(mins). The aging mechanism is only effective for dynamic secure MAC addresses. If the time is 0, the aging mechanism is disabled for this port.

• **Aging Type**: Set the aging type to determine the action when the dynamic secure MAC addresses are aged out. Two types of aging are supported for each port:

a) **Absolute**: the secure addresses on the port are deleted after the specified aging time.

b) **Inactivity**: the secure addresses on the port are deleted only if there

is no data traffic from the secure source MAC address for the specified time period.

Select the corresponding port number and configure the port setting, then click <**Modify**>. The content of the display window will update automatically as you make the changes. Click <**OK**> to save the new settings. Click <**Reload**> to refresh the settings. To save the configuration, go to the **Save Configuration** page, then click <**Save**>.

4.5.4.2 Port Status

This page displays the port security information of all ports. The security information is as follows:

Figure 39. Port Status

• **Port**: Port number.

• **Status**:

a) **NoOper**: This indicates port security of the port that is configured to be disabled.

b) **SecureUp**: This indicates the port security is operational.

c) **SecureDown**: This indicates port security is not operational. This happens when the port security is configured to be enabled but can not be operational due to some reasons such as it conflicts with other features.

d) **Restrict**: This indicates that the port security violation occurs when the violation mode is 'restrict'.

e) **Shutdown**: This indicates that the port is shutdown due to port security violation when the violation mode is 'shutdown'.

• **Restart**: Whether to restart the port in shutdown status (Yes/No).

• **TotalMacAddrCount**: The total numbers of current static and dynamic secure MAC addresses.

• **StaticMacAddrCount**: The total numbers of current static secure MAC addresses.

• **ViolationCount**: The total numbers of secure violation.

Port security status on the port is '**SecureDown**' when one of the following situations occur:

• The port is link down.

- Administrative bridge port is disabled.
- The port is a trunk port.
- The port is a monitor port in port mirroring.
- The port is running 802.1x and in the single-host mode.

If the status of a port is '**Shutdown**', users can select the corresponding port number and set Restart to '**Yes**', then click on <**Modify**>. The field you changed will update the content of the display window. Click <**OK**> to save the settings. Click <**Reload**> to refresh the settings. To save the configuration permanently, go to the **Save Configuration** page, then click <**Save**>.

4.5.4.3 Secure MAC Addresses

Users can add a MAC address into the secure MAC address table of one port. The MAC address added in this way will not age out from the secure MAC address table. We call it static secure MAC address.

Figure 40. Secure MAC addresses

• **MAC Address**: Enter the MAC address.

• **Port Selection**: Select the port to which the MAC belongs.

Click <**Add**> after you have created a new static MAC address. The new entry will be shown in the address window.

Users can select one port from Port Selection, and then click <**Query**>. You will see the current total secure MAC addresses of the port shown in the address window.

Users can remove an existing address by selecting the entry from the list, then clicking <**Remove**>. When you want to select multi-entries, please press '**Shift**' key on the keyboard and selecting the entries with the mouse.

Click <**Add**> or <**Remove**> to make the configuration take effect immediately. To save the static secure MAC address permanently, go to the **Save Configuration** page, then click on <**Save**>.

4.6 QoS

QoS pages include trust state, mapping, priority override, and CoS function.

4.6.1 Trust State

The Ingress Policy block determines the priority of each frame for the Queue Controller. The switch supports this on a per port basis by setting the configuration in the following fields:

Figure 41. Trust state

- **Port**: Select the port to configure.
- **Trust State**: Trust DSCP or CoS.

a) **Trust CoS**: Use IEEE Tags.
Use IEEE 802.1p Traffic Class field for priority data if the frame is an IEEE 802.3ac tagged frame. Otherwise, use port's default priority for priority data.

b) **Trust DSCP**: Use IP for priority. Use IPv4 TOS and/or Diffserv fields if the frame is IPv4 and use IPv6 Traffic Class fields if the frame is IPv6 for priority data. Otherwise, use port's default priority for priority data. About Trust DSCP, The related setting is in the **Mapping** and the **CoS** pages.

Click <**OK**> to send settings to the switch via the HTTP server. Click <**Reload**> to refresh the settings. To permanently save the configuration, go to the **Save Configuration** page, then click <**Save**>.

4.6.2 Mapping

This page is used to map DSCP (Differentiated Services Code Point) value to CoS (Classification of Service) priority. The valid DSCP value is from 0 to 63. For IPv6, 4 multiply by DSCP value are Traffic Class value. For example, DSCP value 4 means IPv6 Traffic Class value is 16. The switch supports this by setting the configuration in the

Figure 42. Mapping

following fields:

• **DSCP**: select the DSCP value.

• **CoS**: select the CoS priority.

Click <**OK**> to send the settings to the switch via the HTTP server. Click <**Reload**> to refresh the settings. To permanently save the configuration, go to the **Save Configuration** page, then click <**Save**>.

4.6.3 Priority Override

Figure 43. Priority Override

The **Priority Override** page allows you to enable or disable the QoS source MAC priority override and the destination MAC priority override.

When the source MAC priority override is enabled, the priority override based on source MAC can occur on all ports. A source MAC priority override occurs when the source address of a packet results in an entry hit where the source address has been added to the static MAC address table and assigned a priority. When this occurs, the priority value assigned to the static ARL table is used to override the packet's previously determined priority. The source MAC priority override has higher priority than the port's default priority, IP priority, and VLAN priority override.

When destination MAC priority override is enabled, the priority overrides based on destination MAC can occur on all ports. A destination MAC priority override occurs when the destination address of a packet results in an entry hit where the destination address has been added to the static MAC address table and assigned a priority. When this occurs, the priority value assigned to the static ARL table is used to override the packet's previously determined priority. The destination MAC priority override has highest priority over the port's default priority, IP priority, VLAN priority override, and source MAC priority override.

If you want to create a static MAC entry and combine the CoS priority, please go to the **Static Addresses** page.

Click <**OK**> to send the settings to the switch via the HTTP server. Click <**Reload**> to refresh the settings. To permanently save the configuration, go to the **Save Configuration** page, then click <**Save**>.

4.6.4 CoS

Figure 44. CoS

The switch supports 4 egress queues for each port. You can specify the scheduling types as follows:

• **Strict priority scheduling**: Each CoS value can map into one of the four queues. The queue 4 has the highest priority to transmit the packets. The packets in the low priority queue do not transmit until all the high priority queues become empty. In Strict priority scheduling, weight setting is always zero.

• **Weighted round-robin (WRR) scheduling**: WRR scheduling requires you to specify a number to indicate the importance (or weight) of the queue relative to the other CoS queues. WRR scheduling prevents the low priority queues from being completely neglected during periods of high priority traffic. WRR scheduling transmits some packets from each queue in turn. The number of packets it sends corresponds to the relative importance of the queue. For example, if Queue 1 has a weight of 1 and Queue 2 has a weight of 2, one packet is sent from Queue 1 for every two that are sent from Queue 2. By using this scheduling, low priority queues have the opportunity to send packets even though the high priority queues are not empty. The fixed weights are 1, 2, 4, 8.

Click <**OK**> to send the settings to the switch via the HTTP server. Click <**Reload**> to refresh the settings. To permanently save the configuration, go to the **Save Configuration** page, then click <**Save**>.

4.7 Cable Diagnosis

The major function of **Cable Diagnosis** is to detect cable fault (open or short) and report the estimated fault location. Moreover, Cable Diagnosis can also detect PHY type (10M, 100M or 1000M) as well as estimated cable length of a normal cable. Cable length estimation only supports Giga speed mode.

Figure 45. Cable Diagnosis

Just select a port number and click <**Go**>. Test results shall be displayed accordingly.

When you enable the Cable Diagnosis on a port, the connection of this port will be disconnected during the diagnosis.

4.8 Statistics Chart

The **Statistics Chart** pages provide network flow in different charts. You can specify the period/time to refresh the chart. You can monitor the network traffic amount in different graphic chart by these pages. Most MIB-II counters are displayed in these charts.

Click <**Auto Refresh**> to set the period for retrieving new data from the switch. You can differentiate the statistics or ports by selecting **Color**. Finally, click <**Draw**> to let the browser to draw the graphic chart. Each new Draw will reset the statistics.

4.8.1 Traffic Comparison

This page shows one statistical item for all the ports in one graphic chart. Specify the statistics item to display and click <**Draw**>. The browser will show you the updated data and refresh the graphic periodically.

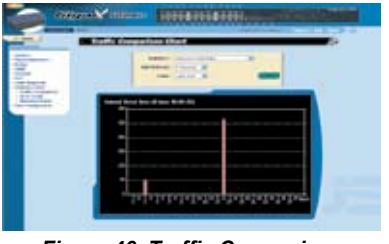


Figure 46. Traffic Comparison

4.8.2 Error Group

Select the **Port** and display **Color**, then click <**Draw**>. The statistics window shows you all the error counts for the specified port. The data is updated periodically.

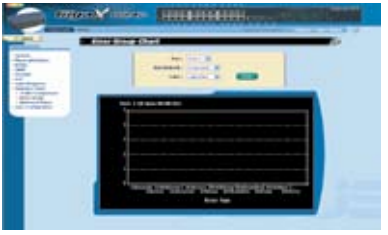


Figure 47. Error Group

4.8.3 Historical Status

In this chart, you can display information for different ports and statistics. This chart shows the history of the statistics information.

Figure 48. Historical Status

4.9 Save Configuration

Click <**Save**> to save the configuration. To restore to factory default settings, click <**Restore**>. You will lose all the configurations when you choose to restore the default configurations.

Figure 49. Save Configuration

5 IP Addresses, Network Masks & Subnets

5.1 IP Addresses

This section pertains only to IP addresses for IPv4 (version 4 of the Internet Protocol). IPv6 addresses are not covered.

This section assumes basic knowledge of binary numbers, bits, and bytes.

IP addresses, the Internet's version of telephone numbers, are used to identify individual nodes (computers or devices) on the Internet. Every IP address contains four numbers, each from 0 to 255 and separated by dots (periods), e.g. 20.56.0.211. These numbers are called, from left to right, field1, field2, field3, and field4.

This style of writing IP addresses as decimal numbers separated by dots is called dotted decimal notation. The IP address 20.56.0.211 is read "twenty dot fifty-six dot zero dot two-eleven."

5.1.1 Structure of an IP address

IP addresses have a hierarchical design similar to that of telephone numbers. For example, a 7-digit telephone number starts with a 3-digit prefix that identifies a group of thousands of telephone lines, and ends with four digits that identify one specific line in that group.

Similarly, IP addresses contain two kinds of information:

- **Network ID**: Identifies a particular network within the Internet or intranet.
- **Host ID**: Identifies a particular computer or device on the network.

The first part of every IP address contains the network ID, and the rest of the address contains the host ID. The length of the network ID depends on the network's class (see following section). Table 8 shows the structure of an IP address.

Table 7: IP address structure

	Field1	Field2	Field3	Field4
Class A	Network ID	Host ID		
Class B	Network ID		Host ID	
Class C	Network ID			Host ID

Here are some examples of valid IP addresses:

Class A: 10.30.6.125 (network = 10, host = 30.6.125)

Class B: 129.88.16.49 (network = 129.88, host = 16.49)

Class C: 192.60.201.11 (network = 192.60.201, host = 11)

5.1.2 Network classes

Classes A, B, and C are the three commonly used network classes. (There is also a class D but it has a special use beyond the scope of this discussion.) These classes have different uses and characteristics.

Class A networks are the Internet's largest networks, each with room for over 16 million hosts. Up to 126 of these huge networks can exist, for a total of over 2 billion hosts. Because of their huge size, these networks are used for WANs and by organizations at the infrastructure level of the Internet, e.g. your ISP.

Class B networks are smaller but still quite large, each being able to hold over 65,000 hosts. There can be up to 16,384 class B networks in existence. A class B network might be appropriate for a large organization such as a business or government agency.

Class C networks are the smallest, only able to hold 254 hosts at most, but the total possible number of class C networks exceeds 2 million (2,097,152 to be exact). LANs connected to the Internet are usually class C networks.

The class can be determined easily from field1:
field1 = 1-126: Class A
field1 = 128-191: Class B
field1 = 192-223: Class C
(field1 values not shown are reserved for special uses)

A host ID can have any value except all fields set to 0 or all fields set to 255, as those values are reserved for special uses.

5.2 Subnet masks

A mask looks like a regular IP address, but contains a pattern of bits that tells what parts of an IP address are the network ID and what parts are the host ID: bits set to 1 mean "this bit is part of the network ID" and bits set to 0 mean "this bit is part of the host ID."

Subnet masks are used to define subnets (what you get after dividing a network into smaller pieces). A subnet's network ID is created by "borrowing" one or more bits from the host ID portion of the address. The subnet mask identifies these host ID bits.

For example, consider a class C network 192.168.1. To split this into two subnets, you would use the subnet mask:

255.255.255.128

It's easier to see what's happening if we write this in binary:

11111111. 11111111. 11111111.10000000

As with any class C address, all of the bits in field1 through field 3 are part of the network ID, but note how the mask specifies that the first bit in field 4 is also included. Since this extra bit has only two values (0 and 1), this means there are two subnets. Each subnet uses the remaining 7 bits in field4 for its host IDs, which range from 0 to 127 (instead of the usual 0 to 255 for a class C address).

Similarly, to split a class C network into four subnets, the mask is:

255.255.255.192 or 11111111. 11111111. 11111111.11000000

The two extra bits in Field 4 can have four values (00, 01, 10, 11), so there are four subnets. Each subnet uses the remaining six bits in field4 for its host IDs, ranging from 0 to 63.

Sometimes a subnet mask does not specify any additional network ID bits, and thus no subnets. Such a mask is called a default subnet mask. These masks are:
Class A: 255.0.0.0
Class B: 255.255.0.0
Class C: 255.255.255.0
These are called default because they are used when a network is initially configured, at which time it has no subnets.

6 Troubleshooting

This section gives instructions for using several IP utilities to diagnose problems. A list of possible problems with suggestion actions is also provided.

All the known bugs are listed in the release note. Read the release note before you set up the switch. Contact Customer Support if these suggestions do not resolve the problem.

6.1 Diagnosing problems using IP utilities

6.1.1 ping

Ping is a command you can use to check whether your PC can recognize other computers on your network and the Internet. A ping command sends a message to the computer you specify. If the computer receives the message, it sends messages in reply. To use it, you must know the IP address of the computer with which you are trying to communicate.

On Windows-based computers, you can execute a ping command from the Start menu. Click the **Start** button, and then click **Run**. In the Open text box, type a statement such as the following:

ping 192.168.1.1

Click <**OK**>. You can substitute any private IP address you know on your LAN or a public IP address for an Internet site.

If the target computer receives the message, a Command Prompt window appears as shown in Figure 50.

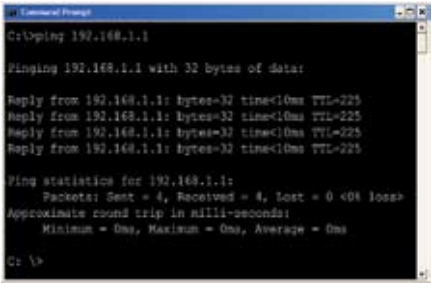


Figure 50. Using the ping utility

If the target computer cannot be located, you will receive the message "Request timed out."

Using the ping command, you can test whether the path to the switch is working (using the pre-configured default LAN IP address 192.168.1.1) or another address you assigned.

You can also test whether access to the Internet is working by typing an external address, such as that for www.yahoo.com (216.115.108.243). If you do not know the IP address of a particular Internet location, you can use the nslookup command, as explained in the following section.

From most other IP-enabled operating systems, you can execute the same command at a command prompt or through a system administration utility.

6.1.2 nslookup

You can use the nslookup command to determine the IP address associated with an Internet site name. You specify the common name, and the nslookup command looks up the name on your DNS server (usually located with your ISP). If that name is not an entry in your ISP's DNS table, the request is then referred to another higher-level server, and so on, until the entry is found. The server then returns the associated IP address.

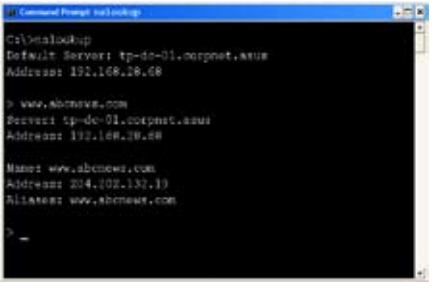


Figure 51. Using the nslookup utility

On Windows-based computers, you can execute the nslookup command from the Start menu. Click the **Start** button, then click **Run**. In the Open text box, type the following: **nslookup**

Click <**OK**>. A Command Prompt window displays with a bracket prompt (>). At the prompt, type the name of the Internet address you are interested in, such as www.absnews.com.

The window displays the associate IP address you know. See Figure 59.

There may be several addresses associated with an Internet name. This is common for web sites that receive heavy traffic; they use multiple, redundant servers to carry the same information.

To exit from the nslookup utility, type **exit** and press <**Enter**> at the command prompt.

6.2 Simple fixes

Table 8: Problems & suggested actions

Problem	Suggested Action
LEDs	
SYSTEM LED does not light up after the switch is turned on.	Verify if the power cord is securely connected to the switch and a wall socket/power strip.
Gigabit Ethernet Link LED does not illuminate after an Ethernet cable is attached.	1. Verify if the Ethernet cable is securely connected to your LAN switch/hub/PC and to the switch. Make sure the PC and/or hub/switch is turned on. 2. Verify if your cable is sufficient for your network requirements. A 1000 Mbps network (1000BaseTx) should use cables labeled Cat 5. 10Mbit/sec cables may tolerate lower quality cables.
Network Access	
PC cannot access another host in the same network	1. Check the Ethernet cabling is good and the LED is green. 2. If the port LED is amber, check if this port is disabled. You may experience a disconnected network in a short period (around 1 minute) if you just turned on the STP.
PCs cannot display web configuration pages.	1. The switch is powered up and the connecting port is enabled. The factory default IP for the switch is 192.168.1.1. 2. Verify your network setup in your PC for this information. If your PC does not have a valid route to access the switch, change the switch IP to an appropriate IP that your PC can access. 3. Ping “switch IP” from the PC, if it still fails, repeat step 2.

Table 8: Problems & suggested actions

Problem	Suggested Action
Web configuration interface	
You forgot/lost your WEB Configuration Interface user ID or password.	1. If you have not changed the password from the default, try using “admin” as the user ID and bypassing password.
Some pages do not display completely	1. Verify that you are using Internet Explorer v5.5 or later. Netscape is not supported. Support for Javascript® must be enabled in your browser. Support for Java® may also be required. 2. Ping the switch IP address to see if the link is stable. If some ping packets fail, check your network setup to make sure a valid setting.
Changes to Configuration are not being retained.	Be sure to click <**Save**> in the Save Configuration page to save any changes.

6.3 Files upload and download procedure

6.3.1 Upload firmware by FTP

Make sure your PC and the switch are in the same VLAN before you use ftp function as well as the other remote management tools. The switch VLAN is shown in the **System-->IP setup** page of the WEB GUI or use "**net interface show**" to display the VID by CLI.

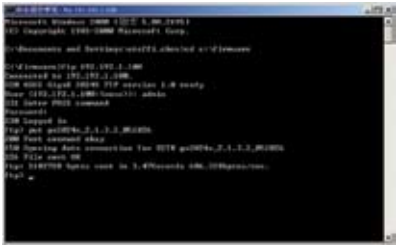


Figure 51. Upload Firware by FTP

1. Open the command prompt window.
2. Change to the directory where the firmware is located.
3. Use command "**ftp <IP Address>**" to connect to FTP server in the switch, so the IP address is the switch IP, ex: "**ftp 192.192.1.100**".
4. Type the system's user name.
5. Type the system's password.
6. Use command "**put <File Name>**" to upload firmware. The file name is your local name of the firmware.

ex: "**put gx2024x_2.1.3.2_051026**".

6.3.2 Upload auto-config file by FTP

Make sure your PC and the switch are in the same VLAN before you use ftp function as well as the other remote management tools. The switch VLAN is shown in the **System-->IP setup** page of the WEB GUI or use "**net interface show**" to display the VID by CLI.

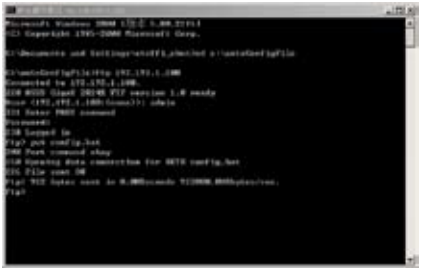


Figure 52. Upload auto-config by FTP

The auto-config file is consisted of CLI commands in a text file, the switch will execute the commands after the file is loaded into the switch.

1. Open the command prompt window.
2. Change to the directory where the auto-config file is located.
3. Use the command "**ftp <IP Address>**" to connect to the FTP server, ex: "**ftp 192.192.1.100**".
4. Type the system's user name.
5. Type the system's password.
6. Use the command "**put <File Name>**" to upload auto-config file. "**#autoconfig**" must be included at the header of the file, and the file name of the auto-config file must be "**config.bat**", ex: "**put config. bat**".

6.3.3 Backup system configurations by FTP

Make sure your PC and the switch are in the same VLAN before you use ftp function as well as the other remote management tools. The switch VLAN is shown in the **System-->IP setup**" page of the WEB GUI or use "**net interface show**" to display the VID by CLI.

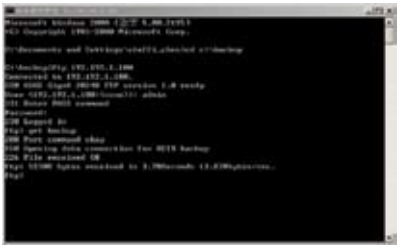


Figure 53. Backup system configurations by FTP

1. Open the command prompt window.
2. Change to the directory that the system configurations file will be located.
3. Use the command "**ftp <IP Address>**" to connect to the switch IP address as your FTP server IP, ex: "**ftp 192.192.1.100**".
4. Type the system's user name.
5. Type the system's password.
6. The default file name of the system configuration file is "**backup**". You must use this file name to backup the system configuration. The file can be renamed after downloading.

6.3.4 Restore system configurations by FTP

Make sure your PC and the switch are in the same VLAN before you use ftp function as well as the other remote management tools. The switch VLAN is shown in the **System-->IP setup** page of the WEB GUI or use "**net interface show**" to display the VID by CLI.

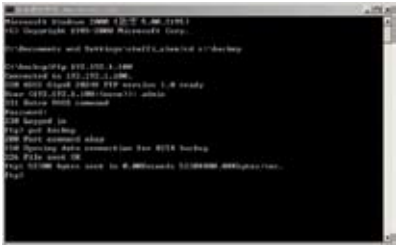


Figure 54. Restore system configurations by FTP

1. Open the command prompt window.
2. Change to the directory where the system configuration file is located.
3. Use the command "**ftp <IP Address>**" to connect to the switch IP address as the FTP server IP, ex: "**ftp 192.192.1.100**".
4. Type the system's user name.
5. Type the system's password.
6. Use the command "**put <File Name>**" to restore the system configurations. The file must be the backup file from the same switch model, ex: "**put backup**".

7 Glossary

10BASE-T A designation for the type of wiring used by Ethernet networks with a data rate of 10 Mbps. Also known as Category 3 (CAT 3) wiring. See also data rate, Ethernet.

100BASE-T A designation for the type of wiring used by Ethernet networks with a data rate of 100 Mbps. Also known as Category 5 (CAT 5) wiring. See also data rate, Ethernet.

1000BASE-T A designation for the type of wiring used by Ethernet networks with a data rate of 1000 Mbps.

binary The “base two” system of numbers, which uses only two digits, 0 and 1, to represent all numbers. In binary, the number 1 is written as 1, 2 as 10, 3 as 11, 4 as 100, etc. Although expressed as decimal numbers for convenience, IP addresses in actual use are binary numbers; e.g., the IP address 209.191.4.240 is 11010001.10111111.00000100.11 110000 in binary. See also bit, IP address, network mask.

bit Short for “binary digit,” a bit is a number that can have two values, 0 or 1. See also binary.

bps bits per second

CoS Class of Service. Defined in 802.1Q, the value range is from 0 to 7.

broadcast To send data to all computers on a network.

Ethernet The most commonly installed computer network technology, usually using twisted pair wiring. Ethernet data rates are 10 Mbps and 100 Mbps. See also 10BASE-T, 100BASE-T, twisted pair.

FTP **File Transfer Protocol**

A program used to transfer files between computers connected to the Internet. Common uses include uploading new or updated files to a web server, and downloading files from a web server.

host A device (usually a computer) connected to a network.

ICMP **Internet Control Message Protocol**

An Internet protocol used to report errors and other network-related information. The ping command makes use of ICMP.

IGMP **Internet Group Management Protocol**

An Internet protocol that enables a computer to share information about its membership in multicast groups with adjacent routers. A multicast group of computers is one whose members have designated as interested in receiving specific content from the others. Multicasting to an IGMP group can be used to simultaneously update the address books of a group of mobile computer users or to send company newsletters to a distribution list.

IGMP Snooping Snoop the IGMP packets on each port and associate the port with a layer 2 multicast group.

mask See network mask.

Multicast To send data to a group of network devices.

Mbps Abbreviation for Megabits per second, or one million bits per second. Network data rates are often expressed in Mbps.

Monitor Also called “Roving Analysis”, allow you to attach a network analyzer to one port and use it to monitor the traffics of other ports on the switch.

network mask A network mask is a sequence of bits applied to an IP address to select the network ID while ignoring the host ID. Bits set to 1 mean “select this bit” while bits set to 0 mean “ignore this bit.” For example, if the network mask 255.255.255.0 is applied to the IP address 100.10.50.1, the network ID is 100.10.50, and the host ID is 1. See also binary, IP address, subnet, “IP Addresses Explained” section.

NIC **Network Interface Card**

An adapter card that plugs into your computer and provides the physical interface to your network cabling, which for Ethernet NICs is typically an RJ-45 connector. See Ethernet, RJ-45.

packet Data transmitted on a network consists of units called packets. Each packet contains a payload (the data), plus overhead information such as where it came from (source address) and where it should go (destination address).

ping **Packet Internet (or Inter-Network) Groper**

A program used to verify whether the host associated with an IP address is online. It can also be used to reveal the IP address for a given domain name.

port A physical access point to a device such as a computer or router, through which data flows into and out of the device.

protocol A set of rules governing the transmission of data. In order for a data transmission to work, both ends of the connection have to follow the rules of the protocol.

remote In a physically separate location. For example, an employee away on travel who logs in to the company's intranet is a remote user.

RJ-45 **Registered Jack Standard-45**

The 8-pin plug used in transmitting data over phone lines. Ethernet cabling usually uses this type of connector.

RMON **Remote Monitoring**

Extensions to SNMP, provide comprehensive network monitoring capabilities.

routing Forwarding data between your network and the Internet on the most efficient route, based on the data's destination IP address and current network conditions. A device that performs routing is called a router.

SNMP **Simple Network Management Protocol**

The TCP/IP protocol used for network management.

STP **Spanning Tree Protocol**

The bridge protocol to avoid packet looping in a complicate network.

subnet A subnet is a portion of a network. The subnet is distinguished from the larger network by a subnet mask which selects some of the computers of the network and excludes all others. The subnet's computers remain physically connected to the rest of the parent network, but they are treated as though they were on a separate network. See also network mask.

subnet mask A mask that defines a subnet. See also network mask.

TCP See TCP/IP.

TCP/IP **Transmission Control Protocol/Internet Protocol**

The basic protocols used on the Internet. TCP is responsible for dividing data up into packets for delivery and reassembling them at the destination, while IP is responsible for delivering the packets from source to destination. When TCP and IP are bundled with higher-level applications such as HTTP, FTP, Telnet, etc., TCP/IP refers to this whole suite of protocols.

Telnet/SSH An interactive, character-based program used to access a remote computer. While HTTP (the web protocol) and FTP only allow you to download files from a remote computer, Telnet / SSH allows you to log into and use a computer from a remote location.

TFTP **Trivial File Transfer Protocol**

A protocol for file transfers, TFTP is easier to use than File Transfer Protocol (FTP) but not as capable or secure.

Trunk Two or more ports are combined as one virtual port, also called as Link Aggregation.

TTL **Time To Live**

A field in an IP packet that limits the life span of that packet. Originally meant as a time duration, the TTL is usually represented instead as a maximum hop count; each router that receives a packet decrements this field by one. When the TTL reaches zero, the packet is discarded.

twisted pair The ordinary copper telephone wiring long used by telephone companies. It contains one or more wire pairs twisted together to reduce inductance and noise. Each telephone line uses one pair. In homes, it is most often installed with two pairs. For Ethernet LANs, a higher grade called Category 3 (CAT 3) is used for 10BASE-T networks, and an even higher grade called Category 5 (CAT 5) is used for 100BASE-T networks. See also 10BASE-T, 100BASE-T, Ethernet.

upstream The direction of data transmission from the user to the Internet.

VLAN Virtual Local Area Network

WAN Wide Area Network

Any network spread over a large geographical area, such as a country or continent. With respect to the SL-1000, WAN refers to the Internet.

Web browser A software program that uses Hyper-Text Transfer Protocol (HTTP) to download information from (and upload to) web sites, and displays the information, which may consist of text, graphic images, audio, or video, to the user. Web browsers use Hyper-Text Transfer Protocol (HTTP). Popular web browsers include Netscape Navigator and Microsoft Internet Explorer. See also HTTP, web site, WWW.

Web page A web site file typically containing text, graphics and hyperlinks (cross-references) to the other pages on that web site, as well as to pages on other web sites. When a user accesses a web site, the first page that is displayed is called the home page. See also hyperlink, web site.

Web site A computer on the Internet that distributes information to (and gets information from) remote users through web browsers. A web site typically consists of web pages that contain text, graphics, and hyperlinks. See also hyperlink, web page.