Intel® 4-Port Gb Ethernet Switch Module: Installation and User's Guide

A Guide for Technically Qualifed Assemblers of Intel Identified Subassemblies/Products

Order Number: C28706-002

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**Trademark of IBM

Safety

Before installing this product, read the Safety Information in the Appendix.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 Safety Information
（安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας
(safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się
z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	To Disconnect:
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Statement 2:

CAUTION:
When replacing the lithium battery, use only Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100 C (212 F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

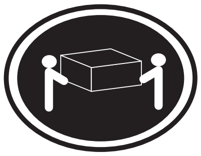
DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

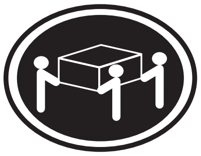
Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

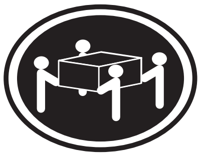
Statement 4:



18 kg (39.7 lb)



32 kg (70.5 lb)

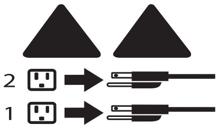


55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

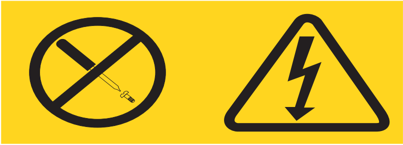


Statement 6:

CAUTION:
If you install a strain-relief bracket option over the end of the power cord that is connected to the device, you must connect the other end of the power cord to an easily accessible power source.

Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.



Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Statement 13:

DANGER

Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device for electrical specifications.

Statement 14:

CAUTION:
Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the following label is attached.

Contents

Chapter 1. Introducing the Intel® 4-Port Gb Ethernet Switch Module

Thank you for purchasing an Intel® 4-Port Gb Ethernet Switch Module. This *Installation Guide* contains information about:

- Setting up and installing your switch module
- Configuring your switch module

For installation details, see Chapter 2. “Installing and removing a switch module” on page 7. For additional information, see the instructions in your Resource CDs.

Your 4-Port Gb Ethernet Switch Module is one of up to four Ethernet switch modules that can be installed in the blade server chassis. This high-performance Ethernet Switch Module is ideally suited for networking environments that require superior microprocessor performance, efficient memory management, flexibility, and reliable data storage.

Performance, reliability, and expansion capabilities were key considerations in the design of your 4-Port Gb Ethernet Switch Module. These design features make it possible for you to customize the system hardware to meet your needs today, while providing flexible expansion capabilities for the future.

The product name, machine type and serial number are located on the identification label on the side of the Switch Module. The media access control (MAC) address also is located on the identification label.

Note: The MAC address is also located on a separate label on the information panel under the external Ethernet port connectors.

Record your product information in this table.	
Product name	4-Port Gb Ethernet Switch Module
Type	________________________________
Model number	________________________________
Serial number	________________________________
Media access control (MAC) address	________________________________

Verify that the shipping carton contains a 4-Port Gb Ethernet Switch Module. If the Ethernet switch module is missing or damaged, contact your local reseller for replacement. Otherwise, return the Ethernet switch module to its static-protective package.

Note: The illustrations in this document might differ slightly from your hardware.

Related publications

This *Installation and User's Guide* contains detailed setup and installation instructions for the 4-Port Gb Ethernet Switch Module. This publication also provides general information about your Ethernet switch module, including information about features, and how to configure your 4-Port Gb Ethernet Switch Module.

In addition to this *Installation and User's Guide*, the following related documentation is provided with your 4-Port Gb Ethernet Switch Module:

- *Intel® Server Blade Chassis Enterprise SBCE Installation and User's Guide*

  This publication is provided in PDF on the *Intel® Server Blade Chassis Enterprise SBCE Resource CD*. It provides general information about your SBCE system, including:

  — Information about features

  — How to set up, cable, and start your SBCE system

  — How to install options in your SBCE system

  — How to configure your SBCE system

  — How to perform basic troubleshooting

- *Intel® SBX42 Installation and User's Guide*

  This publication is provided in PDF on the *Intel® SBX42 Resource CD*. It provides general information about your blade server, including:

  — Information about features

  — How to set up and start your blade server

  — How to install options in your blade server

  — How to configure your blade server

  — How to install an operating system on your blade server

  — How to perform basic troubleshooting of your blade server

- *Hardware Maintenance Manual and Troubleshooting Guides*

  The Intel® *Server Blade Chassis Enterprise* SBCE and the Intel® SBX42 each come with a customized *Hardware Maintenance Manual and Troubleshooting Guide*. These publications are provided in PDF on their respective resource CDs. They contain information to help you solve the problem yourself or to provide helpful information to a service technician.

Depending on your blade server model, additional publications might be included on the *Intel® SBX42 Resource CD*.

Notices and statements used in this book

The following notices and statements are used in this book:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

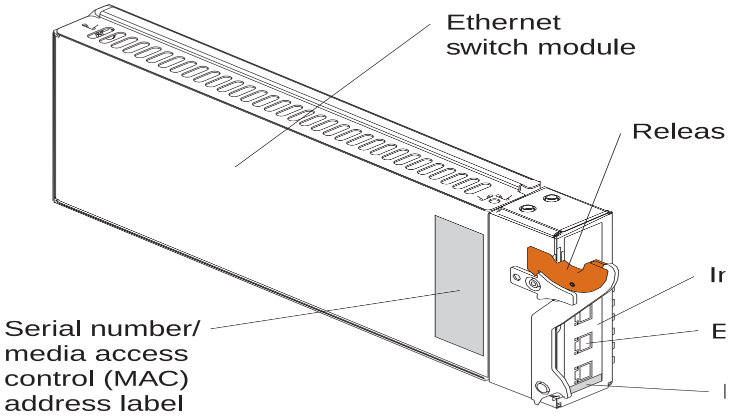
Major components of the 4-Port Gb Ethernet Switch Module

The orange color on components and labels on your Ethernet switch module and blade server identifies hot-swap or hot-plug components. You can install or remove these components while the system is running, provided that your system is configured to support this function.

The blue color on components and labels indicates touch points where a component can be gripped, a latch moved, and so on.

The following illustration shows the major components of your Ethernet switch module.

Note: The illustrations in this document might differ slightly from your hardware.



For more information about the components of the information panel, see Chapter 3, “Information panel LEDs and external ports” on page 13. For more information about the MAC address, see “IP addresses and SNMP community names” on page 17.

Specifications and features

This section provides a summary of the specifications and features for your 4-Port Gb Ethernet Switch Module.

The 4-Port Gb Ethernet Switch Module features include:

- Ports
  - Four external 1000BASE-T ports for making 10/100/1000 Mbps connections to a backbone, end stations, and servers
  - Fourteen internal full-duplex gigabit ports, one connected to each of the blade server system’s blade servers
  - Two internal full-duplex 10/100 Mbps ports connected to the management module
- Performance features
  - Transmission method: Store-and-forward
  - Random-access memory (RAM) buffer: 8 MB
  - Packet filtering/forwarding rate:
    - Full-wire speed for all connections. 148800 packets per second (pps) per port (for 100 Mbps)
    - 1488100 pps per port (for 1000 Mbps)
  - Media access control (MAC) address learning: Automatic update. Supports 28 K MAC address
  - Priority queues: Four priority queues per port
  - Forwarding table age time: Maximum age: 17 to 2100 seconds. Default is 300 seconds.
  - 802.1D Spanning Tree support. Can be disabled on the entire switch or on a per-port basis
  - 802.1Q Tagged virtual local area network (VLAN) support, including Generic Attribute Registration Protocol (GARP) VLAN Registration Protocol (GVRP)
  - Support for 256 VLANs in total, including 128 static VLANs
  - Internet group management protocol (IGMP) snooping support per VLAN
  - Link aggregation with 802.3ad support on four external ports for up to two static trunk groups or two link aggregation control protocol (LACP) 802.3ad link aggregation groups
- Management
  - Spanning Tree Algorithm (STA) protocol for creation of alternative backup paths and prevention of network loops
  - Simple network management protocol (SNMP) version 1
  - Fully configurable either in-band or out-of-band control through SNMP based software
  - Flash memory for software upgrades. This can be done through trivial file transfer protocol (TFTP) or hypertext transfer protocol (HTTP) Web interface.
  - Built-in SNMP management:
    - Bridge management information base (MIB) (RFC 1493)
    - MIB-II (RFC 1213)
    - 802.1P/Q MIB (RFC 2674)
    - Interface MIB (RFC 2233)

        - Mini-RMON MIB (RFC 1757) - four groups. The remote monitoring (RMON) specification defines the counters for the receive functions only. However, the switch provides counters for both receive and transmit functions.
    - Supports Web-based management
    - TFTP support
    - Bootstrap protocol (BOOTP) support
    - Dynamic host configuration protocol (DHCP) client support
    - Password enabled
    - Telnet remote control console
- Network cables:
    - 10BASE-T:
        - UTP Category 3, 4, 5 (100 meters maximum)
        - 100-ohm STP (100 meters maximum)
    - 100BASE-TX:
        - UTP Category 5 (100 meters maximum)
        - EIA/TIA-568 100-ohm STP (100 meters maximum)
    - 1000BASE-T:
        - UTP Category 5e (100 meters maximum)
        - UTP Category 5 (100 meters maximum)
        - EIA/TIA-568B 100-ohm STP (100 meters maximum)

Standards and topology

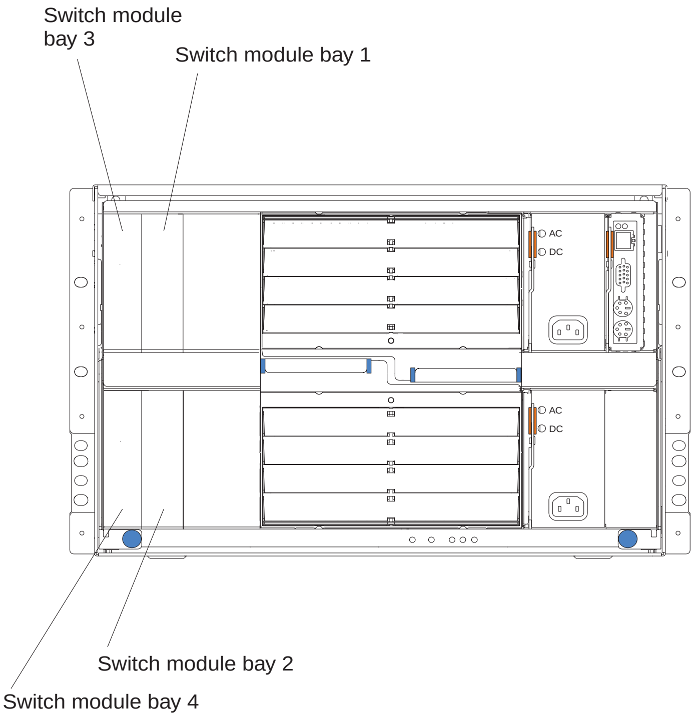
The following standards apply to the Ethernet switch module:

- IEEE 802.3 10BASE-T Ethernet
- IEEE 802.3u 100BASE-TX Fast Ethernet
- IEEE 802.3z Gigabit Ethernet
- IEEE 802.1Q Tagged VLAN
- IEEE 802.1P Tagged Packets
- IEEE 802.3ab 1000BASE-T
- IEEE 802.3x Full-duplex Flow Control
- ANSI/IEEE 802.3 NWay auto-negotiation

The following topology applies to the Ethernet switch module: Star

Chapter 2. Installing and removing a switch module

The following illustration shows the switch-module bay locations.



Attention: To maintain proper system cooling, each module bay must contain either a module or a filler module; each blade bay must contain either a blade or a filler blade.

Ethernet interface requirements

Your *blade server chassis* supports a minimum of one hot-plug Ethernet switch module in switch-module bay 1. This switch module is a fully functional four-connector Ethernet switch that provides a network connection to Ethernet Link 1 in all the blade servers in the chassis. To provide a network connection for Ethernet Link 2 in each blade server, install an Ethernet switch module in switch-module bay 2.

If you install an interface option on any blade server, you must install a hot-plug switch module of the same interface type in switch-module bay 3 to obtain connection 1 for the interface option. To provide connection 2 for the interface option, install a switch module of that interface type in switch-module bay 4. The switch modules in bays 3 and 4 provide connections to all the interface options in the SBCE system.

Important: The switch modules in switch-module bays 3 and 4 and all blade server interface options in the blade server chassis must use the same interface type. For example: if you install an Ethernet interface option on a blade server, the switch modules that you install in switch-module bays 3 and 4 must be Ethernet, and all other interface options in the blade server chassis must also be Ethernet interface options.

The following table summarizes the application for each switch module.

Bay	Switch-module function
1	Connection 1 (Ethernet Link 1) for all blade servers in the blade server chassis
2	Connection 2 (Ethernet Link 2) for all blade servers in the blade server chassis
3	Connection 3 from all blade server interface options in the blade server chassis
4	Connection 4 from all blade server interface options in the blade server chassis

For additional information, see the *Intel® Server Blade Chassis Enterprise SBCE Installation and User's Guide* on the *SBCE Resource CD*.

Installation guidelines

Before you begin to install the Ethernet switch module in your blade server chassit, read the following information:

- Become familiar with the safety and handling guidelines specified under "Safety" on page ix and "Handling static-sensitive devices" on page 9, and read the safety statements in SBCE publications.
- The labels in your SBCE unit identify hot-swap or hot-plug components. You can install or remove hot-swap modules while the system is running. For complete details about installing or removing a hot-swap or hot-plug component, see the detailed information in this chapter.
- The blue color on components and labels identifies touch points where you can grip a component, move a latch, and so on.
- You do not need to turn off the blade server system to install or replace any of the hot-swap or hot-plug modules on the rear of the blade server system.

System reliability considerations

Attention: To help ensure proper cooling and system reliability, make sure that:

- Each of the module bays on the rear of the blade server system has either a module or filler module installed.
- A removed hot-swap module is replaced with an identical module or filler module within 1 minute of removal.
- Cables for the optional modules are routed according to the illustrations and instructions in this document.

Handling static-sensitive devices

Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

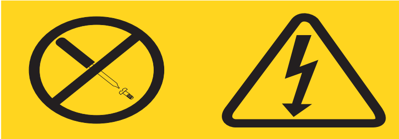
To reduce the possibility of electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the chassis for at least two seconds. (This drains static electricity from the package and from your body.)
- Remove the device from its package and install it directly into your blade server system without setting it down. If it is necessary to set the device down, place it in its static-protective package. Do not place the device on your blade server system chassis or on a metal table.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

Installing a switch module

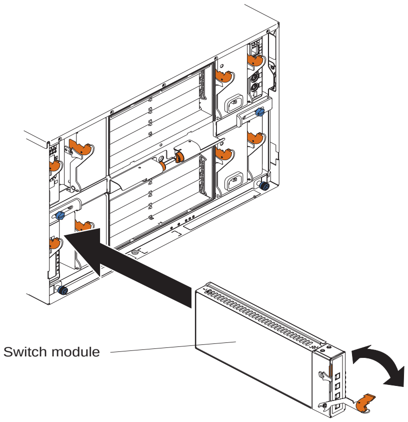
Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.



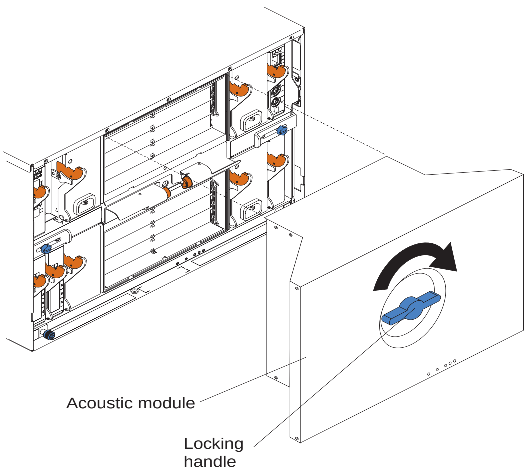
Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

The following illustration shows how to install a switch module in the rear of the system.



Complete the following steps to install a switch module.

1. Review the information in “Safety” on page ix and “Installation guidelines” on page 8 through “Handling static-sensitive devices” on page 9.
2. Remove the acoustic attenuation module, if installed, from the rear of the blade server system chassis.



3. Select a switch-module bay in which to install the switch module.
4. Select a switch-module bay in which to install the switch module, in accordance with the instructions in “Ethernet interface requirements” on page 7.
5. Remove the filler module from the selected bay. Store the filler module for future use.
6. If you have not already done so, touch the static-protective package that contains the switch module to an unpainted metal part of the blade server system chassis for at least two seconds.
7. Remove the switch module from its static-protective package.
8. Ensure that the release latch on the switch module is in the open position (perpendicular to the module).
9. Slide the switch module into the appropriate switch-module bay until it stops.
10. Push the release latch on the front of the switch module to the closed position.

11. Make sure that the LEDs on the switch module indicate that it is operating properly. Verify that:
    - The dc power LED and the ac power LED on each power module are lit.
    - The OK LED on each management module is lit.
    - The OK LED on each switch module is lit.
12. If you have other switch modules to install, do so now; otherwise, go to step 13.
13. Attach any cables required by the switch module. For the location of the connectors on the *Intel® Server Blade Chassis Enterprise SBCE*, see *the SBCE Installation and User’s Guide* on the SBCE *Resource CD*.
14. Replace the acoustic attenuation module, if you removed it in step 2 on page 10.

Removing a switch module

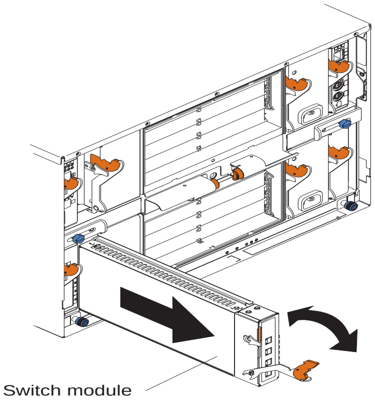
Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Complete the following steps to remove a switch module.

1. Remove the acoustic attenuation module, if installed, from the rear of the blade server system chassis (see step 2 on page 10 for location).
2. Select an appropriate switch-module bay from which to remove a switch module, in accordance with the instructions in “Ethernet interface requirements” on page 7.
3. Unplug any cables from the selected switch module.
4. Pull the release latch toward the bottom of the switch module as shown in the illustration. The module moves out of the bay about 0.64 cm (0.25 inch).



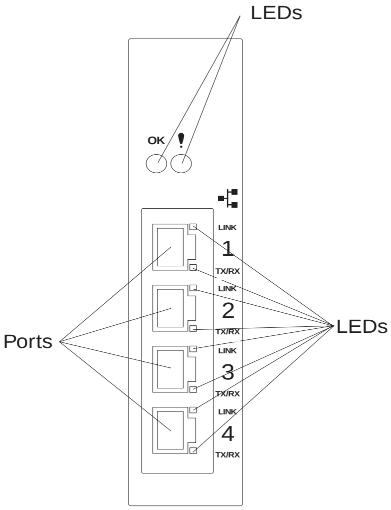
5. Slide the switch module out of the bay and set it aside.
6. Place either another switch module or a filler module in the bay within 1 minute.
7. If you placed another switch module in the bay, reconnect any cables that you unplugged in step 3.
8. Replace the acoustic attenuation module option, if you removed it in step 1.

Chapter 3. Information panel LEDs and external ports

This chapter describes the information panel and LEDs (also known as indicators) on the 4-Port Gb Ethernet Switch Module. This chapter also identifies the external ports on the information panel.

Information panel

The information panel of the switch module consists of LEDs and four external 1000BASE-T ports, as shown in the following illustration.

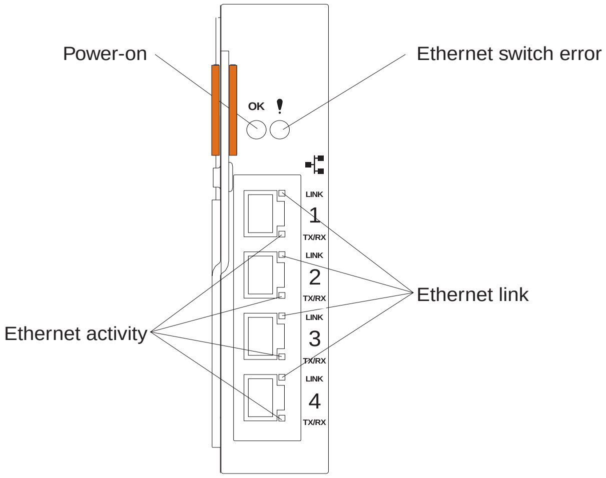


The switch module contains:

- Comprehensive LEDs display the status of the switch module and the network (see “LEDs”).
- Fourteen internal ports, one connected to each of the processor blades.
- Two internal full-duplex 10/100 Mbps ports connected to the management module.
- Four external 1000BASE-T Ethernet ports for 10/100/1000 Mbps connections to external Ethernet devices, such as backbones, end stations, and servers. These ports are identified as Ext1, Ext2, Ext3, and Ext4 in the switch configuration menus and are labeled 1 through 4 (from top to bottom) on the switch module, as shown in the preceding illustration.

LEDs

The LEDs on the information panel of the switch module include OK, !, Ethernet link, and Ethernet activity. The following illustration shows the LEDs on the switch module. A description of each LED follows the illustration.



Notes:

1. The illustrations in this document might differ slightly from your hardware.
2. An amber LED illuminates when a system error or event has occurred. To identify the error or event, check the LEDs on the information panel of the switch module.

OK (power-on): This green LED is located above the four external 10/100/1000 Mbps ports on the information panel. When this LED is on, it indicates that the switch module has passed the power-on self-test (POST) and is operational.

! (Ethernet switch error): This amber LED is located next to the OK (power-on) LED on the information panel. This LED indicates that the switch module has a fault. If the switch module fails the POST, this fault LED will be lit.

Ethernet link: This green link status LED is located at the top of each external 10/100/1000 Mbps port. When this LED is lit on a port, it indicates that there is a connection (or link) to a device on that port.

Ethernet activity: This green activity LED is located at the bottom of each external 10/100/1000 Mbps port. When this LED blinks on a port, it indicates that data is being received or transmitted (that is, activity is occurring) on that port. The blink frequency is proportional to the amount of traffic on that port.

Chapter 4. Switch management and operating concepts

This chapter discusses many of the concepts and features used to manage the switch and the concepts necessary to understand how the switch functions. In addition, this chapter explains many important points regarding these features.

Configuring the switch to implement these concepts and use its many features is discussed in detail in the following chapters.

Ethernet switch subsystem overview

This section provides information that you should be familiar with when managing and configuring the internal switch modules. If you are familiar with Layer 2 Ethernet switches, you will recognize the industry-standard parameters and terminology that are used in this document. However, it is important that you also understand the system operating environment with regard to the internal switches.

The Ethernet switch modules are hot-swappable subsystems that provide Ethernet switching capabilities within a blade server system chassis. The primary purpose of the switch module is to provide Ethernet interconnectivity among the processor blades, management modules, and the external network infrastructure.

Two independent switch modules provide redundancy in the base system configuration. Each of the 14 server blades within a blade server system chassis has a dedicated, 1000 Mbps (1 Gbps) full-duplex link to each of the two switch modules. Ports 1 through 14 on the switch module correspond to server blades 1 through 14, respectively (numbered left to right when viewed from the front of the chassis). Each switch module has four external 10/100/1000 Mbps Ethernet ports for connection to the external network infrastructure. These ports are identified as Ext1, Ext2, Ext3, and Ext4 in the switch configuration menus and are labeled 1 through 4 (from top to bottom) on the switch module (see Chapter 3, “Information panel LEDs and external ports” on page 13 for an illustration).

Depending on the application, the external Ethernet interfaces can be configured to meet a variety of requirements for bandwidth or function.

The blade server system chassis Ethernet switch modules have been preconfigured with default parameter settings that can be used with most typical installations. All switch modules will need a few basic parameter settings initially, such as an Internet protocol (IP) address for management and control, security access and control parameters, and basic setup of the external ports for link aggregation.

Chassis configuration and operation

The Ethernet switch module is an integral subsystem within the overall blade server system chassis. For additional blade server system chassis level information, see the applicable *Intel® Server Blade Chassis Enterprise SBCE Installation and User’s Guide* publications on the *Resource CD*. The SBCE system chassis includes a management module (MM) as the central element for overall chassis management and control. The switch module includes a 100-Mbps internal Ethernet port that can only be accessed by the management module. To prevent inadvertent changes, this management port is “hidden” and does not appear in the port configuration and status screens. The factory default settings will *only* permit management and control access to the switch module through the 10/100 Mbps Ethernet port on the management module. You can use the four external 10/100/1000 Mbps Ethernet ports on the switch module for management and control of the switch by selecting this mode as an option through the management module configuration utility program.

Switch management and control

This document describes the user interfaces, screens, parameters, and other information that you need for remote management and control of your blade server system 4-Port Gb Ethernet Switch Module. Complete the following initial configuration steps:

1. Connect the Ethernet port of the management module to a 10/100 Mbps network (with access to a management station) or directly to a management station.
2. Initially configure the management module with the appropriate IP addresses for network access (see the applicable *Intel® Server Blade Chassis Enterprise SBCE Installation and User's Guide* publications on the *SBCE Resource CD* for more information).
3. Assign an initial IP address to the switch module through the management module. You can assign this IP address through one of the following methods:
   - Automatically through a DHCP server
   - Manually through the SBCE system configuration utility program

Once a transmission control protocol/Internet protocol (TCP/IP) communication path has been established with the switch module through the MM Ethernet port, you can perform a series of management and control tasks. These tasks are in the following categories:

- Configuration

  Modify switch parameter settings
- Remote Management Setup
- Network Monitoring
  - Automatically receive error alerts (traps)
  - View/reset port traffic statistics
  - Monitor data traffic on selected output ports, and so on
- Maintenance
  - Update the switch software
  - Query history log
  - Restore factory default settings, and so on

The switch module supports two primary management and control user interfaces. A built-in Web browser interface is the primary interface. A telnet command line interface (CLI) may also be used as an alternate management method. The Web browser interface can also be invoked from the SBCE system management and configuration utlity program, along with the telnet interface that provides a series of menu windows. Both interfaces provide access to the same switch information and control parameters.

In addition, you can access an extensive set of both standard and private MIB objects through SNMP protocols.

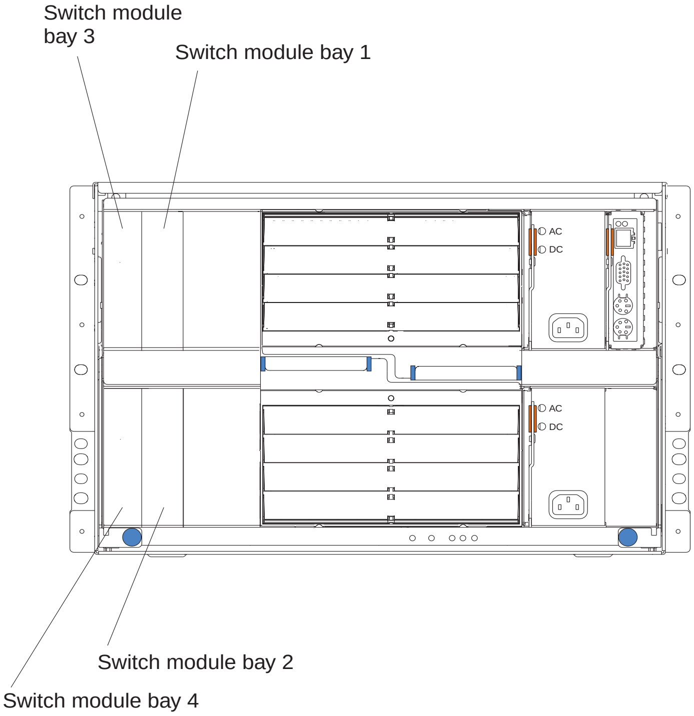
IP addresses and SNMP community names

Each switch must be assigned its own Internet protocol (IP) address, which is used for communication with an SNMP network manager or other transmission control protocol/Internet protocol (TCP/IP) applications (for example, BOOTP or TFTP). The switch default IP address is 192.168.70.1*xx*, where *xx* depends on the number of the bay into which you have installed the switch module, as shown in Table 1.

Table 1. Default IP addresses based on switch-module bay numbers

Bay number	Default IP address
Bay 1	192.168.70.127
Bay 2	192.168.70.128
Bay 3	192.168.70.129
Bay 4	192.168.70.130

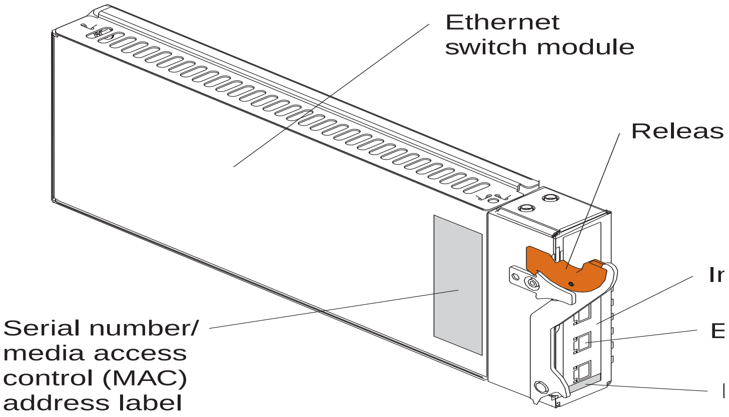
The following illustration shows the switch-module bay locations.



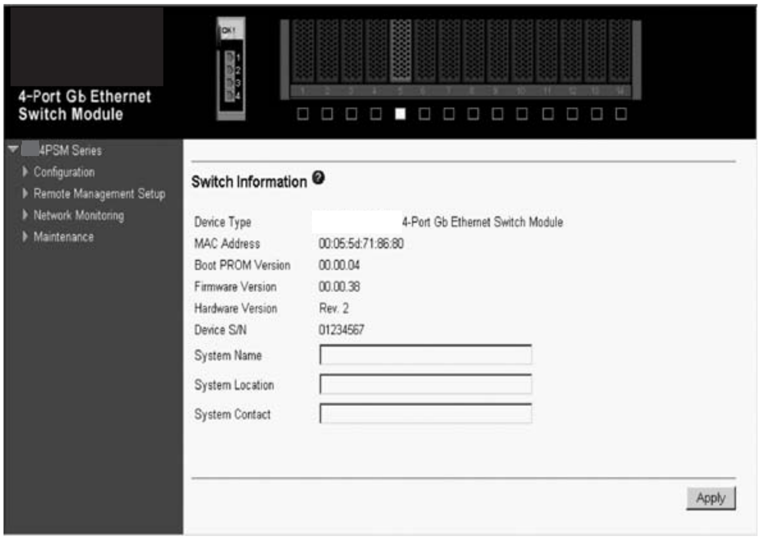
You can change the default switch IP address to meet the specification of your networking address scheme.

The switch also has a unique, factory-assigned media access control (MAC) address. The switch MAC address is located on one side of the switch module, on the same label as the serial number, as shown in the following illustration.

Note: The MAC address is also located on a separate label on the information panel under the external Ethernet port connectors.



The switch MAC address can also be found under the **Switch Information** menu item, as shown in the following illustration.



Switch Information

Device Type	4-Port Gb Ethernet Switch Module
MAC Address	00:05:5d:71:86:80
Boot PROM Version	00.00.04
Firmware Version	00.00.38
Hardware Version	Rev. 2
Device S/N	01234567
System Name	
System Location	
System Contact	

In addition, you can also set an IP address for a gateway router. This becomes necessary when the network management station is located on a different IP network from the switch, making it necessary for management packets to go through a router to reach the network manager, and vice versa.

For security, you can set a list of IP addresses of the network managers that are permitted to manage the switch. You can also change the default SNMP community strings in the switch and set the access rights of these community strings.

Traps

Traps are messages that alert you of events that occur on the switch. The events can be as serious as a restart (for example, someone accidentally turned off the switch) or less serious, such as a port-status change. The switch generates traps and sends them to the network manager (trap recipient).

Trap recipients are special users of the network who are given certain rights and access in overseeing the maintenance of the network. Trap recipients will receive traps sent from the switch; they must immediately take certain actions to avoid future failure or breakdown of the network.

You can also specify which network managers can receive traps from the switch by entering a list of the IP addresses of authorized network managers. You can enter up to four trap recipient IP addresses, and four corresponding SNMP community strings.

SNMP community strings function like passwords in that the community string entered for a given IP address must be used in the management station software, or a trap will be sent.

The following are trap types that the switch can send to a trap recipient:

Cold start
This trap indicates that the switch has been turned on and initialized such that software settings are reconfigured and hardware systems are restarted. A cold start is different from a factory reset in that configuration settings saved to nonvolatile random-access memory (NVRAM) used to reconfigure the switch.

Warm start
This trap indicates that the switch module has been restarted; however, the power-on self-test (POST) is skipped.

Authentication failure
This trap indicates that someone has tried to log on to the switch using an invalid SNMP community string. The switch automatically stores the source IP address of the unauthorized user.

New root
This trap indicates that the switch has become the new root of the Spanning Tree. The trap is sent by the switch soon after its election as the new root. This implies that upon expiration of the topology change timer, the new root trap is sent out immediately after the switch is elected as the new root.

Topology change (Spanning Tree Protocol (STP))
This trap indicates that one or more of the configured ports changes from the learning state to the forwarding state, or from the forwarding state to the blocking state. The trap is not sent if a new root trap is sent for the same change.

Link up
This trap indicates that the link of a port has changed from link down to link up.

Link down
This trap indicates that the link of a port has changed from link up to link down.

MIBs

Management and counter information are stored in the switch in the management information base (MIB). The switch uses the standard MIB-II management information base module. Consequently, values for MIB objects can be retrieved from any SNMP-based network management software. In addition to the standard MIB-II module, the switch also supports its own proprietary enterprise MIB as an extended management information base. These MIBs can also be retrieved by specifying the object identifier (OID) of the MIB as the network manager. MIB values can be either read-only or read-write.

Read-only MIB variables can be either constants that are programmed into the switch or variables that change while the switch is in operation. Examples of read-only constants are the number of ports and type of ports. Examples of read-only variables are the statistics counters, such as the number of errors that have occurred, or how much data (in kilobytes) has been received and forwarded through a port.

Read-write MIBs are variables usually related to user-customized configurations. Examples of these are the switch IP address, STA parameters, and port status.

If you use a third-party vendor's SNMP software to manage the switch, a diskette listing the switch propriety enterprise MIBs can be obtained by request. If your software provides functions to browse or modify MIBs, you can also get the MIB values and change them (if the attributes of the MIBs permit the write operation). However, this process can become complicated, because you must know the MIB OIDs and retrieve them one by one.

SNMP

The Simple Network Management Protocol (SNMP) is an open system interconnection (OSI) layer 7 (the application layer) protocol for remotely monitoring and configuring network devices. SNMP enables network management stations to read and modify the settings of gateways, routers, switches, and other network devices. SNMP can be used to perform many of the same functions as a directly connected console, or can be used within an integrated network management software package such as NetView or Hewlett-Packard OpenView.

SNMP performs the following functions:

- Sending and receiving SNMP packets through the IP protocol
- Collecting information about the status and current configuration of network devices
- Modifying the configuration of network devices

The switch has a software program, called an *agent*, that processes SNMP requests, but the user program that makes the requests and collects the responses runs on a management station (a designated computer on the network). The SNMP agent and the user program both use the user datagram protocol/Internet protocol (UDP/IP) to exchange packets.

Authentication

The authentication protocol ensures that both the router SNMP agent and the remote user SNMP application program discard packets from unauthorized users. Authentication is accomplished through using community strings, which function like passwords. The remote user SNMP application and the router SNMP must use the same community string. SNMP community strings of up to 20 characters can be entered under the Remote Management Setup menu.

Packet forwarding

The switch uses a forwarding table to store the information that it collects. The switch programs the mapping from the destination MAC address to the destination port number into its forwarding table. This information is then used to forward packets. This reduces the traffic congestion on the network, because packets, instead of being transmitted to all ports, are transmitted to the destination port only. For example, if port 1 receives a packet destined for a station on port 2, the switch transmits that packet through port 2 only and transmits nothing through the other ports. This process is referred to as learning the network topology.

The aging time affects the learning process of the switch. Dynamic forwarding table entries, which consist of the source and destination MAC addresses and their associated port numbers, are deleted from the table if they are not accessed within the aging time.

The aging time can be from 17.2 to 2200 seconds with a default value of 300 seconds. A very long aging time can result in dynamic forwarding table entries that are out of date or no longer exist. This might cause the switch to make incorrect packet-forwarding decisions.

If the aging time is too short, however, many entries might be aged out too soon. This will result in a high percentage of received packets whose source addresses cannot be found in the forwarding table. In this case, the switch will broadcast the packet to all ports, thus negating many of the benefits of having a switch.

Static forwarding entries are not affected by the aging time.

Spanning Tree Protocol

The Institute of Electrical and Electronics Engineers (IEEE) 802.1D Spanning Tree Protocol (STP) enables the blocking of links between switches that form loops within the network. When multiple links between switches are detected, a primary link is established. Duplicated links are blocked from use and become standby links. The protocol enables the duplicate links to be used in the event of a failure of the primary link. When the STP is configured and enabled, primary links are established, and duplicated links are blocked automatically. The reactivation of the blocked links (at the time of a primary link failure) is also accomplished automatically, without operator intervention.

This automatic network reconfiguration provides maximum uptime to network users. However, the concepts of the STA and protocol are a complicated and complex subject and must be fully researched and understood. It is possible to cause serious degradation of the performance of the network if the spanning tree is incorrectly configured. Read the following information before making any changes from the default values.

The switch STP performs the following functions:

- Creates a single spanning tree from any combination of switching or bridging elements
- Automatically reconfigures the spanning tree to compensate for the failure, addition, or removal of any element in the tree
- Reconfigures the spanning tree without operator intervention

Improper configuration of the switch module external ports or improper cabling of the external ports to another switch device can create duplicate links that might cause network loops. Consult your network administrator for details about the configuration requirements for your system.

For additional information about the STP, see Appendix D.

VLANs

A virtual local area network (VLAN) is a network topology configured according to a logical scheme rather than the physical layout. VLANs can be used to combine any collection of blade servers into an autonomous user group that appears as a group within one or more chassis. VLANs also logically segment the blade servers into different broadcast domains so that packets are forwarded only between blade servers and the four external ports within the VLAN. Typically, a VLAN corresponds to a particular subnet, although not necessarily.

VLANs can enhance performance by conserving bandwidth and improve security by limiting traffic to specific domains.

Notes about VLANs on the 4-Port Gb Ethernet Switch Module

No matter what basis is used to uniquely identify blade servers and assign these nodes VLAN membership, packets *cannot* cross VLANs without a network device performing a routing function between the VLANs.

The switch supports only IEEE 802.1Q VLANs. The port untagging function can be used to remove the 802.1Q tag from packet headers to maintain compatibility with devices that are tag-unaware.

The switch default is to assign all blade servers and the four external ports to a single 802.1Q VLAN named DEFAULT_VLAN.

The DEFAULT_VLAN has a VLAN ID (VID) of 1.

The Ethernet switch module can be configured to enable a wide variety of VLAN configurations among the various external ports.

IEEE 802.1Q VLANs

The following terms are relevant to VLANs and important with respect to understanding how VLANs function:

Tagging
The act of putting 802.1Q VLAN information into the header of a packet.

Untagging
The act of stripping 802.1Q VLAN information out of the packet header.

Ingress port
A port on a switch where packets are flowing into the switch and where VLAN decisions must be made.

Egress port
A port on a switch where packets are flowing out of the switch, either to another switch or to an end station, and where tagging decisions must be made.

IEEE 802.1Q (tagged) VLANs are implemented on the switch module. 802.1Q VLANs require tagging, which enables them to span the entire network (provided that all switches on the network are IEEE 802.1Q-compliant).

VLANs enable a network to be segmented to reduce the size of broadcast domains. All packets entering a VLAN will be forwarded only to the stations (over IEEE 802.1Q enabled switches) that are members of that VLAN. This includes broadcast, multicast, and unicast packets from unknown sources.

VLANs can also provide a level of security to your network. IEEE 802.1Q VLANs will deliver packets only between stations that are members of the VLAN.

Any port can be configured as either tagging or untagging. The untagging feature of IEEE 802.1Q VLANs enables VLANs to work with legacy switches that do not recognize VLAN tags in packet headers. The tagging feature enables VLANs to span multiple 802.1Q-compliant switches through a single physical connection and enables spanning tree to be enabled on all ports and work normally.

The IEEE 802.1Q standard restricts the forwarding of untagged packets to the VLAN of which the receiving port is a member.

The main characteristics of IEEE 802.1Q are as follows:

- Assigns packets to VLANs by filtering
- Assumes the presence of a single global spanning tree
- Uses an explicit tagging scheme with one-level tagging

802.1Q VLAN packet forwarding

The switch makes packet-forwarding decisions based on the following types of rules:

Ingress rules

Rules relevant to the classification of received frames belonging to a VLAN.

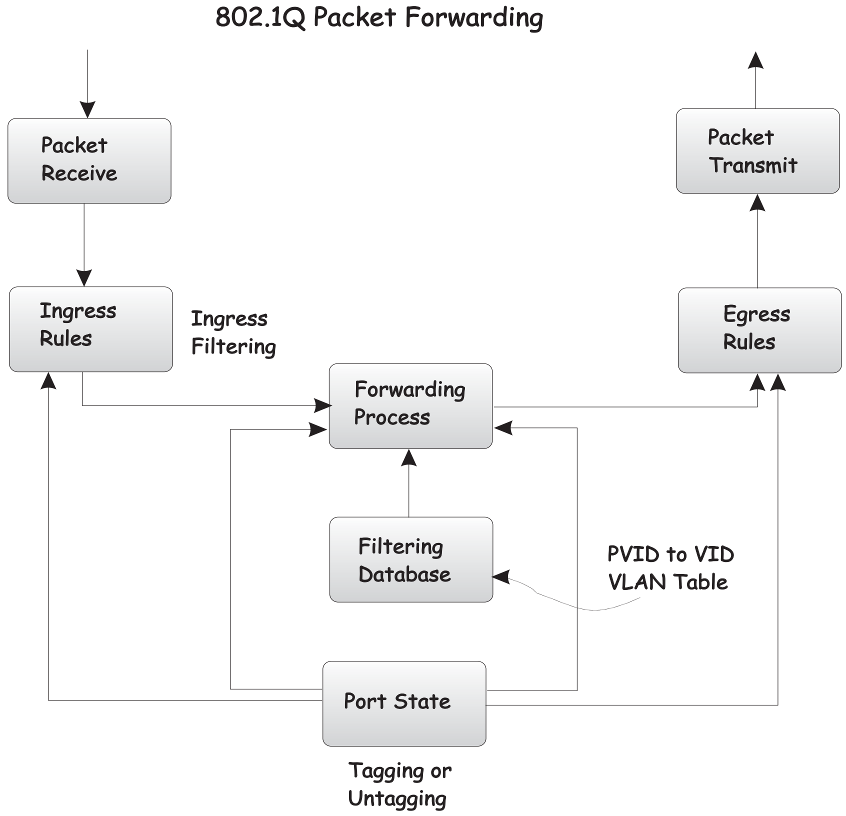
Forwarding rules between ports

The switch decides whether to filter or forward the packet.

Egress rules

The switch determines whether the packet must be sent tagged or untagged.

The following illustration shows the 802.1Q VLAN packet-forwarding decision-making process of the switch.

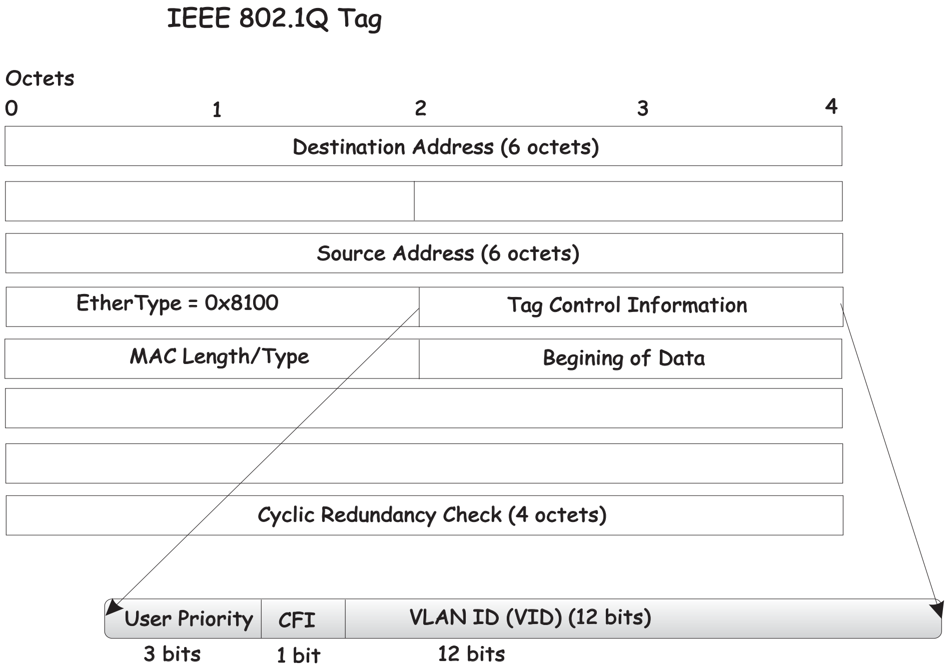


802.1Q VLAN tags

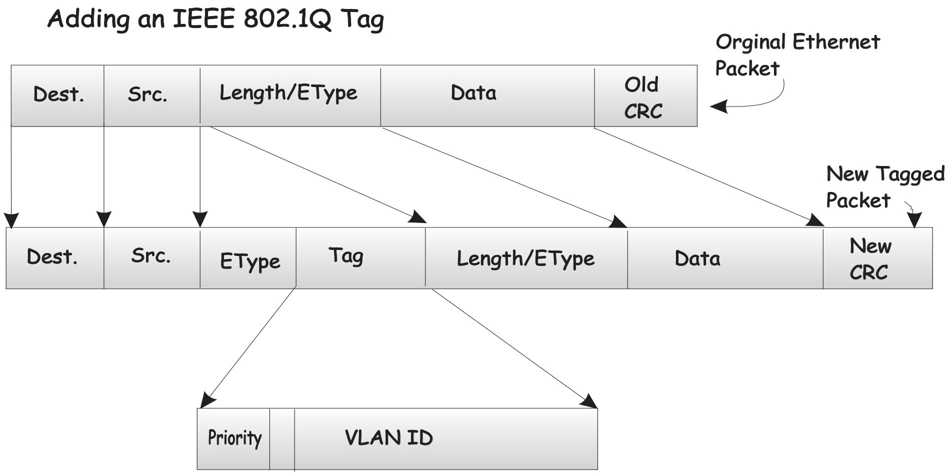
The following illustration shows the 802.1Q VLAN tag. Four additional octets are inserted after the source MAC address. Their presence is indicated by a value of 0x8100 in the **EtherType** field. When a packet **EtherType** field is equal to 0x8100, the packet carries the IEEE 802.1Q/802.1p tag. The tag is contained in the following 2 octets and consists of 3 bits of user priority, 1 bit of Canonical Format Identifier (CFI)[1] and 12 bits of VLAN ID (VID). The 3 bits of user priority are used by 802.1p. The VID is the VLAN identifier and is used by the 802.1Q standard. Because the VID is 12 bits long, 4094 unique VLANs can be identified.

The tag is inserted into the packet header, increasing the length of the entire packet by 4 octets. All of the information that was originally contained in the packet is retained.

[1] CFI is used for encapsulating Token Ring packets so that they can be carried across Ethernet backbones.



The **EtherType** and **VLAN ID** are inserted after the MAC source address, but before the original **EtherType/Length** or **Logical Link Control**. Because the packet is now 1 bit longer than it was originally, the cyclic redundancy check (CRC) must be recalculated.



Port VLAN ID

Packets that are tagged (are carrying the 802.1Q VID information) can be transmitted from one 802.1Q compliant network device to another with the VLAN information intact. This enables 802.1Q VLANs to span network devices (and indeed, the entire network, if all network devices are 802.1Q compliant).

Not all network devices are 802.1Q compliant. These devices are referred to as tag-unaware. 802.1Q devices are referred to as tag-aware.

Before the adoption of 802.1Q VLANs, port-based and MAC-based VLANs were in common use. These VLANs relied upon a port VLAN ID (PVID) to forward packets. A packet received on a given port would be assigned that port PVID and then be forwarded to the port that corresponded to the packet destination address (found in the switch forwarding table). If the

PVID of the port that received the packet is different from the PVID of the port that is to transmit the packet, the switch will drop the packet.

Within the switch, different PVIDs mean different VLANs (remember that two VLANs cannot communicate without an external router). So, VLAN identification based upon the PVIDs cannot create VLANs that extend outside a given switch (or switch stack).

Every physical port on a switch has a PVID. 802.1Q ports are also assigned a PVID, for use within the switch. If no VLANs are defined on the switch, all ports are then assigned to a default VLAN with a PVID of 1. Untagged packets are assigned the PVID of the port on which they were received. Forwarding decisions are based upon this PVID, where VLANs are concerned. Tagged packets are forwarded according to the VID contained within the tag. Tagged packets are also assigned a PVID, but the PVID is not used to make packet-forwarding decisions; the VID is.

Tag-aware switches must keep a table to relate PVIDs within the switch to VIDs on the network. The switch will compare the VID of a packet to be transmitted to the VID of the port that is to transmit the packet. If the two VIDs are different, the switch will drop the packet. Because of the existence of the PVID for untagged packets and the VID for tagged packets, tag-aware and tag-unaware network devices can coexist on the same network.

A switch port can have only one PVID but can have as many VIDs as the switch has memory in its VLAN table to store them.

Because some devices on a network might be tag-unaware, a decision must be made at each port on a tag-aware device before a packet is transmitted, whether or not to tag the packet. If the transmitting port is connected to a tag-unaware device, the packet should be untagged. If the transmitting port is connected to a tag-aware device, the packet should be tagged.

Tagging and untagging

Every port on an 802.1Q compliant switch can be configured as tagging or untagging.

Ports with tagging enabled will put the VID number, priority, and other VLAN information into the header of all packets that flow into and out of it. If a packet has previously been tagged, the port will not alter the packet, thus keeping the VLAN information intact. The VLAN information in the tag can then be used by other 802.1Q compliant devices on the network to make packet-forwarding decisions.

Ports with untagging enabled will strip the 802.1Q tag from all packets that flow into and out of those ports. If the packet does not have an 802.1Q VLAN tag, the port will not alter the packet. Thus, all packets received by and forwarded by an untagging port will have no 802.1Q VLAN information. (Remember that the PVID is only used internally within the switch). Untagging is used to send packets from an 802.1Q-compliant network device to a noncompliant network device.

Ingress filtering

A port on a switch where packets are flowing into the switch and VLAN decisions must be made is referred to as an ingress port. If ingress filtering is enabled for a port, the switch will examine the VLAN information in the packet header (if present) and decide whether to forward the packet.

If the packet is tagged with VLAN information, the ingress port will first determine whether the ingress port itself is a member of the tagged VLAN. If it is not, the packet will be dropped. If the ingress port is a member of the 802.1Q VLAN, the switch then determines whether the destination port is a member of the 802.1Q VLAN. If it is not, the packet is dropped. If the destination port is a member of the 802.1Q VLAN, the packet is forwarded, and the destination port transmits it to its attached network segment.

If the packet is not tagged with VLAN information, the ingress port will tag the packet with its own PVID as a VID (if the port is a tagging port). The switch then determines whether the destination port is a member of the same VLAN (has the same VID) as the ingress port. If it does not, the packet is dropped. If it has the same VID, the packet is forwarded, and the destination port transmits it on its attached network segment.

This process is referred to as *ingress filtering* and is used to conserve bandwidth within the switch by dropping packets that are not on the same VLAN as the ingress port at the point of reception. This eliminates the subsequent processing of packets that will just be dropped by the destination port.

VLANs

The switch initially configures one VLAN (VID = 1), known as the DEFAULT_VLAN. The factory default setting assigns all ports on the switch to the DEFAULT_VLAN. As new VLANs are configured, their respective member ports are removed from the DEFAULT_VLAN. In addition, the VID value of 4095 is reserved for internal use.

Packets cannot cross VLANs. If a member of one VLAN is to connect to another VLAN, the link must be through an external router.

All VLANs must be configured before the IP interface is set up. An IP addressing scheme must then be established, and implemented when the IP interface is set up on the switch.

Notes:

1. If no VLANs are configured on the switch, all packets will be forwarded to any destination port. Packets with unknown source addresses will be flooded to all ports. Broadcast and multicast packets will also be flooded to all ports.
2. An IP interface consists of two parts: a subnet mask and a network address. You will need to use this information when you configure the IP interface of the switch.

DHCP

The Dynamic Host Configuration Protocol (DHCP) can reduce the administrative burden of assigning and maintaining IP address information. DHCP provides reliable and simple TCP/IP network configuration, ensures that address conflicts do not occur, and helps to conserve the use of IP addresses through the centralized management of address allocation.

Dynamic address allocation enables a client to be assigned an IP address from a pool of free addresses. Each address is assigned with a lease and a lease expiration period. The client must renew the lease to continue using the assigned address. Dynamically assigned addresses can be returned to the free address pool if the computer is not being used, if it is moved to another subnet, or if its lease expires. Usually, network policy ensures that the same IP address is assigned to a client each time and that addresses returned to the free address pool are reassigned.

When the address lease expires, the DHCP client enters the renewing state. The client sends a request message to the DHCP server that provided the address. The DHCP server sends an acknowledgement that contains the new lease and configuration parameters. The client then updates its configuration values and returns to the bound state.

When the DHCP client is in the renewing state, it must release its address immediately in the rare event that the DHCP server sends a negative acknowledgment. The DHCP server sends this message to inform a client that it has incorrect configuration information, forcing it to release its current address and acquire new information.

If the DHCP client cannot successfully renew its lease, the client enters a rebinding state. The client then sends a request message to all DHCP servers in its range, attempting to renew its lease. Any DHCP server that can extend the lease sends an acknowledgment containing the extended lease and updated configuration information. If the lease expires or if a DHCP server responds with a negative acknowledgment, the client must release its current configuration and then return to the initializing state.

If the DHCP client uses more than one network adapter to connect to multiple networks, this protocol is followed for each adapter that you want to configure for TCP/IP. Multi-homed systems are selectively configured for any combination of system interfaces.

When a DHCP-enabled computer is restarted, it sends a message to the DHCP server with its current configuration information. The DHCP server either confirms this configuration or sends a negative reply so that the client must begin the initializing state again. System startup might, therefore, result in a new IP address for a client computer, but neither the user nor the network administrator has to take any action in the configuration process.

Before loading TCP/IP with an address acquired from the DHCP server, DHCP clients check for an IP address conflict by sending an Address Resolution Protocol (ARP) request containing the address. If a conflict is found, TCP/IP does not start, and the user receives an error message. The conflicting address should be removed for the list of active leases, or it should be excluded until the conflict is identified and resolved.

Chapter 5. Web-Based network management

This chapter describes how to use the Web-based network management module to access and configure the internal switching software.

Important: Before you configure your Ethernet switch module, be sure that the management modules in your blade server system chassis are properly configured. In addition, to access and manage your Ethernet switch module from an external environment, you might need to enable certain features, such as the external ports and external management over all ports. See the *Intel® Server Blade Chassis Enterprise SBCE Resource CD* for more information.

Introduction

The switch module offers an embedded hypertext markup language (HTML), Web-based interface that enables you to manage the switch through a standard browser, such as Opera, Netscape* Navigator*/Communicator, or Microsoft® Internet Explorer*. The Web browser acts as an access tool and can communicate directly with the switch using the HTTP protocol. Your browser window might vary with the window illustrations in this guide.

Note: This Web-based management module does not accept Chinese language input (or other double-byte character-set languages).

The Web-based management module and the Telnet program are different ways to access the same internal switching software and configure it. Thus, all the settings that you encounter in Web-based management are the same as those found in the Telnet program. If your system application requires that you use the Telnet program, see Chapter 6 for additional information.

Remotely managing the Ethernet switch module

The Ethernet switch module supports two remote-access modes for management through Ethernet connections. You can select the mode that is best suited for your blade server system environment. The Ethernet switch module has an internal Ethernet path to the management module and the four external Ethernet ports on the switch module.

- The default mode uses the internal path to the management module only. In this mode, the remote-access link to the management console must be attached to the 10/100 Mbps Ethernet port on the management module. With this mode, the IP addresses and SNMP parameters of the Ethernet switch modules can be automatically assigned by the blade server system or you must manually assign them through the blade server system chassis Management and Configuration Program. This mode enables the system administrator to provide a secure LAN for management of the blade server chassis subsystems separately from the data network.

  Important: With this mode, the Ethernet switch module does not respond to remote-management commands through the four external Ethernet ports on the switch module.

  See the applicable *Installation and User's Guide* on the *Intel® Server Blade Chassis Enterprise SBCE Resource CD* for additional instructions for configuring the Ethernet switch module for this mode of operation.
- The system administrator can select to enable remote management of the Ethernet switch module through the four external Ethernet ports on the switch module, instead of or in addition to access through the management module. This mode can only be enabled through the management module configuration interface. Once this mode is enabled, the external Ethernet ports will support both management traffic and blade server system

application data traffic. Also, the Ethernet switch module can transmit DHCP and BOOTP request frames through the external Ethernet ports.

This mode enables the Ethernet switch module IP addresses to reside on a different subnet than the management modules. This is useful when the Ethernet switch modules are to be managed and controlled as part of the overall network infrastructure, while maintaining secure management of other blade server chassis subsystems through the management module. However, management access to the Ethernet switch-module link will be lost if the Ethernet switch module IP address is not on the same subnet as the management module. This chapter contains additional instructions for configuring the Ethernet switch module for this mode of operation.

The two previously described modes are only applicable to the Ethernet switch module. The management module can only be remotely accessed through the 10/100 Mbps Ethernet port on the management module.

Getting started

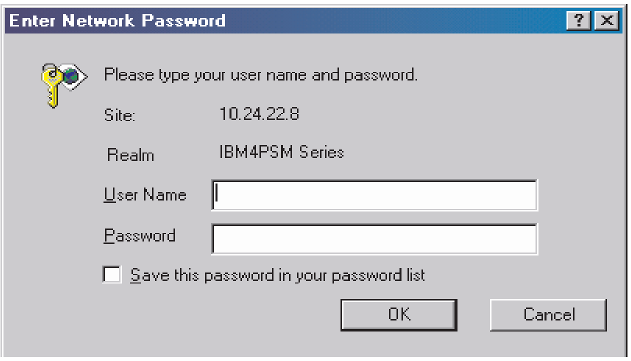
The first step in getting started with using Web-based management for your switch is to install a browser. A Web browser is a program that enables a person to read hypertext, for example, Opera, Netscape Navigator, or Microsoft Internet Explorer. Follow the installation instructions for the browser.

The second and last step is to configure the IP interface of the switch. To do this, use the SBCE Configuration Management program (see the applicable *Intel® Server Blade Chassis Enterprise SBCE Installation and User's Guide* publications on the *SBCE Resource CD* for more information).

Note: An IP interface consists of two parts: a subnet mask and a network address. You will need to use this information when you configure the IP interface of the switch.

You are now ready to begin managing your switch by simply running the browser installed on your computer and pointing it to the IP address that you have defined for the device. The URL in the address bar should have the following format and contain information similar to: http://123.123.123.123, where the numbers *123* represent the IP address of the switch.

Depending on which browser you are using, a dialog box similar to the following will open:



Enter Network Password

Please type your user name and password.

Site: 10.24.22.8

Realm IBM4PSM Series

User Name

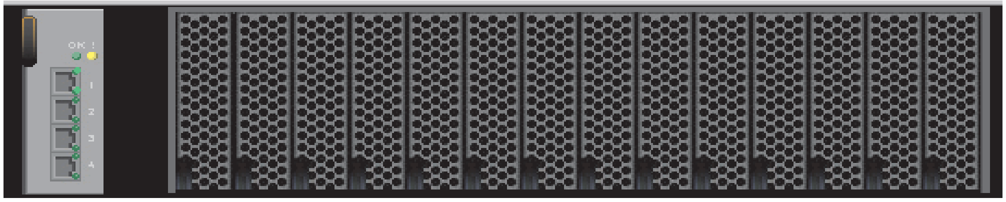
Password

☐ Save this password in your password list

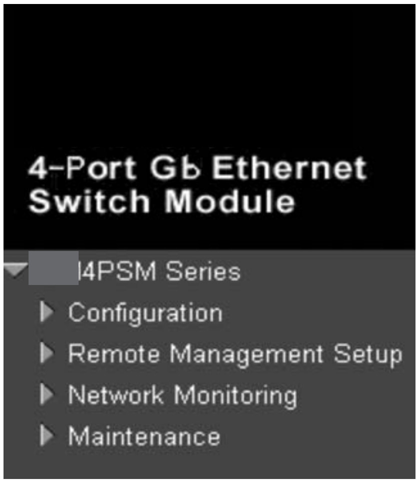
Enter USERID for the **User Name** and PASSW0RD for the **Password** (where the sixth alphanumeric character is the number zero, not the letter *O*) and click **OK**. This opens the main page in the management module.

Note: Capital letters are required, as these fields are both case-sensitive. To increase system security, change the password after you log onto the system for the first time and, be sure to store the new password in a safe location.

The top panel shows a real-time information-panel display of the switch module:



The panel on the left side contains the main menu. The featured items include: **Configuration**, **Remote Management Setup**, **Network Monitoring**, and **Maintenance.**

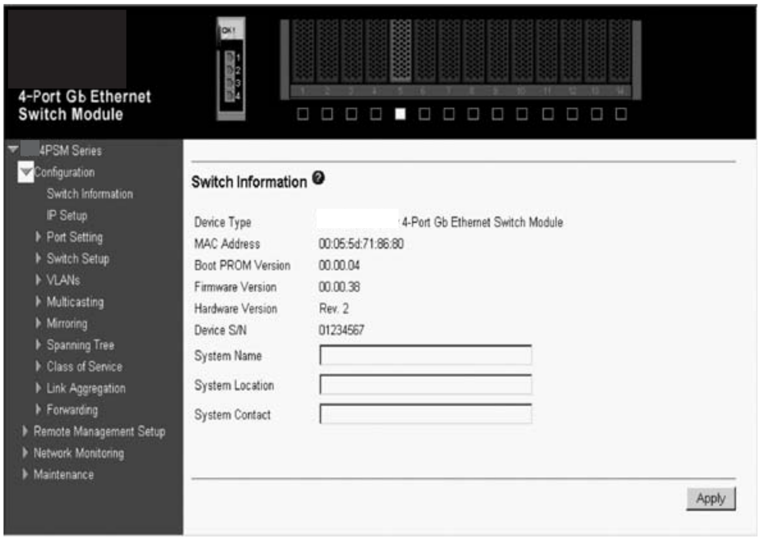


These are the major categories for switch module management. If the sub-menus for each main category do not appear, click the small square hyperlink to the left of the folder icon.

The Web-based switch module management features are described in the following sections in this chapter.

Configuration

The Configuration menu includes: **Switch Information**, **IP Setup**, **Port Setting**, **Switch Setup**, **VLANs**, **Multicasting**, **Mirroring**, **Spanning Tree**, **Class of Service**, **Link Aggregation**, and **Forwarding**, as well as secondary windows.

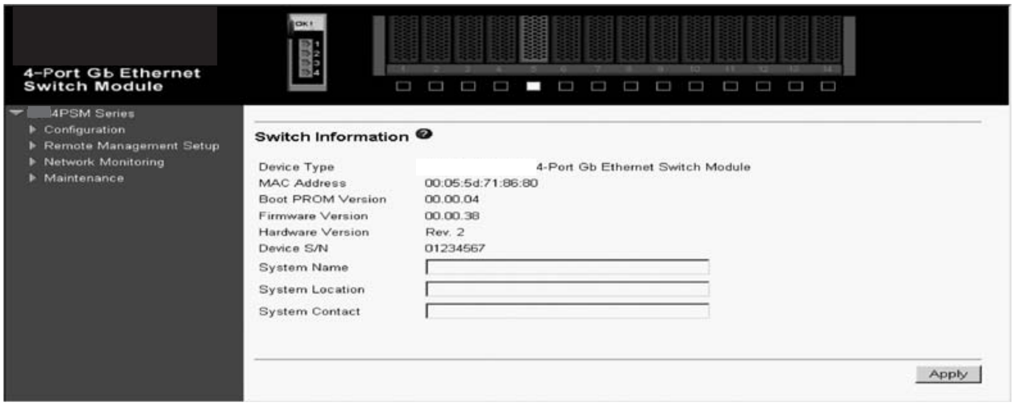


Switch Information

Device Type 4-Port Gb Ethernet Switch Module
MAC Address 00:05:5d:71:86:80
Boot PROM Version 00.00.04
Firmware Version 00.00.38
Hardware Version Rev. 2
Device S/N 01234567
System Name
System Location
System Contact

Switch Information

When you select **Switch Information** from the Configuration menu, a window similar to the following opens:



Switch Information

Device Type 4-Port Gb Ethernet Switch Module
MAC Address 00:05:5d:71:86:80
Boot PROM Version 00.00.04
Firmware Version 00.00.38
Hardware Version Rev. 2
Device S/N 01234567
System Name
System Location
System Contact

To establish the basic switch settings, enter a name for the switch in the **System Name** field, the physical location of the switch in the **System Location** field, and the name of the contact person responsible for the switch in the **System Contact** field. Then, click **Apply**.

The data fields on the Switch Information window are described as follows:

Device Type
A description of the switch type.

MAC Address
The Ethernet address for the device.

Boot PROM Version
Version number for the firmware startup code.

Firmware Version
Version number of the firmware code installed on the switch. This can be updated by using the Update Firmware window in the **Reset and Update** section of the Switch Information window.

Hardware Version
Version number of the hardware installed on the switch.

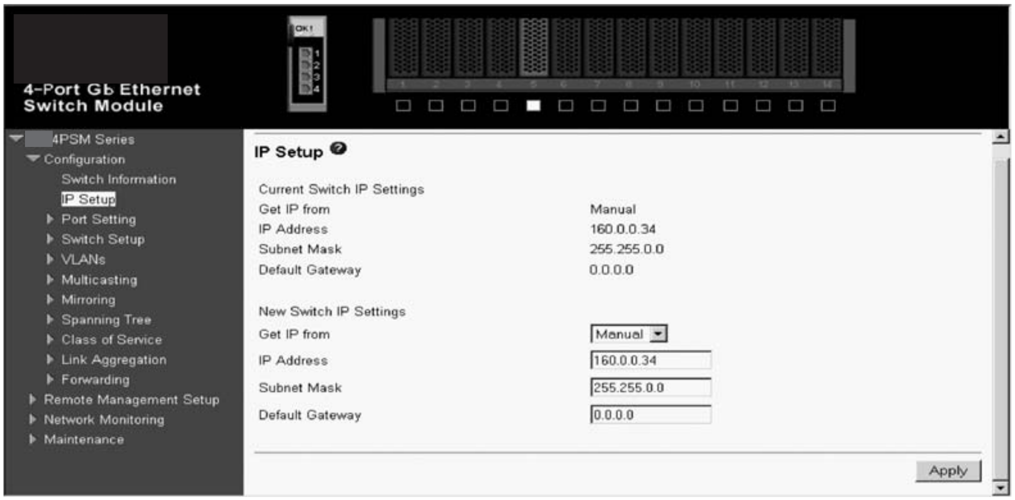
System Name
A user-assigned name for the switch.

System Location
A user-assigned description for the physical location of the switch.

System Contact
The name of the person to contact regarding any problems or questions with respect to the switch. You might also want to include a phone number or extension.

IP Setup

When you select **IP Setup** from the **Configuration** menu, a window similar to the following opens:



IP Setup

Current Switch IP Settings
Get IP from Manual
IP Address 160.0.0.34
Subnet Mask 255.255.0.0
Default Gateway 0.0.0.0

New Switch IP Settings
Get IP from Manual
IP Address 160.0.0.34
Subnet Mask 255.255.0.0
Default Gateway 0.0.0.0

This window is used to determine whether the switch should get its IP Address settings from the user (Manual), a BOOTP server, or a DHCP server. If you are not using either BOOTP or DHCP, enter the **IP Address**, **Subnet Mask**, and **Default Gateway** of the switch. If you enable BOOTP, you do not need to configure any IP parameters because a BOOTP server automatically assigns IP configuration parameters to the switch. If you enable DHCP, a Dynamic Host Configuration Protocol request will be sent when the switch is turned on. Once you have selected a setting under **Get IP From**, click **Apply** to activate the new settings.

Note: BOOTP and DHCP are only supported through the four external Ethernet ports on the switch module. To use BOOTP and DHCP, you must first enable these ports for remote-management access through the SBCE system management and configuration program. For a detailed description of this program, see the *Intel® Server Blade Chassis Enterprise SBCE Installation and User's Guide* on the *SBCE Resource CD*.

The switch default IP address is 192.168.70.1*xx*, where *xx* depends on the number of the bay into which you have installed the switch module, as shown in Table 2.

Table 2. Default IP addresses based on switch-module bay numbers (IP Setup window of Web-based Configuration menu)

Bay number	Default IP address
Bay 1	192.168.70.127
Bay 2	192.168.70.128
Bay 3	192.168.70.129
Bay 4	192.168.70.130

The data fields on the IP Setup window are described as follows:

Get IP From

There are three choices for how the switch receives its IP Address settings: **Manual**, **BOOTP**, and **DHCP**.

Manual

You can enter an IP address, a subnet mask, and a default gateway for the switch. These fields should be of the form *xxx.xxx.xxx.xxx*, where each *xxx* is a number (represented in decimal form) between 0 and 255. This address should be a unique address on the network assigned for use by the network administrator. The fields that require entries under this option are as follows:

IP Address

The host address for the device on the TCP/IP network.

Subnet Mask

The address mask that controls subnetting on your TCP/IP network. This address mask is a bitmask that determines the extent of the subnet that the switch module is on. Should be of the form *xxx.xxx.xxx.xxx*, where each *xxx* is a number (represented in decimal) between 0 and 255. The value should be 255.0.0.0 for a Class A network, 255.255.0.0 for a Class B network, and 255.255.255.0 for a Class C network, but you can also use custom subnet masks.

Note: For switch communication with a remote management station, through the management module external Ethernet port, the switch module internal network interface and the management module internal and external interfaces must be on the same subnet.

Default Gateway

The IP address that determines where packets with a destination address outside the current subnet should be sent. The IP address of the device is usually the address of a router or a host acting as an IP gateway to handle connections to other subnets or other TCP/IP networks. If your network is not part of an intranet, or you do not want the device to be accessible outside your local network, you can enter a value of **0.0.0.0** in this field.

BOOTP

The switch module will send out a BOOTP broadcast request when it is turned on. The BOOTP protocol enables IP addresses, network masks, and default gateways to be assigned by a central BOOTP server. If this option is set, the switch module will first look for a BOOTP server to provide it with this information before using the default or previously entered settings.

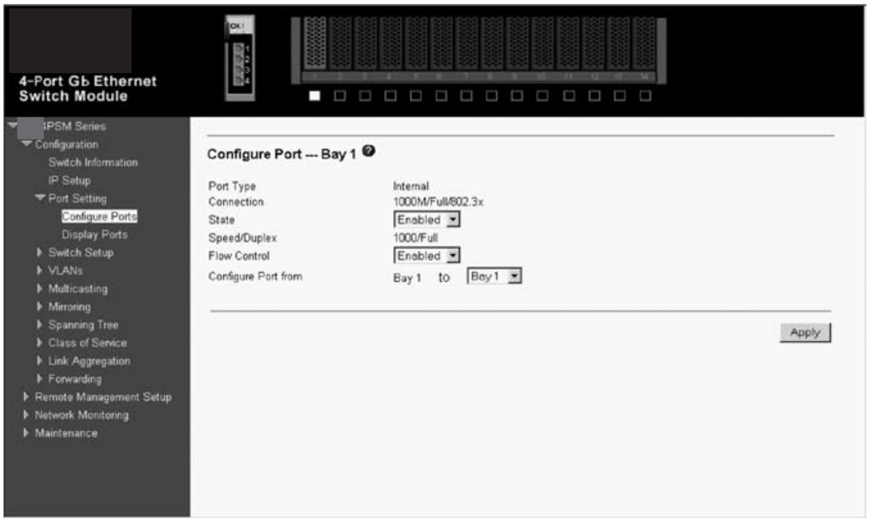
DCHP The switch module will send out a DCHP broadcast request when it is turned on. The DCHP protocol enables IP addresses, network masks, and default gateways to be assigned by a DCHP server. If this option is set, the switch will first look for a DCHP server to provide it with this information before using the default or previously entered settings.

Port Setting

When you select **Port Setting** from the Configuration menu, you can then select either **Configure Ports** or **Display Ports** from the Port Setting menu. These menu choices are described in the following sections.

Configure Ports:

When you select **Port Setting** from the Configuration menu and **Configure Ports** from the Port Setting menu, a window similar to the following opens:



Configure Port --- Bay 1

Port Type Internal
Connection 1000M/Full/802.3x
State Enabled
Speed/Duplex 1000/Full
Flow Control Enabled
Configure Port from Bay 1 to Bay 1

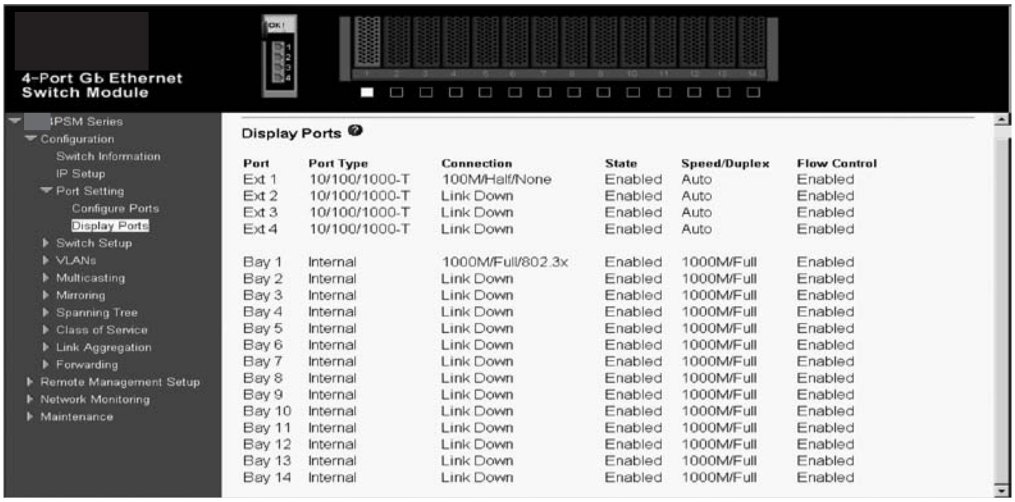
Select the port that you want to configure by using the drop-down menus in the **Configure Port from and to** fields. Follow these steps:

1. Enable or disable the port. If you select **Disabled** in the **State** field, devices connected to that port cannot use the switch, and the switch purges their addresses from its address table after the MAC address aging time elapses.
2. Configure the **Speed/Duplex** setting for the four external 10/100/1000 Mbps ports. Select **Auto** to enable the port to select the best transmission speed, duplex mode, and flow control settings based on the capabilities of the device at the other end. The other selections enable you to force the port to operate in the specified manner. Select **1000M/Full** for port operation at 1000 Mbps and full duplex. Select **100M/Full** for port operation at 100 Mbps and full duplex. Select **100M/Half** for port operation at 100 Mbps and half duplex. Select **10M/Full** for port operation at 10 Mbps and full duplex. Select **10M/Half** for port operation at 10 Mbps and half duplex. The 14 internal ports are **1000M/Full** only.
3. Configure the **Flow Control** setting for the port. Selecting **Enabled** in full-duplex mode will implement IEEE 802.3x flow control. Select **Disabled** for no flow control. Also, if the port is set for **Auto** (**NWay**) in the **Speed/Duplex** field and flow control is enabled, flow control (whether full- or half-duplex) will only be implemented if the other device can auto-negotiate flow control.
4. Click **Apply** to make your changes effective.

To view the configuration settings for the ports on the switch module, see “Display Ports:”.

Display Ports:

When you select **Port Setting** from the Configuration menu and **Display Ports** from the Port Setting menu, a window similar to the following opens:



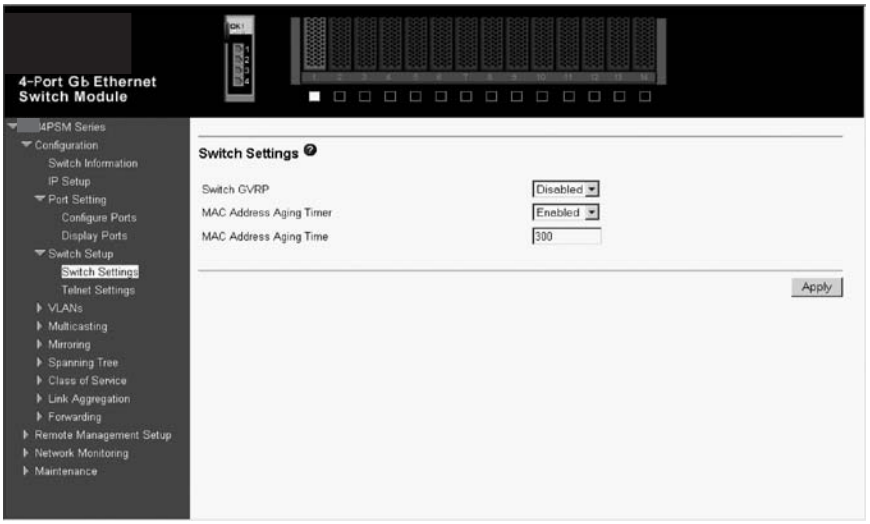
Display Ports

Port	Port Type	Connection	State	Speed/Duplex	Flow Control
Ext 1	10/100/1000-T	100M/Half/None	Enabled	Auto	Enabled
Ext 2	10/100/1000-T	Link Down	Enabled	Auto	Enabled
Ext 3	10/100/1000-T	Link Down	Enabled	Auto	Enabled
Ext 4	10/100/1000-T	Link Down	Enabled	Auto	Enabled
Bay 1	Internal	1000M/Full/802.3x	Enabled	1000M/Full	Enabled
Bay 2	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 3	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 4	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 5	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 6	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 7	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 8	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 9	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 10	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 11	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 12	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 13	Internal	Link Down	Enabled	1000M/Full	Enabled
Bay 14	Internal	Link Down	Enabled	1000M/Full	Enabled

This window displays the applicable configuration information for all the internal and external ports on the switch module, based on the configuration settings that you selected or accepted in “Configure Ports:” on page 35. Ports are not selectable on this window and, the information on this window is not changeable. To change the configuration settings for the ports on the switch module, see “Configure Ports:” on page 35.

Switch Settings

When you select **Switch Setup** from the Configuration menu and **Switch Settings** from the Switch Setup menu, a window similar to the following opens:



Switch Settings

Switch GVRP: Disabled
MAC Address Aging Timer: Enabled
MAC Address Aging Time: 300

The user-changeable parameters on this window are as follows:

Switch GVRP <Disabled>

Group VLAN Registration Protocol is a protocol that enables members to dynamically join VLANs. This is used to enable or disable GVRP on the switch module.

MAC Address Aging Timer <Enabled>

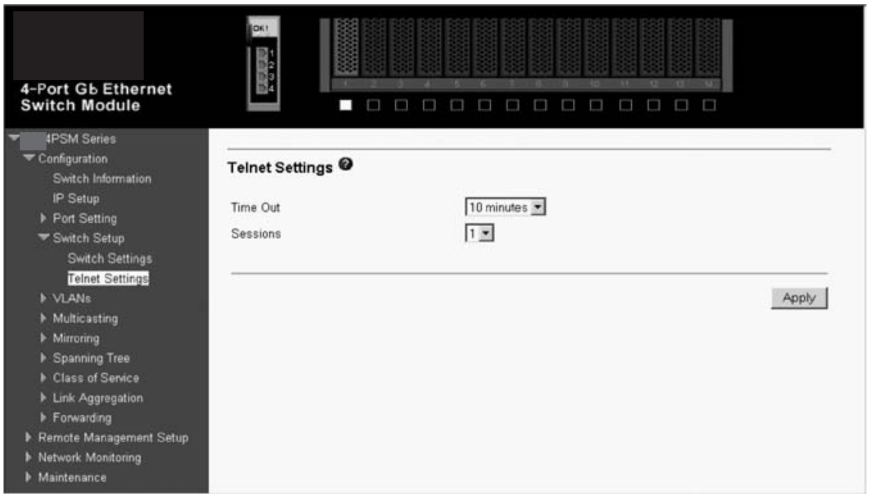
This field specifies whether the aging timer is on or off.

Telnet Settings

Complete the following steps to display the Telnet Settings window:

1. Select **Switch Setup** from the Configuration menu
2. Select **Telnet Settings** from the Switch Setup menu.

A window similar to the following opens:



Telnet Settings

Time Out 10 minutes

Sessions 1

The user-changeable parameters on this window are as follows:

Time Out <10 mins>

This sets the time that the Telnet interface can be idle before the switch automatically logs-out the user. The options are: **2 mins**, **5 mins**, **10 mins**, **15 mins**, and **Never**.

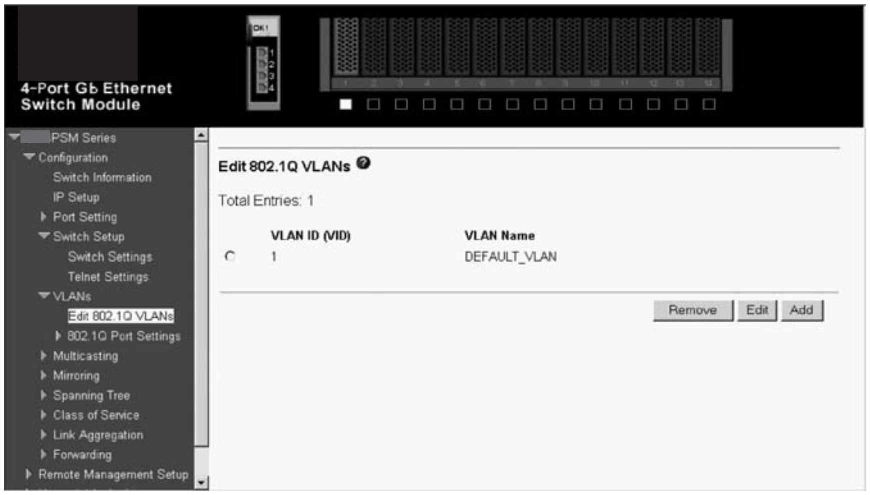
Sessions [1]

This sets the maximum number of available Telnet sessions.

VLANs

This section includes **Edit 802.1Q VLANs** and **802.1Q Port Settings**.

Edit 802.1Q VLANs: To create, modify, or remove an 802.1Q VLAN, select **VLANs** from the Configuration menu and **Edit 802.1Q VLANs** from the VLANs menu. A window similar to the following opens:



Edit 802.1Q VLANs

Total Entries: 1

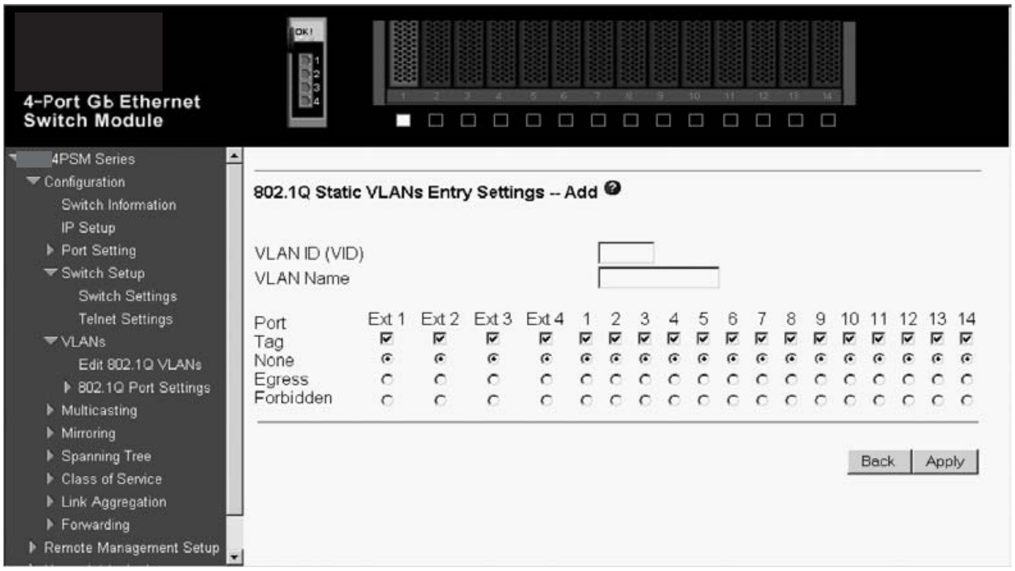
	VLAN ID (VID)	VLAN Name
○	1	DEFAULT_VLAN

You can delete, add, and remove entries through this window. To delete an entry, click the circle next to the appropriate entry; then, click **Remove**. To add an entry, click **Add** and follow the instructions in “802.1Q VLANs Entry Settings -- Add:”. To modify an existing entry, click **Edit** and follow the instructions in "801.1Q VLANs Entry Settings --Edit.

802.1Q VLANs Entry Settings -- Add: Complete the following steps to display the 802.1Q VLANs Entry Settings -- Add window:

1. Select **VLANs** from the Configuration menu.
2. Select **Edit 802.1Q VLANs** from the VLANs menu.
3. Click **Add** on the Edit 802.1Q VLANs window.

A window similar to the following opens:



802.1Q Static VLANs Entry Settings -- Add

VLAN ID (VID) ▭

VLAN Name ▭

Port	Ext 1	Ext 2	Ext 3	Ext 4	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Tag	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
None	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Egress	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Forbidden	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

To add an entry, enter the appropriate information in the preceding window. Click **Apply** to make the changes effective.

To configure an 802.1Q static VLAN entry, select the desired VLAN ID number in the first field and then enter a VLAN name in the second field. Next, either check the **Tag** option, or leave it unchecked if you do not want a member port to be a Tagging port. In the last two rows, check **None** if you do not want a port to belong to the VLAN. Otherwise, check **Egress** to statically set a port to belong to a VLAN, or **Forbidden** to prevent a port from being a member of the VLAN. Click **Apply** to make the changes effective.

802.1Q VLANs Entry Settings -- Edit: Complete the following steps to display the 802.1Q VLANs Entry Settings -- Edit window:

1. Select **VLANs** from the Configuration menu.
2. Select **Edit 802.1Q VLANs** from the VLANs menu.
3. Click **Edit** on the Edit 802.1Q VLANs window.

The 802.1Q VLANs Entry Settings -- Edit window opens.

To modify an entry, complete the appropriate information on the window, and then click **Apply**.

The information on this window is described as follows:

VLAN ID (VID)
The VLAN ID of the VLAN that is being created.

VLAN Name
The name of the VLAN that is being created.

Tag Specifies the port as either 802.1Q tagging or 802.1Q untagging. Checking the box will designate the port as Tagging.

None Specifies the port as not being a static member of the VLAN, but with no restrictions for joining the VLAN dynamically through GVRP.

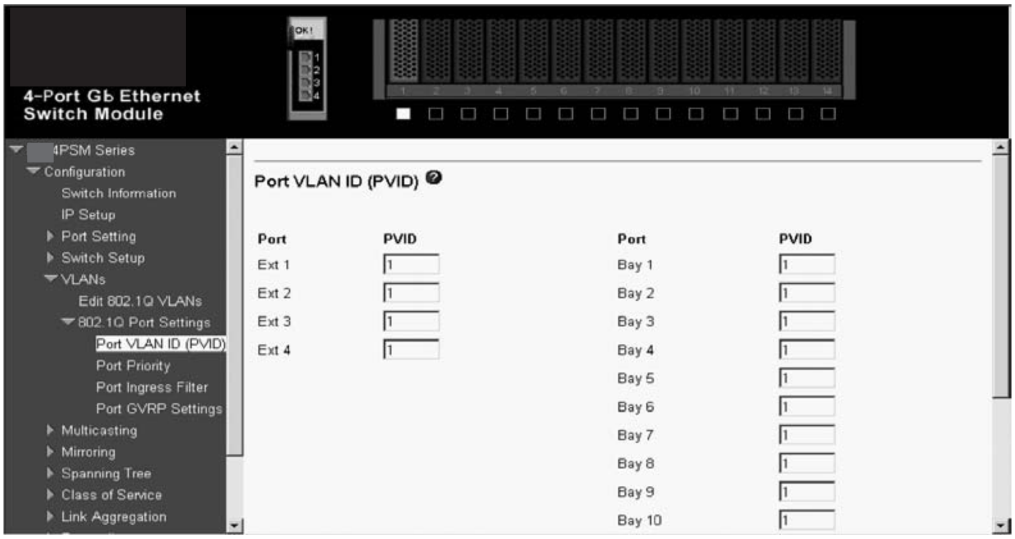
Egress
Specifies the port as being a static member of the VLAN. Egress Member Ports are ports that will be transmitting traffic for the VLAN.

Forbidden
Specifies the port that is not permitted to be a member of the VLAN.

Port VLAN ID (PVID): Complete the following steps to display the Port VLAN ID (PVID) window:

1. Select **VLANs** from the Configuration menu.
2. Select **802.1Q Port Settings** from the VLANs menu.
3. Select **Port VLAN ID (PVID)** from the 802.1Q Port Settings window.

A window similar to the following opens:



Port VLAN ID (PVID)

Port	PVID	Port	PVID
Ext 1	1	Bay 1	1
Ext 2	1	Bay 2	1
Ext 3	1	Bay 3	1
Ext 4	1	Bay 4	1
		Bay 5	1
		Bay 6	1
		Bay 7	1
		Bay 8	1
		Bay 9	1
		Bay 10	1

This window enables you to assign a Port VLAN ID (PVID) number to an individual port. Click **Apply** to make your changes effective.

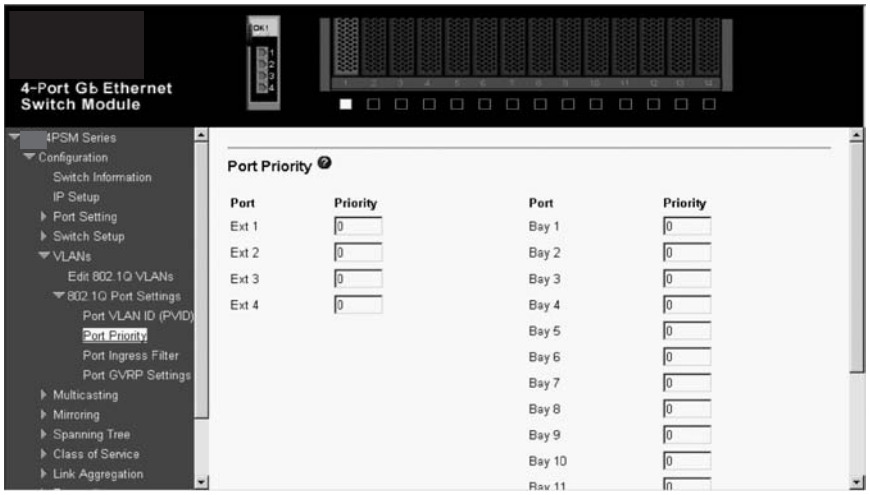
The information on this window is described as follows:

PVID The PVID is used by the port to tag outgoing, untagged packets, and to make filtering decisions about incoming packets. If the port is specified as tagging, and an untagged packet is forwarded to the port for transmission, the port will add an 802.1Q tag using the PVID to write the VID in the tag. When the packet arrives at its destination, the receiving device will use the PVID to make VLAN forwarding decisions. If a packet is received by the port and, Ingress filtering is enabled, the port will compare the VID of the incoming packet to its PVID. If the two are unequal, the port will drop the packet. If the two are equal, the port will receive the packet.

Port Priority: Complete the following steps to display the Port Priority window:

1. Select **VLANs** from the Configuration menu (see “Configuration” on page 32).
2. Select **802.1Q Port Settings** from the VLANs menu.
3. Select **Port Priority** from the 802.1Q Port Settings window.

A window similar to the following opens:



Port Priority

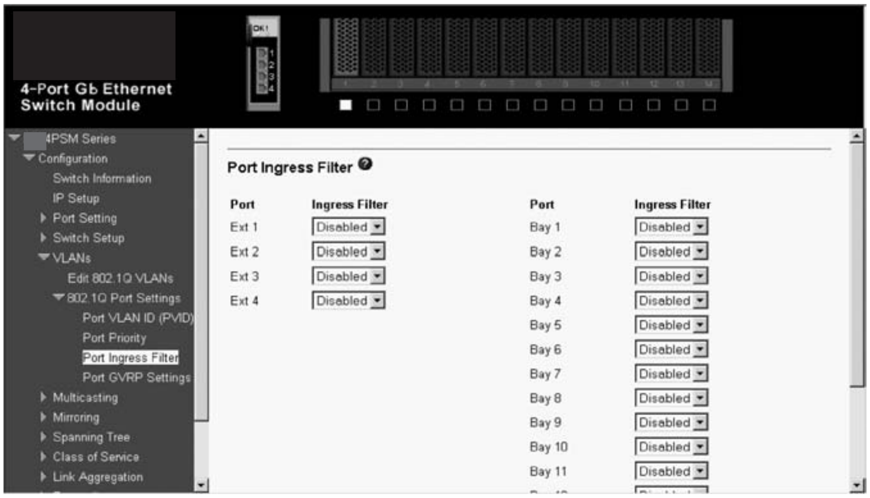
Port	Priority	Port	Priority
Ext 1	0	Bay 1	0
Ext 2	0	Bay 2	0
Ext 3	0	Bay 3	0
Ext 4	0	Bay 4	0
		Bay 5	0
		Bay 6	0
		Bay 7	0
		Bay 8	0
		Bay 9	0
		Bay 10	0
		Bay 11	0

This window enables you to set a default priority for packets that have not already been assigned a priority value. After entering a **Priority** value, click **Apply** to make your changes effective.

Port Ingress Filter: Complete the following steps to display the Port Ingress Filter window:

1. Select **VLANs** from the Configuration menu.
2. Select **802.1Q Port Settings** from the VLANs menu.
3. Select **Port Ingress Filter** from the 802.1Q Port Settings window.

A window similar to the following opens:



Port Ingress Filter

Port	Ingress Filter	Port	Ingress Filter
Ext 1	Disabled	Bay 1	Disabled
Ext 2	Disabled	Bay 2	Disabled
Ext 3	Disabled	Bay 3	Disabled
Ext 4	Disabled	Bay 4	Disabled
		Bay 5	Disabled
		Bay 6	Disabled
		Bay 7	Disabled
		Bay 8	Disabled
		Bay 9	Disabled
		Bay 10	Disabled
		Bay 11	Disabled

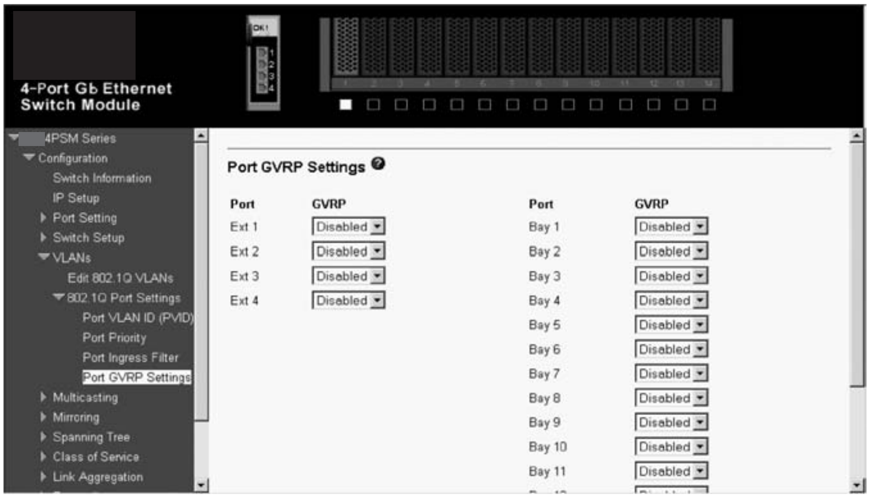
To set an Ingress Filter, select the desired port and then use the drop-down menu to enable it. Click **Apply** to make your change effective.

An Ingress Filter enables the port to compare the VID tag of an incoming packet with the both the VIDs and PVIDs of VLANs assigned to the port. If the VID tag of an incoming port is different from either the VID or PVID assigned to the port, the port filters (drops) the packet.

Port GVRP Settings: Complete the following steps to display the Port GVRP Settings window:

1. Select **VLANs** from the Configuration menu.
2. Select **802.1Q Port Settings** from the VLANs menu.
3. Select **Port GVRP Settings** from the 802.1Q Port Settings window.

A window similar to the following opens:



Port GVRP Settings

Port	GVRP	Port	GVRP
Ext 1	Disabled	Bay 1	Disabled
Ext 2	Disabled	Bay 2	Disabled
Ext 3	Disabled	Bay 3	Disabled
Ext 4	Disabled	Bay 4	Disabled
		Bay 5	Disabled
		Bay 6	Disabled
		Bay 7	Disabled
		Bay 8	Disabled
		Bay 9	Disabled
		Bay 10	Disabled
		Bay 11	Disabled

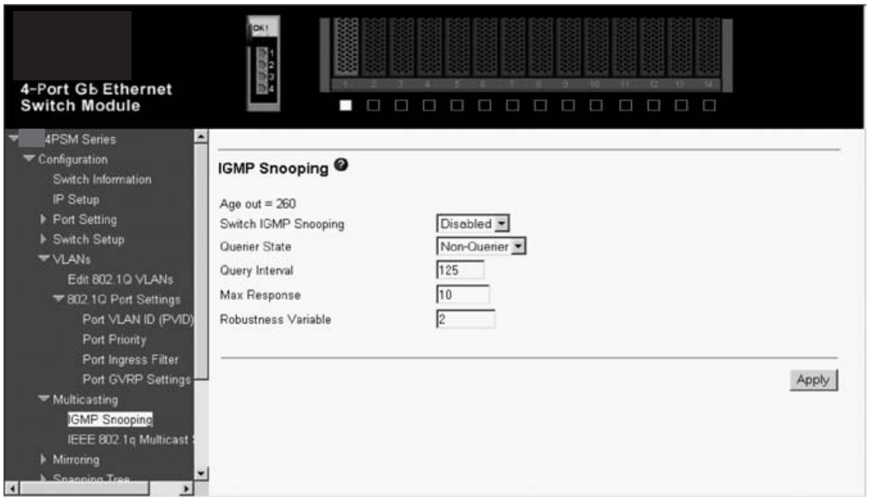
GARP VLAN Registration Protocol (GVRP) is a Generic Attribute Registration Protocol (GARP) application that provides 802.1Q-compliant VLAN pruning and dynamic VLAN creation on 802.1Q trunk ports. With GVRP, the switch can exchange VLAN configuration information with other GVRP switches, prune unnecessary broadcast and unknown unicast traffic, and dynamically create and manage VLANs on switches connected through 802.1Q trunk ports.

Once you enable the desired port, click **Apply** to make your changes effective.

Multicasting

Multicasting is described in the following sections.

IGMP Snooping: To access the IGMP Snooping window, select **IGMP Snooping** from the Multicasting menu. IGMP Snooping can be globally enabled or disabled from the IGMP Snooping window.



IGMP Snooping

Age out = 260

Switch IGMP Snooping	Disabled
Querier State	Non-Querier
Query Interval	125
Max Response	10
Robustness Variable	2

To configure IGMP Snooping, change the **Switch IGMP Snooping** drop-down menu to **Enabled**. Adjust the Querier State field to the appropriate choice among **Non-Querier**, **V1-Querier**, and **V2-Querier** to determine the version of IGMP that is used in your network. You can enter a value between 1 and 255 for the **Robustness Variable** (default is 2). You can set the **Query Interval** between 1 and 65500 seconds (default is 125 seconds). This sets the time between IGMP queries. The **Max Responses** enables a setting between 1 and 25 seconds (default is 10) and specifies the maximum available amount of time before sending a response report. The **Age Out** timer is fixed at 260 seconds. Click **Apply** to make the settings effective.

The user-changeable parameters are as follows:

Switch IGMP Snooping: <Disabled>
This drop-down menu can be used to enable or disable IGMP Snooping, globally, on the switch.

Querier State: <Non-Querier>
This drop-down menu can be set to **Non-Querier**, **V1-Querier**, or **V2-Querier**. This is used to specify the IGMP version (1 or 2) that will be used by the IGMP interface when making queries.

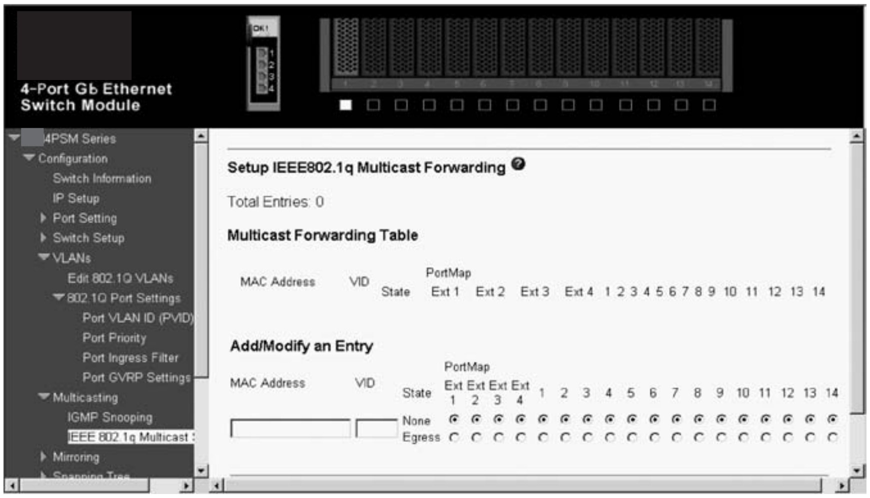
Robustness Variable: [2]
A tuning variable for sub-networks that are expected to lose a large number of packets. You can enter a value between 1 and 255, with larger values being specified for sub-networks that are expected to lose larger numbers of packets.

Query Interval: [125]
Specifies the length of time between sending IGMP queries. You can enter a value between 1 and 65500 seconds, with a default of 125 seconds.

Max Responses: [10]
Sets the maximum available amount of time before sending an IGMP response report. You can enter a value between 1 and 25 seconds, with a default of 10 seconds.

IEEE 802.1q Multicast Setting:

To edit the IEEE 802.1q multicast settings, highlight **IEEE 802.1q Multicast Setting** on the Multicasting menu to access the following window:



Setup IEEE802.1q Multicast Forwarding

Total Entries: 0

Multicast Forwarding Table

MAC Address	VID	State	PortMap Ext 1	Ext 2	Ext 3	Ext 4	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Add/Modify an Entry

MAC Address	VID	State	PortMap Ext 1	Ext 2	Ext 3	Ext 4	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		None	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Egress	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

To add a new entry to the multicast forwarding table, enter the MAC address of the multicast source in the **Multicast MAC Address** field and enter the VLAN ID number of the VLAN that will be receiving the multicast packets in the **VID** field. Then, select the member ports. Each port can be an Egress or a non-member of the multicast group, on a per-VLAN basis. An **Egress** member specifies the port as being a static member of the multicast group. Egress member ports are ports that will be transmitting traffic for the multicast group. A **Non-Member** specifies the port as not being a member of the multicast group, but the port can become a member of the multicast group dynamically. Click **Apply** to make the changes current. Select **Save Changes** to enter the changes into NVRAM.

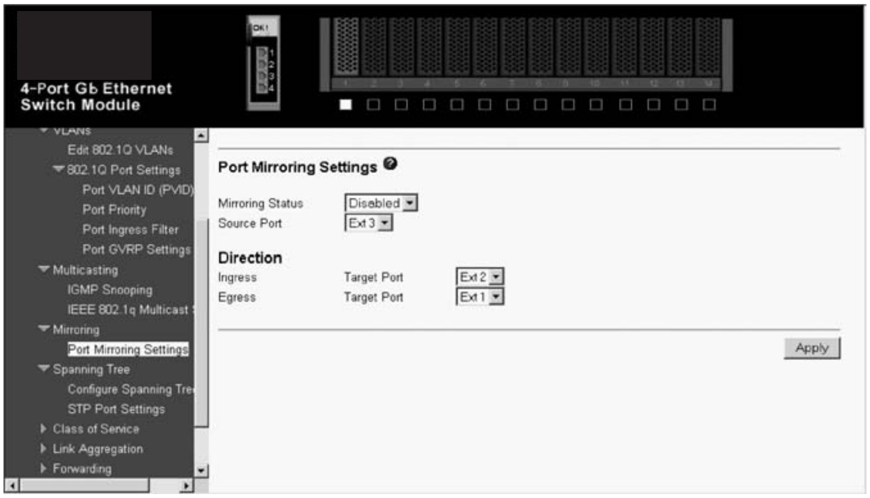
Mirroring

The switch module enables you to copy frames that were transmitted and received on a source port and to redirect the copies to another target port. The source port can be one of the four 10/100/1000 Mbps external ports, while the target port is where you will connect a monitoring/troubleshooting device, such as a sniffer or an RMON probe and, it must be one of the four 10/100/1000 Mbps external ports.

You can attach a monitoring device to the mirrored port, such as a sniffer or an RMON probe, to view details about the packets that pass through the first port. This is useful for network monitoring and troubleshooting purposes.

The default setting for port mirroring is **Disabled**.

The Port Mirroring Settings window contains the following information:



Port Mirroring Settings

Mirroring Status: Disabled
Source Port: Ext 3

Direction

Ingress Target Port: Ext 2
Egress Target Port: Ext 1

To configure a mirror port, enter the port from where you want to copy frames in the **Source Port** field, and the Ingress and/or Egress port in the appropriate **Target Port** field(s). The source port must be one of the four external ports (Ext1, Ext2, Ext3, or Ext4). The target port must be one of the four external ports (Ext1, Ext2, Ext3, or Ext4). Finally, use the Mirroring Status drop-down menu to enable the feature. The default value for **Mirroring Status** is **Disabled**. Click **Apply** to make your changes effective.

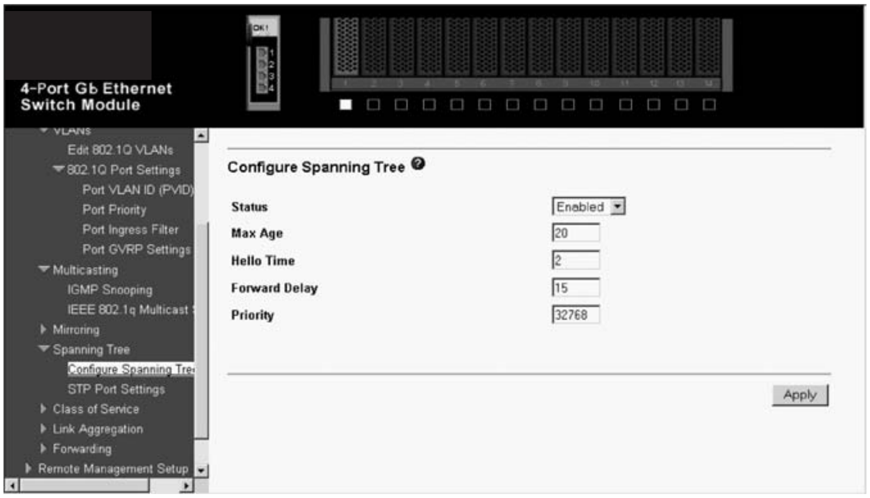
Notes:

1. Do not mirror a faster port or higher traffic ports onto a slower port. For example, if you try to mirror the traffic from a 100 Mbps port onto a 10 Mbps port, this can cause throughput problems. The port from which you are copying frames should always support an equal or lower speed than the port to which you are sending the copies. Also, the target port cannot be a member of a trunk group.
2. Port mirroring is not possible if you use the same egress and ingress target port.

Spanning Tree

This section includes two windows, **Configure Spanning Tree** and **STP Port Settings**.

Configure Spanning Tree: The switch supports 801.2d STP, which enables you to create alternative paths (with multiple switches or other types of bridges) in your network.



Configure Spanning Tree

Status	Enabled
Max Age	20
Hello Time	2
Forward Delay	15
Priority	32768

Click **Apply** after making changes to the preceding window.

The parameters that you can change are:

Status This drop-down menu enables you to enable the STP setting.

Max Age: [6 .. 40] <20>
The maximum age can be set from 6 to 40 seconds. At the end of the Max Age, if a BPDU has still not been received from the root bridge, your switch will start sending its own BPDU to all other switches for permission to become the root bridge. If it turns out that your switch has the lowest Bridge Identifier, it will become the root bridge.

Hello Time: (1 .. 10 Sec) <2>
The Hello Time can be set from 1 to 10 seconds. This is the interval between two transmissions of BPDU packets sent by the root bridge to tell all other switches that it is indeed the root bridge. If you set a Hello Time for your switch, and it is not the root bridge, the set Hello Time will be used if and when your switch becomes the root bridge.

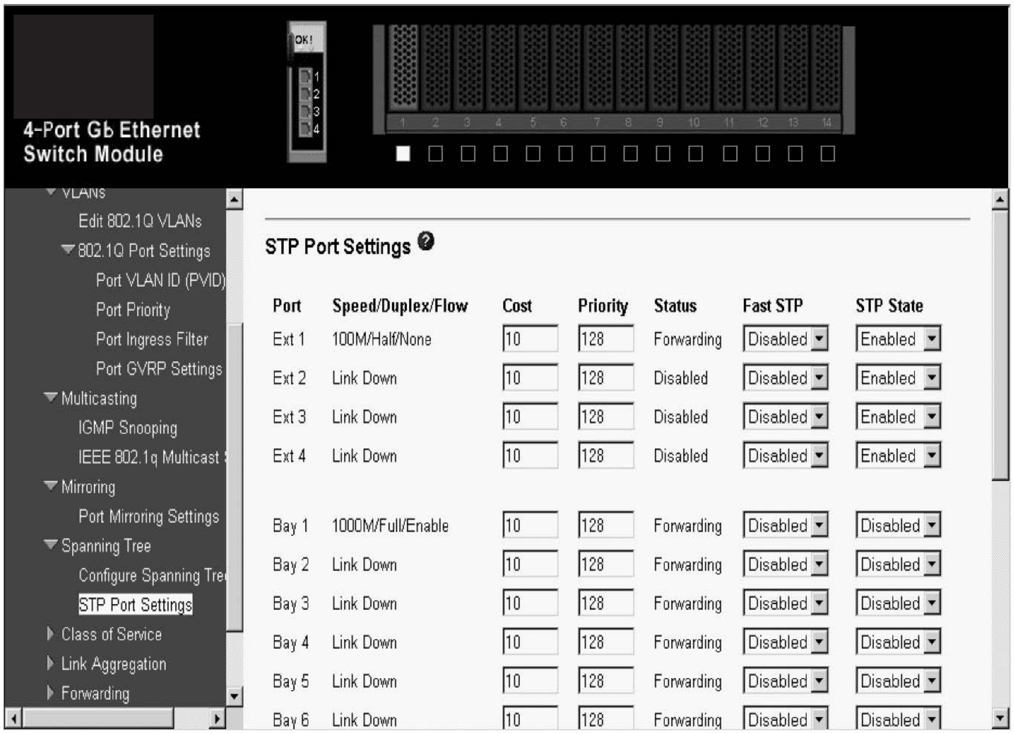
Note: The Hello Time cannot be longer than the Max. Age. Otherwise, a configuration error will occur.

Forward Delay: (4 .. 30 Sec) <15>
The Forward Delay can be from 4 to 30 seconds. This is the time any port on the switch spends in the listening state while moving from the blocking state to the forwarding state.

Priority: (0 .. 65535 Sec) <32768>
A bridge priority can be from 0 to 65535. Zero is equal to the highest bridge priority.

STP Port Settings: In addition to setting Spanning Tree parameters for use on the switch level, the switch module enables for the configuration of STP on individual ports.

To define individual ports, highlight **STP Port Settings** on the Configure Spanning Tree menu and press Enter.



STP Port Settings

Port	Speed/Duplex/Flow	Cost	Priority	Status	Fast STP	STP State
Ext 1	100M/Half/None	10	128	Forwarding	Disabled	Enabled
Ext 2	Link Down	10	128	Disabled	Disabled	Enabled
Ext 3	Link Down	10	128	Disabled	Disabled	Enabled
Ext 4	Link Down	10	128	Disabled	Disabled	Enabled
Bay 1	1000M/Full/Enable	10	128	Forwarding	Disabled	Disabled
Bay 2	Link Down	10	128	Forwarding	Disabled	Disabled
Bay 3	Link Down	10	128	Forwarding	Disabled	Disabled
Bay 4	Link Down	10	128	Forwarding	Disabled	Disabled
Bay 5	Link Down	10	128	Forwarding	Disabled	Disabled
Bay 6	Link Down	10	128	Forwarding	Disabled	Disabled

To configure STP functions for individual ports, enter the desired information in the fields on this window (see the following descriptions for assistance) and then click **Apply**.

The information on this window is described as follows:

View Ports

Enter the range of ports to be configured and displayed.

Cost [10]

A port cost can be set between 1 and 65535. The lower the cost, the greater the probability that the port will be chosen as the designated port (chosen to forward packets).

Priority [128]

A port priority can be set from 0 to 255. The lower the priority, the greater the probability that the port will be chosen as the root port.

Fast STP <Disabled>

Use the drop-down menu to switch between **Enabled** and **Disabled**. When the STP is turned on, a change from link-down to link-up will trigger the STP. The STP will set the port to the listening state. After the forward delay, the STP will set the port to the learning state. After another forward delay, the STP will set the port to the forwarding state. If the forward delay is 15 seconds, the port will take 30 seconds to forward packets. However, when Fast STP is **Enabled** on a port, the port will only take 15 seconds from link-up to the time that it starts forwarding packets. This is because enabling the Fast STP option will skip the learning state, jumping directly to the forwarding state from the listening state.

STP State <Enabled>

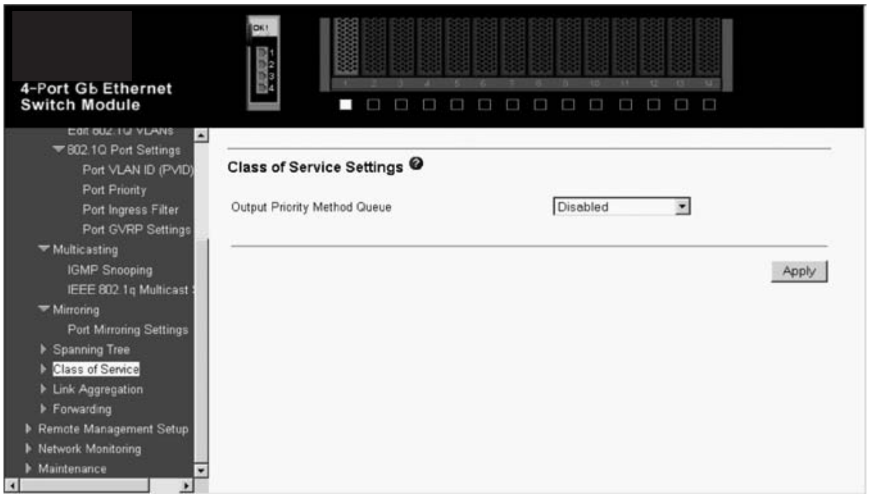
The STP state for a selected port can either be **Enabled** or **Disabled**.

Class of Service

The switch module supports 802.1p priority queuing; four priority queues are supported per port. The switch module provides user-programmable mapping (four Priority Queue assignments: High, Med-High, Med-Low, Low) for the eight 802.1p priority classes (0 to 7). For the priority queue feature to take effect, users must first enable the Output Priority Queue

Method on the Class of Service following window. Otherwise, only the round-robin method can be used to schedule the packets in four different priority queues.

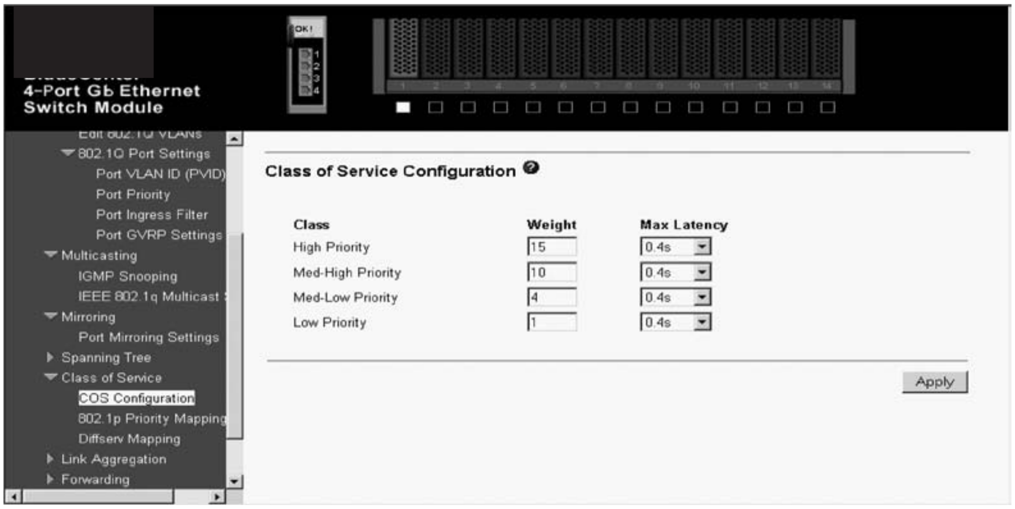
When Output Priority Queue Method is enabled, the weight and latency specified in the Class of Service Configuration window will take effect. Note that the weight can only be a value between 1 and 15. A higher priority queue always has a larger weight than a lower priority queue.



Class of Service Settings

Output Priority Method Queue: Disabled

To enable priority queuing on the switch module, select **Weighted Round Robin** on the drop-down menu on the preceding window and click **APPLY**.

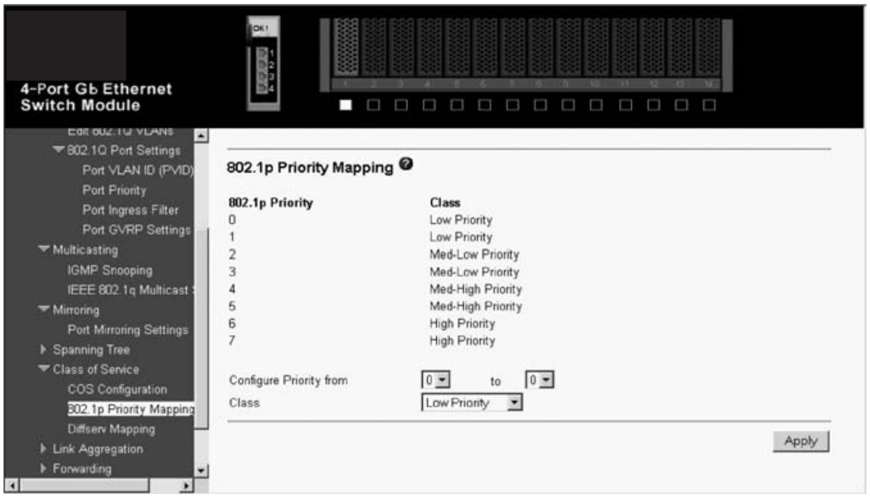


Class of Service Configuration

Class	Weight	Max Latency
High Priority	15	0.4s
Med-High Priority	10	0.4s
Med-Low Priority	4	0.4s
Low Priority	1	0.4s

The switch module supports 802.1p priority queuing; four priority queues are supported per port. The switch module provides user-programmable mapping (four Priority Queue assignments: High, Med-High, Med-Low, Low) for the eight 802.1p priority classes (0 to 7). For the priority queue feature to take effect, users must first enable the Output Priority Queue Method on the Class of Service window. Otherwise, only the round-robin method can be used to schedule the packets in four different priority queues.

When Output Priority Queue Method is enabled, the weight and latency specified in the Class of Service Configuration preceding window will take effect. Note that the weight can only be a value between 1 and 15. A higher priority queue always has a larger weight than a lower priority queue.



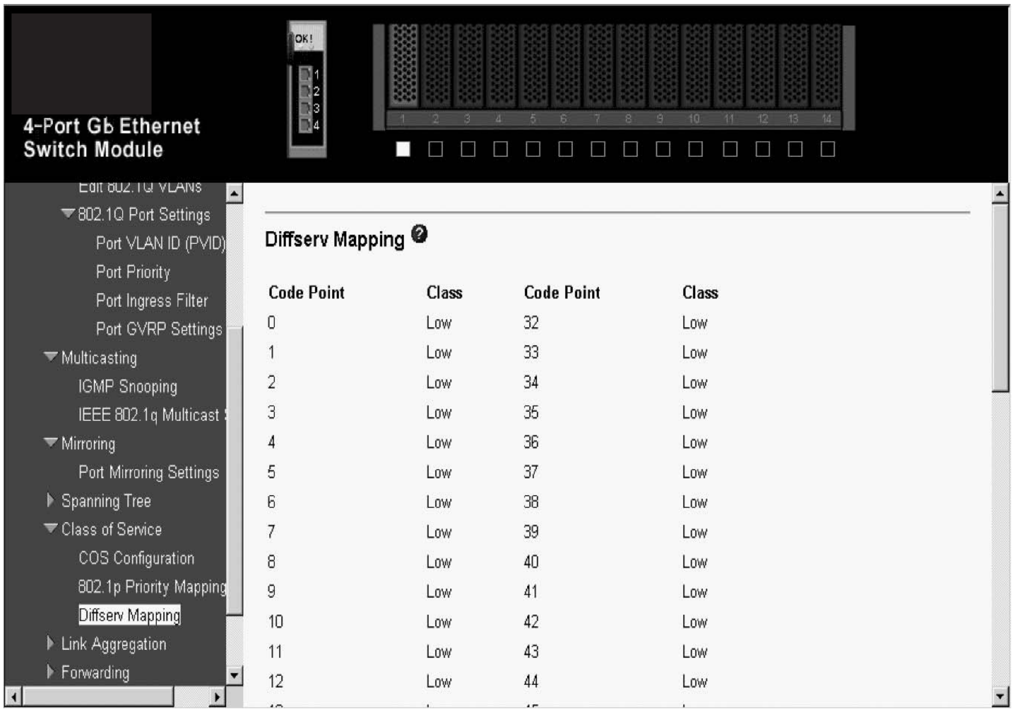
802.1p Priority Mapping

802.1p Priority	Class
0	Low Priority
1	Low Priority
2	Med-Low Priority
3	Med-Low Priority
4	Med-High Priority
5	Med-High Priority
6	High Priority
7	High Priority

Configure Priority from 0 to 0

Class Low Priority

This window enables you to configure traffic class priority by specifying the class value, from **Low Priority** to **High Priority**, of the switch eight levels of priority. Click **Apply** to make your changes effective.



Diffserv Mapping

Code Point	Class	Code Point	Class
0	Low	32	Low
1	Low	33	Low
2	Low	34	Low
3	Low	35	Low
4	Low	36	Low
5	Low	37	Low
6	Low	38	Low
7	Low	39	Low
8	Low	40	Low
9	Low	41	Low
10	Low	42	Low
11	Low	43	Low
12	Low	44	Low

This window enables you to set the following features:

To set up DiffServ Mapping, select **Enabled** in the first drop-down menu on the preceding window, enter a beginning and ending Code Point (0 to 63) in the second field, and select the desired Class in the next field (**Low Priority**, **Med-L Priority**, **Med-H Priority**, or **High Priority**). When you are finished, click **Apply** to make your changes effective.

Link Aggregation

The switch module supports Link Aggregation, or port trunking. Port trunks (aggregated ports) can be used to increase the bandwidth of a network connection or to ensure fault recovery.

You can configure up to two trunk connections (combining two to four ports into one fat pipe) between any two SBCE system switches or other Layer 2 switches. However, before making any physical connections between devices, use the Link Aggregation menus to specify the ports that will belong to the trunking group on both switches.

When using a port trunk, note that:

- The ports used in a trunk must all be of the same speed (100 Mbps or 1000 Mbps) and operate in full-duplex mode only.
- The ports that can be assigned to the same trunk have certain other restrictions, as described in this section.
- Each port can only be assigned to one trunk group, whether a static or dynamic group.
- The ports at both ends of a connection must be configured as trunk ports.
- All of the ports in a trunk have to be treated as a whole when moved from/to, added, or deleted from a VLAN.
- The Spanning Tree Protocol (STP) will treat all the ports in a trunk as a whole.
- Enable the trunk before connecting any cable between the switches to avoid creating a data loop.
- Disconnect all trunk port cables or disable the trunk ports before removing a port trunk to avoid creating a data loop.

Trunking can be set as a static port/group using the Port Trunking window or as a dynamic port/group using the IEEE 802.3ad Link Aggregation windows. When trunking is enabled, a blue border will be placed around the ports on the Web device panel display.

Distribution Method: Link aggregation, or port trunking, enables several ports to be grouped together and to act as a single link. This gives a bandwidth that is a multiple of a single-link bandwidth.

Port trunking is most commonly used to link a bandwidth intensive network device or devices, such as a server, to the backbone of a network.

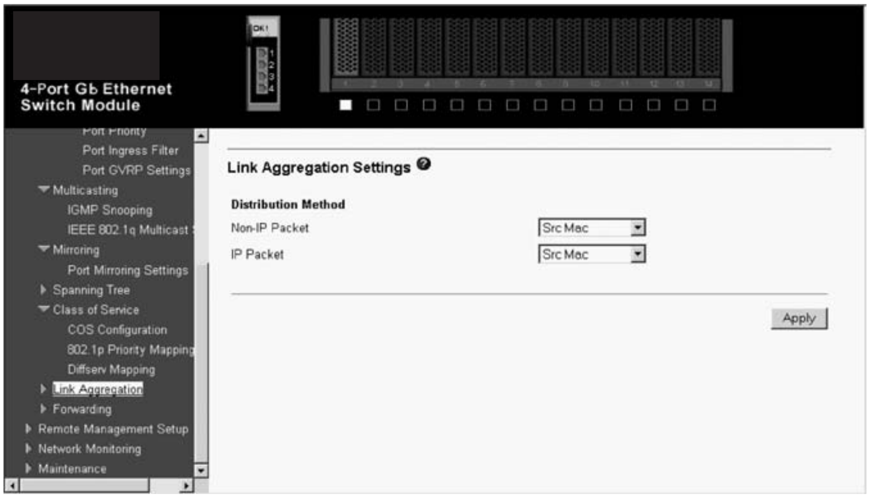
The switch module offers link aggregation on four external ports for up to two static trunk groups or two LACP 802.3ad link aggregation groups. The trunked ports can be non-continuous (that is, have non-sequential port numbers). All of the ports in the group must be members of the same VLAN. In addition, the trunked ports must all have the same speed and be configured as full duplex.

The configuration of the lowest numbered port in the group becomes the configuration for all of the ports in the port trunking group. This port is called the Master Port of the group, and all configuration options, including the VLAN configuration, that can be applied to the Master Port are applied to the entire port trunking group.

Load balancing is automatically applied to the ports in the trunked group, and a link failure within the group causes the network traffic to be directed to the remaining links in the group.

The STP will treat a port trunking group as a single link, on the switch level. On the port level, the STP will use the port parameters of the Master Port in the calculation of port cost and in determining the state of the port trunking group. If two redundant port trunking groups are configured on the switch, STP will block one entire group, in the same way STP will block a single port that has a redundant link.

Use the **Distribution Method** window to set the distribution method for both IP packets and non-IP packets and then click **Apply** to make your changes effective.



Link Aggregation Settings

Distribution Method

Non-IP Packet: Src Mac

IP Packet: Src Mac

The information on the preceding window includes:

Distribution Method

The switch module permits different load sharing methods when ports are trunked together. In some environments, a different method can improve balancing the packet traffic between trunked ports. Generally, you should select the method that can best differentiate packets that go through your trunked ports. If you do not know which method will be the best for your environment, use the trial-and-error approach, checking the network monitoring windows to see which method will yield the best results in terms of efficiency. The selected method is used as a hashing function to determine which packets will go to which port.

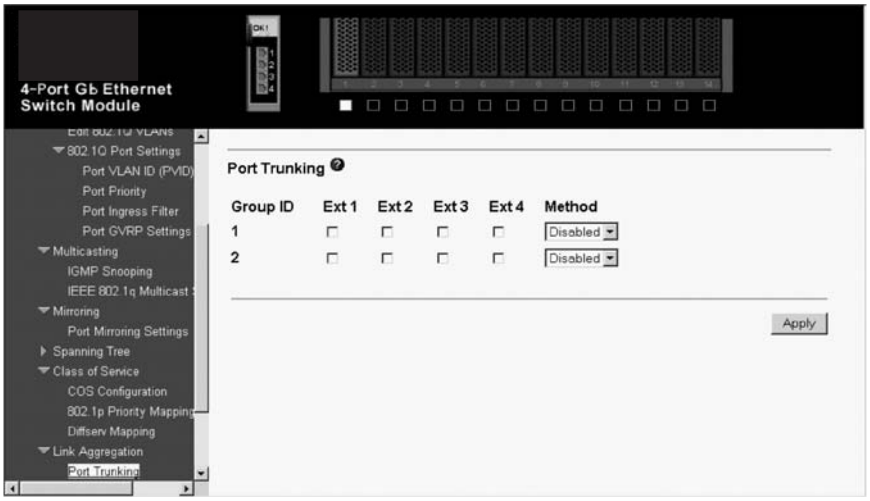
Non-IP Packet <Src Mac>

For non-IP packets, the available methods are: **Src Mac**, **Dest Mac**, or **Src & Dest Mac**.

IP Packet <Src Mac>

For IP packets, the available methods are: **Src Mac**, **Dest Mac**, **Src & Dest Mac**, **Src IP**, **Dest IP**, or **Src & Dest IP**.

Port Trunking: The Port Trunking window contains the following information:



Port Trunking

Group ID	Ext 1	Ext 2	Ext 3	Ext 4	Method
1	□	□	□	□	Disabled
2	□	□	□	□	Disabled

The switch module offers link aggregation on four external ports for up to two static trunk groups or two LACP 802.3ad link aggregation groups. The trunked ports can be non-continuous (that is, have non-sequential port numbers). All of the ports in the group must be members of the same VLAN. In addition, the trunked ports must all have the same speed and be configured as full duplex.

To create or modify a trunk group, check the ports that will comprise the port trunk, and change the **Method** field to **Enabled**. Click **Apply** to activate your settings.

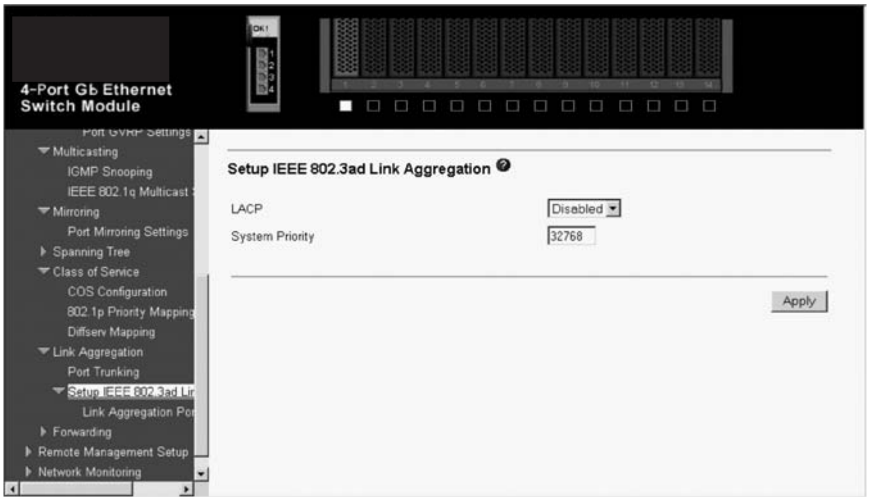
The user-changeable parameters on this window are as follows:

Group ID
The ID number of the trunk group

Port Checks the number of ports that will be members of the trunk group

Method
Enables or disables the trunk group

Setup IEEE 802.3ad Link Aggregation: Use the IEEE 802.3ad Link Aggregation window to set up dynamic port trunking.



Setup IEEE 802.3ad Link Aggregation

LACP: Disabled

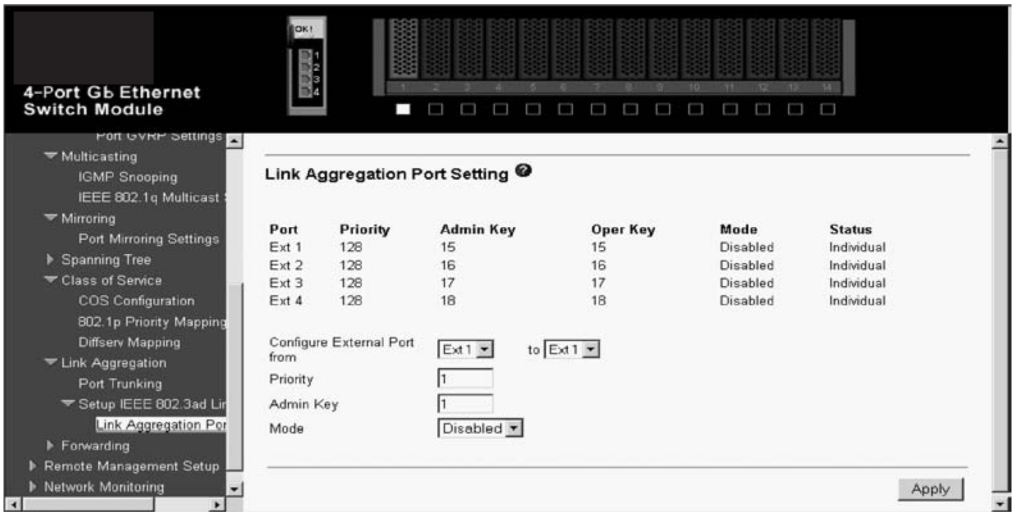
System Priority: 32768

The user-changeable parameters on this window are as follows:

LACP This parameter enables Link Aggregation to be **Enabled** or **Disabled**. Disabling LACP when it is not in use can eliminate some traffic on the network. Enabling Link Aggregation creates an active LACP switch module.

System Priority
An admin ID can be assigned to the switch module to differentiate other LACP switches running on the network.

This window enables you to set up dynamic port trunking on individual ports.



Link Aggregation Port Setting

Port	Priority	Admin Key	Oper Key	Mode	Status
Ext 1	128	15	15	Disabled	Individual
Ext 2	128	16	16	Disabled	Individual
Ext 3	128	17	17	Disabled	Individual
Ext 4	128	18	18	Disabled	Individual

Configure External Port from: Ext 1 to Ext 1
Priority: 1
Admin Key: 1
Mode: Disabled

Apply

Select the range of ports to be configured in the first field, assign a Priority in the second field, enter the Admin Key in the next field, and select **Enabled** in the **Mode** field to enable this feature. After you click **APPLY**, the new port settings will be displayed in the table in the lower portion of the preceding window.

The information on the preceding window includes:

Configure External Port From
Enter the ports that will form the external port trunking group in this field.

Priority [1]
Lower port priority means a higher priority over other enabled link aggregation ports in the group.

Admin Key [1]
This is the administrative key to control the way that links are aggregated. In order to aggregate ports together, the ports must have an equal Admin Key.

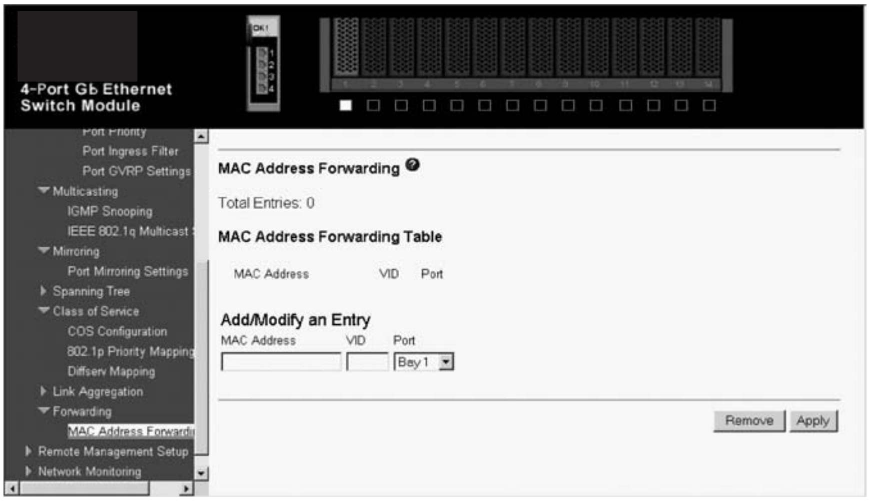
Mode <Enabled>
A port or ports can be enabled to permit them to join or create a link aggregation group.

Oper Key
This displays the operational key used by the port to communicate with other LACP switches.

Status This displays the current status of a link aggregation port.

Forwarding

The MAC Address Forwarding window enables you to set up static packet forwarding on the switch.



MAC Address Forwarding

Total Entries: 0

MAC Address Forwarding Table

MAC Address	VID	Port

Add/Modify an Entry

MAC Address	VID	Port
		Bay 1

The information on the window is described as follows:

MAC Address
The MAC address from which packets will be statically filtered.

VID The VLAN ID number of the VLAN to which the MAC address belongs.

Type Select the filter type, **Permanent** or **DeleteOnReset**.

Port Map
You can designate the port on which the MAC address resides.

Remote Management Setup

This section includes: **Management Station IP Settings**, **SNMP Community Settings**, **Setup Trap Receivers**, **Setup User Accounts**, and **Serial Port Settings**, as well secondary windows.

The following information pertains to the windows illustrated in "Management Station IP Settings","SNMP Community Settings", and "Setting up trap receivers".

Note: Some of the described data fields only appear on some of these windows.

- A trap receiving station is a device that constantly runs a network management application to receive and store traps. You can enter up to four entries.
- The information on these windows is described as follows:

  IP Address
  The IP address of the trap receiving station. If necessary, consult your system network administrator to obtain this IP address.

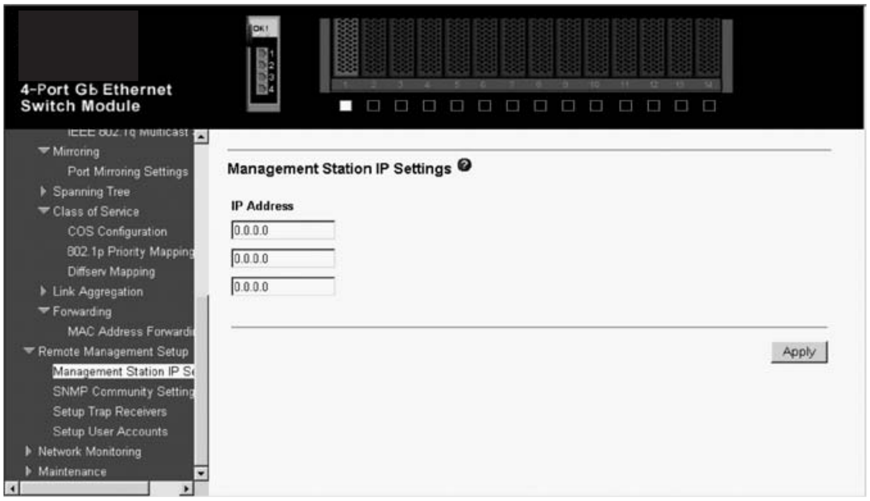
  Community String
  A user-defined SNMP community name. This community string will be included on SNMP packets sent to and from the switch. Any station that is not a member of this community will not receive the packet.

  Rights Enables each community to be separately set to either **Read** (read-only), meaning that the community member can only view switch settings or **R/W** (read/write), which enables the member to change settings in the switch.

  Status Option to set the trap receiving station to **Enabled** or **Disabled**.
- Click **Apply** to make the settings effective.

Management Station IP Settings

The Management Station IP Settings window contains the following information:



Management Station IP Settings

IP Address

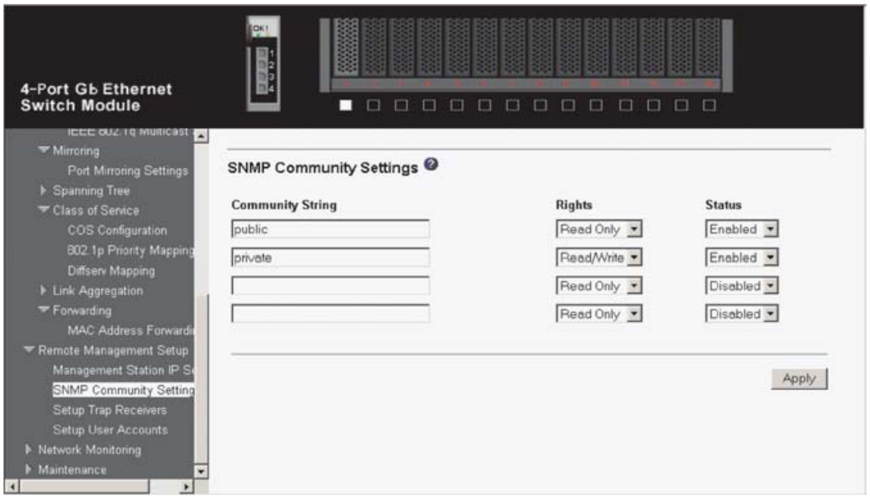
0.0.0.0

0.0.0.0

0.0.0.0

SNMP Community Settings

The SNMP Community Settings window contains the following information:

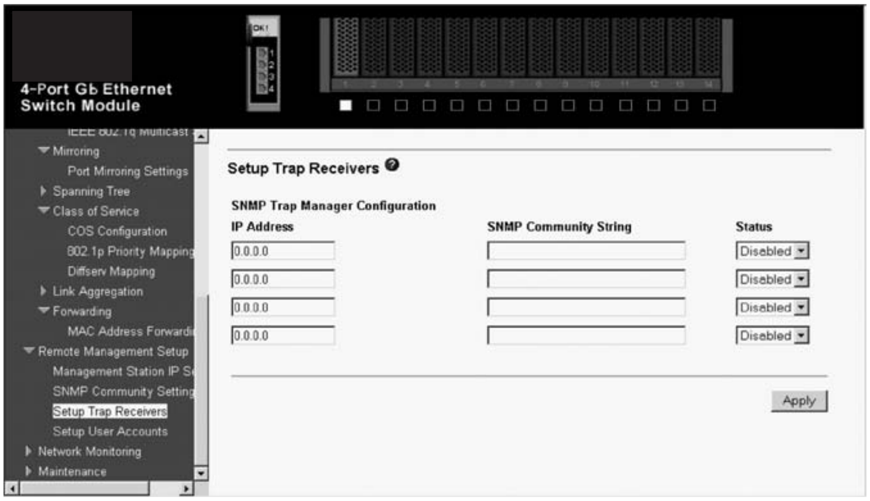


SNMP Community Settings

Community String	Rights	Status
public	Read Only	Enabled
private	Read/Write	Enabled
	Read Only	Disabled
	Read Only	Disabled

Setting up trap receivers

The Setup Trap Receivers window contains the following information:



Setup Trap Receivers

SNMP Trap Manager Configuration

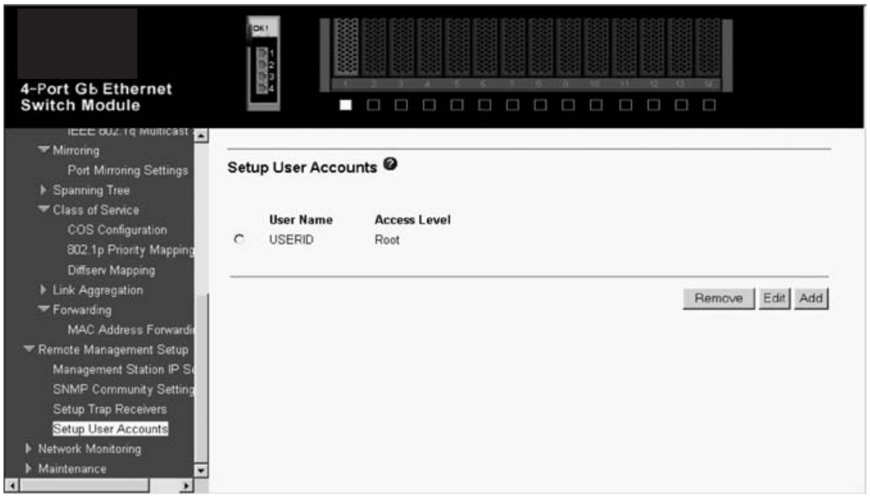
IP Address	SNMP Community String	Status
0.0.0.0		Disabled
0.0.0.0		Disabled
0.0.0.0		Disabled
0.0.0.0		Disabled

For a detailed list of the trap types that are used for this switch, see "Traps".

Setting up user accounts

The switch module enables you to set up and manage user accounts in the following three windows.

The Setup User Accounts window contains the following information:



Setup User Accounts

	User Name	Access Level
○	USERID	Root

The information on this window is described as follows:

User Name
Displays all current users for the switch.

Access Level
Displays the current access level assigned to each corresponding user. There are three access levels: **<User>**, **<User+>**, and **<Root>**. A **<Root>** user has full read/write access, while a **<User>** has read-only access. A **<User+>** has the same privileges as a **<User>**, but with the added ability to restart the switch. See "Assigning Root, Users+, and User privileges" for complete details about access levels. New
Select this hyperlink to add a new user to the table.

You can delete, add, and remove entries through this window. To delete an entry, click the circle next to the appropriate entry; then, click **Remove**. To add an entry, click **Add** and follow the instructions in this section. To modify an existing entry, click **Edit** and follow the instructions in this section.

The following information pertains to the Setup User Account - Add window and the Setup User Account - Edit window that are illustrated in this section.

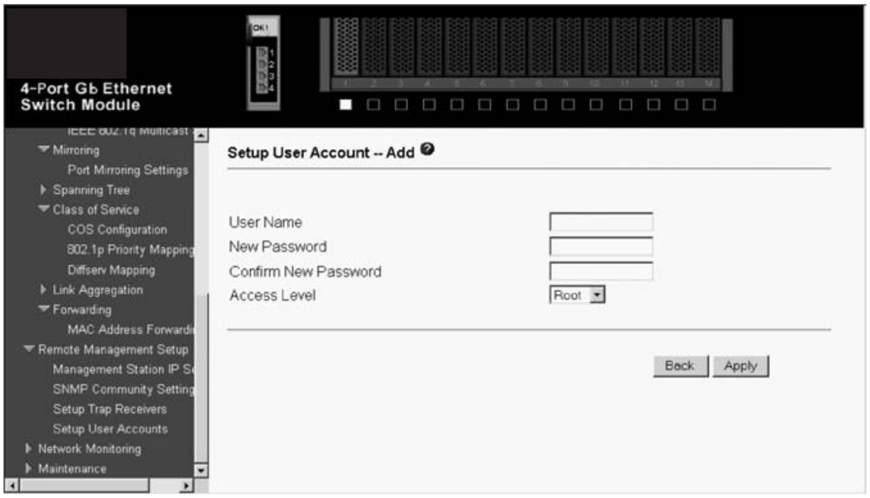
- To add a user account, fill in the appropriate information in the **User Name**, **New Password**, and **Confirm New Password** fields. Then, select the desired access level, **<Root>**, **<User>**, or **<User+>**, in the **Access Level** control and click **Apply**.
- The information on these windows is described as follows:

  User Name
  Enter a user name in this field.

  New Password
  Enter the desired new password in this field.

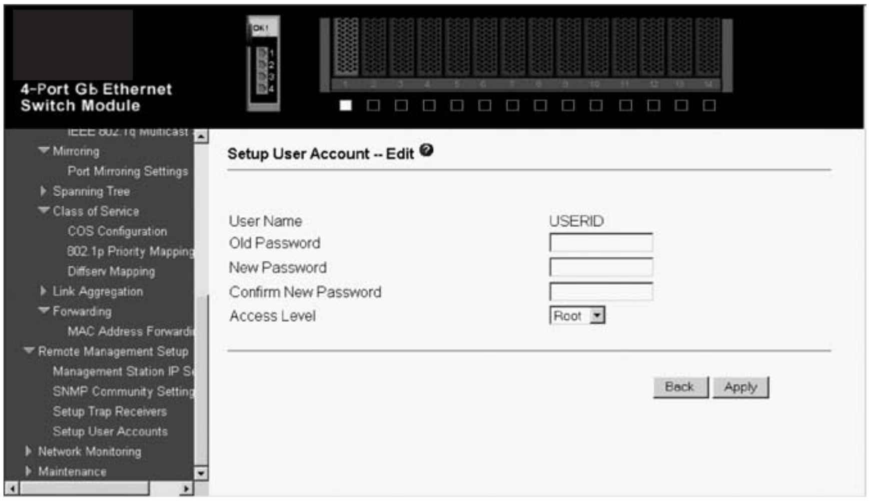
  Confirm New Password
  Enter the new password a second time.

  Access Level
  Displays the current access level assigned to each corresponding user. There are three access levels: **<User>**, **<User+>**, and **<Root>**. A **<Root>** user has full read/write access, while a **<User>** has read only access. A **<User+>** has the same privileges as a **<User>**, but with the added ability to restart the switch.



Setup User Account -- Add

User Name
New Password
Confirm New Password
Access Level Root



Setup User Account -- Edit

User Name	USERID
Old Password	
New Password	
Confirm New Password	
Access Level	Root

Assigning Root, User+, and User privileges

There are three levels of user privileges: Root, User+, and User. Some menu selections that are available to users with Root privileges might not be available to those with User+ and User privileges.

Note: User privileges are also known as normal user privileges.

The following table summarizes the Root, User+, and User privileges:

Table 3. Root, User+, and User privileges

Switch configuration	**Privilege**		
Management	**Root**	**User+**	**User**
Configuration	Yes	Read only	Read only
Network monitoring	Yes	Read only	Read only
Community strings and trap stations	Yes	Read only	Read only
Update firmware and configuration files	Yes	No	No
System utilities	Yes	Ping only	Ping only
Factory reset	Yes	No	No
Reboot switch	Yes	Yes	No
User accounts management			
Add/update/delete user accounts	Yes	No	No
View user accounts	Yes	No	No

After establishing a user account with Root-level privileges, press Esc. Then, highlight **Save Changes** and press Enter (see “Saving changes” on page 69). The switch will save any changes to its NVRAM and restart. Log on with the new user name and password as described in “Getting started” on page 30. You are now ready to continue configuring the switch.

Network Monitoring

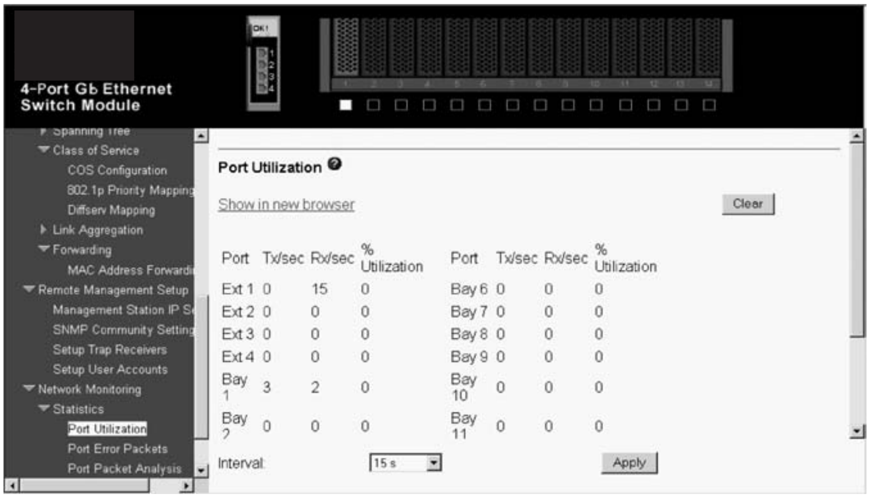
This section is divided into three main areas: Statistics, Address Table, and Applications. In addition, this section contains secondary windows.

Statistics

This section contains descriptions and illustrations of the following windows:

- **Port Utilization**
- **Port Error Packets**
- **Port Packet Analysis**

Port Utilization: The switch module can display the utilization percentage of a specified port in the following window.



Port Utilization

Port	Tx/sec	Rx/sec	% Utilization	Port	Tx/sec	Rx/sec	% Utilization
Ext 1	0	15	0	Bay 6	0	0	0
Ext 2	0	0	0	Bay 7	0	0	0
Ext 3	0	0	0	Bay 8	0	0	0
Ext 4	0	0	0	Bay 9	0	0	0
Bay 1	3	2	0	Bay 10	0	0	0
Bay 2	0	0	0	Bay 11	0	0	0

Interval: 15 s

The information on this window is described as follows:

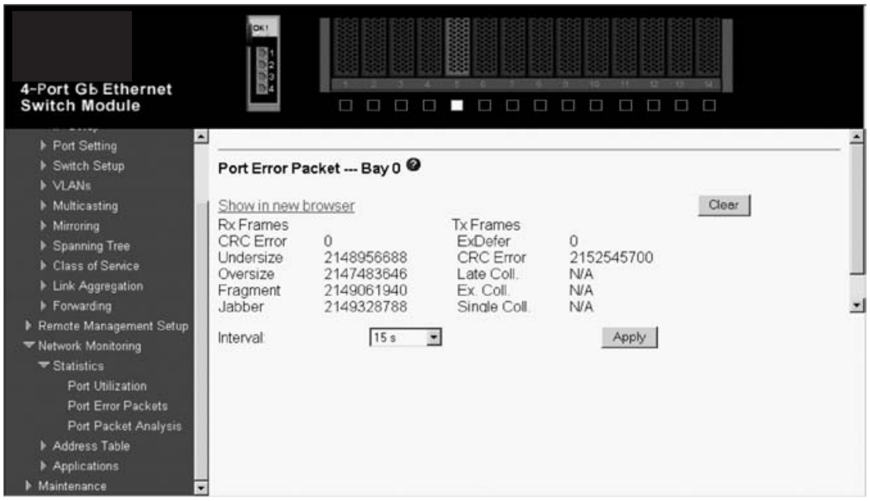
Tx/sec The rate at which the given port is transmitting packets, in packets per second.

Rx/sec The rate at which the given port is receiving packets, in packets per second.

% Utilization
The percentage utilization of the available bandwidth of the given port.

Port Error Packets: The Web Manager enables various packet statistics to be viewed as either a line graph or a table.

The Port Error Packet window contains the following information:



Port Error Packet --- Bay 0

Rx Frames		Tx Frames	
CRC Error	0	ExDefer	0
Undersize	2148956688	CRC Error	2152545700
Oversize	2147483646	Late Coll.	N/A
Fragment	2149061940	Ex. Coll.	N/A
Jabber	2149328788	Single Coll.	N/A

Interval: 15 s

Rx Frames
Received packets.

CRC Error
For 10 Mbps ports, the counter records CRC errors; that is, frame-check sequence (FCS) errors or alignment errors. For 100 Mbps ports, the counter records the sum of CRC errors and code errors (frames received with rxerror signal).

Undersize
The total number of frames received that were less than 64 octets long (excluding framing bits, but including FCS octets) and were otherwise well-formed.

Oversize
The total number of frames received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well-formed.

Fragments
The total number of frames received that were less that 64 octets in length (excluding framing bits, but including FCS octets) and had either an FCS or an alignment error.

Jabber
The total number of frames received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either an FCS or an alignment error.

Drop Pkts
The total number of events in which packets were dropped due to a lack of resources.

Tx Frames
Transmitted packets.

ExDefer
The number of frames for which the first transmission attempt on a particular interface was delayed because the medium was busy.

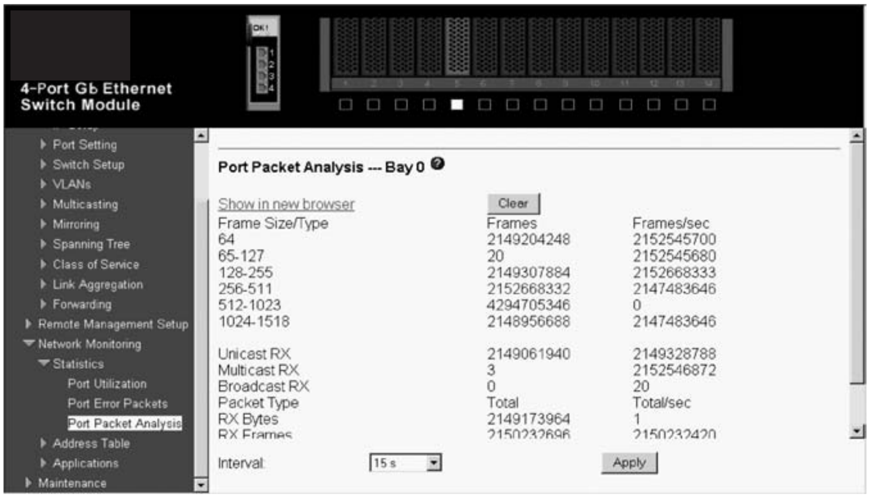
Late Coll.
Late Collisions. The number of times that a collision is detected later than 512 bit-times into the transmission of a packet.

Ex. Coll.
Excessive Collisions. The number of frames for which transmission failed due to excessive collisions.

Single Coll.
Single Collision Frames. The number of successfully transmitted frames for which transmission is inhibited by more than one collision.

Coll. An estimate of the total number of collisions on this network segment.

Port Packet Analysis: The Port Packet Analysis window contains the following information:



Port Packet Analysis --- Bay 0

Frame Size/Type	Frames	Frames/sec
64	2149204248	2152545700
65-127	20	2152545680
128-255	2149307884	2152668333
256-511	2152668332	2147483646
512-1023	4294705346	0
1024-1518	2148956688	2147483646
Unicast RX	2149061940	2149328788
Multicast RX	3	2152546872
Broadcast RX	0	20
Packet Type	Total	Total/sec
RX Bytes	2149173964	1
RX Frames	2150232696	2150232420

Interval: 15 s

The information on this window is described as follows:

Frames
The number of packets (or frames) received or transmitted by the switch with the size, in octets, given by the column on the right.

Frames/sec
The number of packets (or frames) transmitted or received, per second, by the switch.

Unicast RX
Displays the number of unicast packets received by the switch in total number (**Frames**) and the rate (**Frames/sec**).

Multicast RX
Displays the number of multicast packets received by the switch in total number (**Frames**) and the rate (**Frames/sec**).

Broadcast RX
Displays the number of broadcast packets received by the switch in total number (**Frames**) and the rate (**Frames/sec**).

RX Bytes
Displays the number of bytes (octets) received by the switch in total number (**Total**), and rate (**Total/sec**).

RX Frames
Displays the number of packets (frames) received by the switch in total number (**Total**), and rate (**Total/sec**).

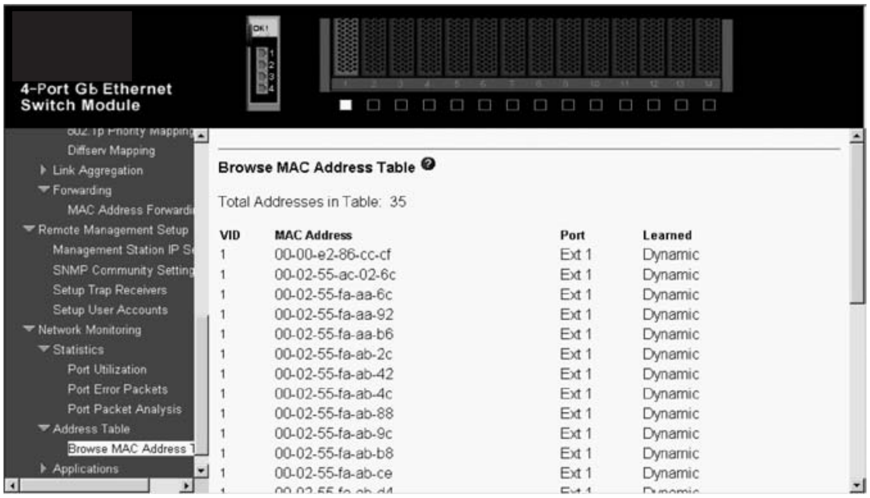
TX Bytes
Displays the number of bytes (octets) transmitted by the switch in total number (**Total**), and rate (**Total/sec**).

TX Frames
Displays the number of packets (frames) transmitted by the switch in total number (**Total**), and rate (**Total/sec**).

Address Table

This section contains a description and illustration of the **Browse MAC Address Table** window.

The Web manager enables the switch MAC address table (sometimes referred to as a forwarding table) to be viewed:



Browse MAC Address Table

Total Addresses in Table: 35

VID	MAC Address	Port	Learned
1	00-00-e2-86-cc-cf	Ext 1	Dynamic
1	00-02-55-ac-02-6c	Ext 1	Dynamic
1	00-02-55-fa-aa-6c	Ext 1	Dynamic
1	00-02-55-fa-aa-92	Ext 1	Dynamic
1	00-02-55-fa-aa-b6	Ext 1	Dynamic
1	00-02-55-fa-ab-2c	Ext 1	Dynamic
1	00-02-55-fa-ab-42	Ext 1	Dynamic
1	00-02-55-fa-ab-4c	Ext 1	Dynamic
1	00-02-55-fa-ab-88	Ext 1	Dynamic
1	00-02-55-fa-ab-9c	Ext 1	Dynamic
1	00-02-55-fa-ab-b8	Ext 1	Dynamic
1	00-02-55-fa-ab-ce	Ext 1	Dynamic
1	00-02-55-fa-ab-d4	Ext 1	Dynamic

The information on this window is described as follows:

Search by VLAN ID
Enables the forwarding table to be browsed by VLAN ID (VID).

Search by MAC Address
Enables the forwarding table to be browsed by MAC Address.

Search by Port
Enables the forwarding table to be browsed by port number.

Jump Enables the user to move to a sector of the database corresponding to a user defined port, VLAN, or MAC address.

Find Click the icon to find the data entry.

Clear All
Clears all forwarding table entries.

Clear By Port
Clears the forwarding table entries that have the entered port number.

VID The VLAN ID of the VLAN of which the port is a member.

MAC Address
The MAC address that you entered into the address table.

Port The port to which the MAC address corresponds.

Learned
How the switch discovered the MAC address. The possible entries are **Dynamic**, **Self**, and **Static**.

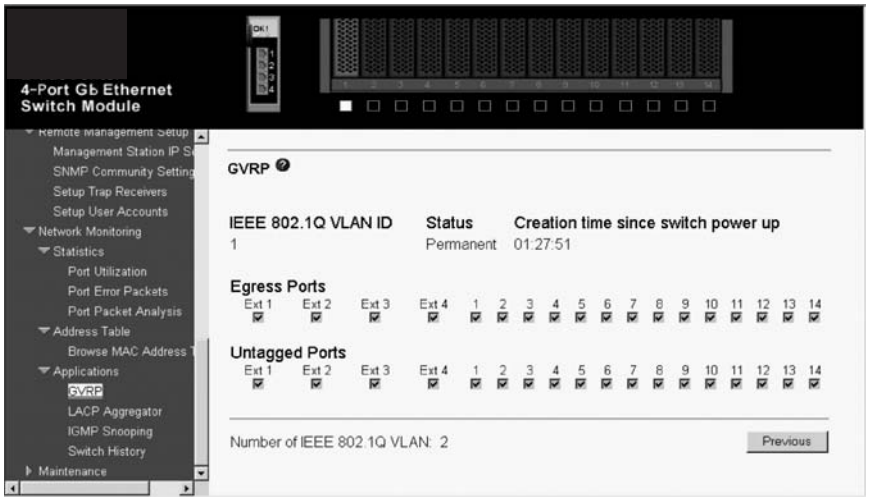
Next Click this button to view the next page of the address table.

Applications

This section contains descriptions and illustrations of the following windows:

- **GVRP**
- **LACP Aggregator**
- **IGMP Snooping**
- **Switch History**

GVRP: The read-only GVRP Status window contains the following information:



GVRP

IEEE 802.1Q VLAN ID	Status	Creation time since switch power up
1	Permanent	01:27:51

Egress Ports

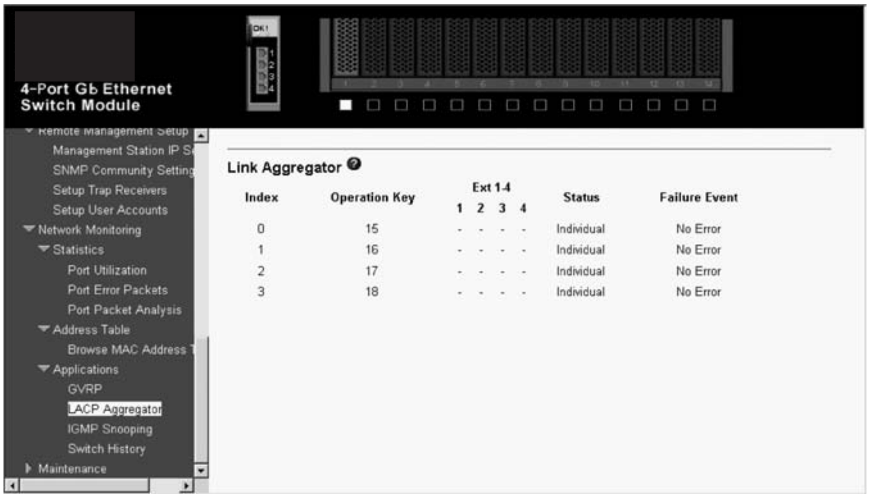
Ext 1	Ext 2	Ext 3	Ext 4	1	2	3	4	5	6	7	8	9	10	11	12	13	14
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑

Untagged Ports

Ext 1	Ext 2	Ext 3	Ext 4	1	2	3	4	5	6	7	8	9	10	11	12	13	14
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑

Number of IEEE 802.1Q VLAN: 2

LACP Aggregator: The Link Aggregation Control Protocol aggregator displays the status of dynamic LACP trunked ports from the group point of view.



Link Aggregator

Index	Operation Key	Ext 1-4				Status	Failure Event
		1	2	3	4		
0	15	-	-	-	-	Individual	No Error
1	16	-	-	-	-	Individual	No Error
2	17	-	-	-	-	Individual	No Error
3	18	-	-	-	-	Individual	No Error

The information on this read-only window is described as follows:

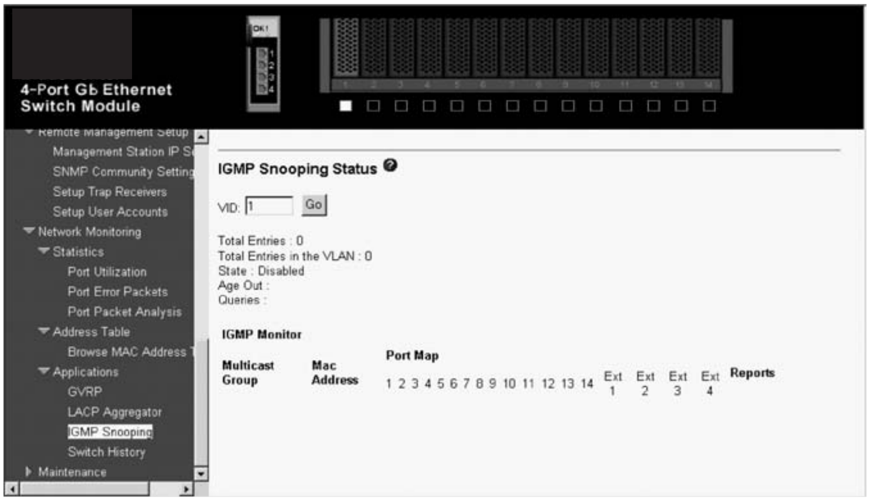
Index The LACP Aggregator ID number.

Operation Key
Displays the operational key used by the aggregator to communicate with other aggregators.

Member Port
Displays the port member status in the aggregator group.

Status Displays the status of each aggregator. When there is only one port member in the aggregator, the aggregator acts as a normal individual port (by default, each LACP-enabled port is assigned to their own aggregator group). Otherwise, it will start to aggregate when there is more than one port that wants to join the aggregator group.

IGMP Snooping: The switch IGMP snooping table can be browsed by using the Web manager. The table is displayed by VLAN ID (VID).



IGMP Snooping Status

VID: 1

Total Entries : 0
Total Entries in the VLAN : 0
State : Disabled
Age Out :
Queries :

IGMP Monitor

Multicast Group	Mac Address	Port Map 1 2 3 4 5 6 7 8 9 10 11 12 13 14	Ext 1	Ext 2	Ext 3	Ext 4	Reports

The information on this window is described as follows:

VID VLAN ID of the VLAN for which the IGMP Snooping table is to be displayed.

Search Click this button to display the IGMP Snooping Table for the current VID.

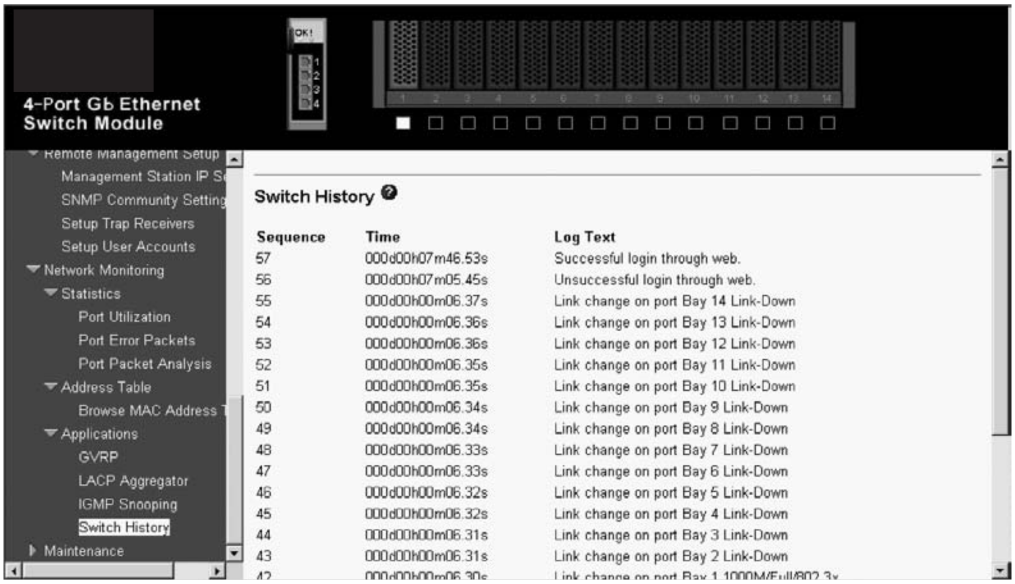
Multicast Group
The IP address of a multicast group learned by IGMP snooping.

MAC Address
The corresponding MAC address learned by IGMP snooping.

Port Map
Displays the ports that have forwarded multicast packets.

Reports
The number of IGMP reports for the listed source.

Switch History: The Web Manager enables the switch history log, as compiled by the switch management agent, to be viewed.



Switch History

```
Sequence   Time                 Log Text
57         000d00h07m46.53s     Successful login through web.
56         000d00h07m05.45s     Unsuccessful login through web.
55         000d00h00m06.37s     Link change on port Bay 14 Link-Down
54         000d00h00m06.36s     Link change on port Bay 13 Link-Down
53         000d00h00m06.36s     Link change on port Bay 12 Link-Down
52         000d00h00m06.35s     Link change on port Bay 11 Link-Down
51         000d00h00m06.35s     Link change on port Bay 10 Link-Down
50         000d00h00m06.34s     Link change on port Bay 9 Link-Down
49         000d00h00m06.34s     Link change on port Bay 8 Link-Down
48         000d00h00m06.33s     Link change on port Bay 7 Link-Down
47         000d00h00m06.33s     Link change on port Bay 6 Link-Down
46         000d00h00m06.32s     Link change on port Bay 5 Link-Down
45         000d00h00m06.32s     Link change on port Bay 4 Link-Down
44         000d00h00m06.31s     Link change on port Bay 3 Link-Down
43         000d00h00m06.31s     Link change on port Bay 2 Link-Down
42         000d00h00m06.30s     Link change on port Bay 1 1000M/Full/802.3x
```

The switch can record event information in its own logs, to designated SNMP trap receiving stations, and to the PC connected through a Telnet interface. Clicking **Next** at the bottom of the window will enable you to display all the switch trap logs.

The information on this window is described as follows:

Sequence
A counter incremented whenever an entry to the switch history log is made. The table displays the last entry (highest sequence number) first.

Time Displays the time in days, hours, and minutes since the switch was last restarted.

Log Text
Displays text describing the event that triggered the history log entry.

Maintenance

This section includes **Using TFTP Server** (**Download Configuration File**, **Upgrade Firmware**, **Upload Configuration File**, and **Save Log**), **Using Browser** (**Upgrade Firmware/Configuration File** and **Download Configuration/Log Files**), **Save Changes**, **Factory Reset**, and **Restart System**.

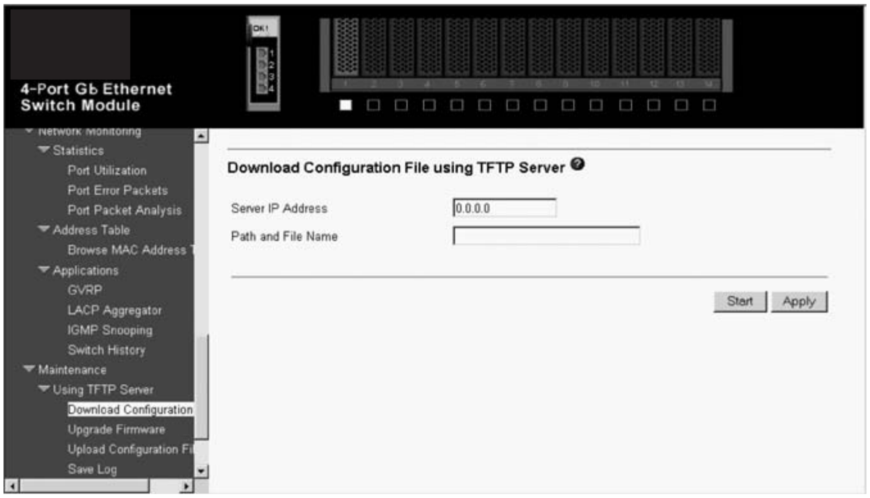
Using TFTP Server

Trivial File Transfer Protocol (TFTP) services enable the switch firmware code to be upgraded by downloading a new firmware code file from a TFTP server to the switch. A configuration file can also be loaded into the switch, and switch settings can be saved to a TFTP server. In addition, the switch history log can be uploaded from the switch to a TFTP server.

Note: TFTP server software must be running on the management station for the TFTP services listed here to work.

Download Configuration File

The Download Configuration File from TFTP Server window contains the following information:



Download Configuration File using TFTP Server

Server IP Address 0.0.0.0

Path and File Name

Enter the IP address of the TFTP server in the **Server IP Address** field and the complete path and file name of the firmware code file for the switch. Click **Apply** to enter the server IP address into the switch RAM (select **Save Changes** to enter the address into the switch NVRAM). Click **Start** to initiate the file transfer.

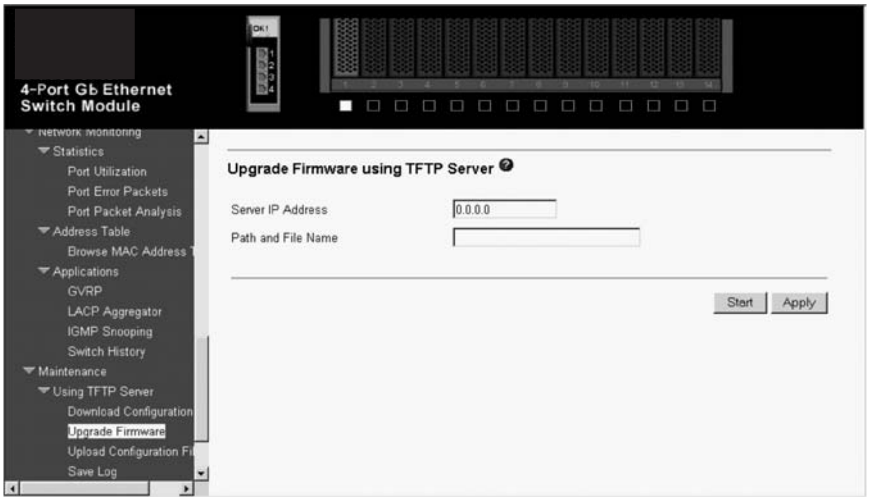
The information on this window is described as follows:

Server IP Address
The IP address of the TFTP server.

Path and File Name
The full file name (including path) of the new firmware code file on the TFTP server.

Upgrade Firmware

A configuration file can be downloaded from a TFTP server to the switch. This file is then used by the switch to configure itself.



Upgrade Firmware using TFTP Server

Server IP Address	0.0.0.0
Path and File Name	

Enter the IP address of the TFTP server in the **Server IP Address** field and the complete path and file name of the firmware code file for the switch. Click **Apply** to enter the server IP address into the switch RAM (select **Save Changes** to enter the address into the switch NVRAM). Click **Start** to initiate the file transfer.

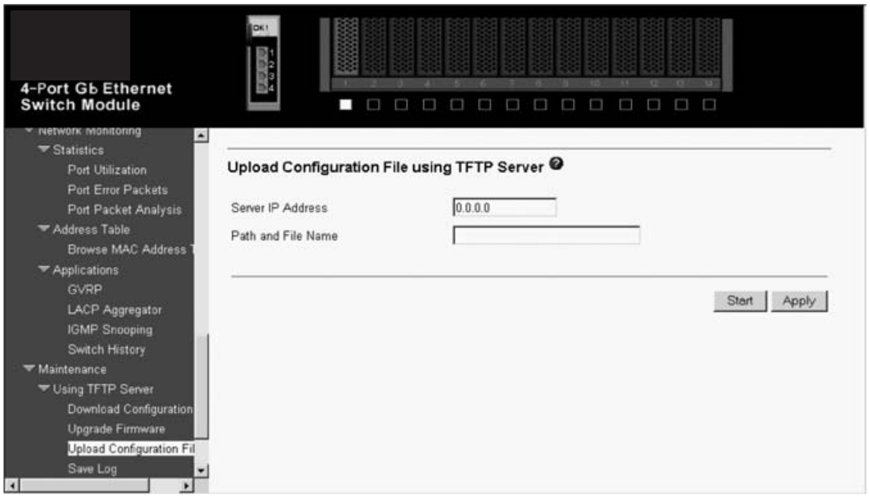
The information on this window is described as follows:

Server IP Address
The IP address of the TFTP server.

Path and File Name
The full file name (including path) of the new firmware code file on the TFTP server.

Upload Configuration File

The switch module current settings can be uploaded to a TFTP Server by the switch module management agent.



Upload Configuration File using TFTP Server

Server IP Address 0.0.0.0

Path and File Name

Enter the IP address of the TFTP server in the **Server IP Address** field and the complete path and file name of the firmware code file for the switch. Click **Apply** to enter the server IP address into the switch RAM (select **Save Changes** to enter the address into the switch NVRAM). Click **Start** to initiate the file transfer.

Note: If you do not save configurations to NVRAM, the configurations that you are uploading to a TFTP server will not be saved correctly.

The information on this window is described as follows:

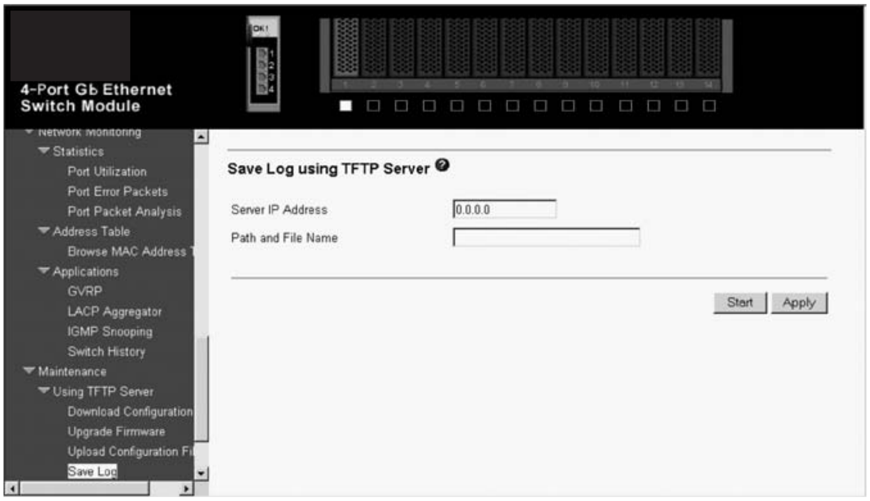
Server IP Address
The IP address of the TFTP server.

Path and File Name
The full file name (including path) of the new firmware code file on the TFTP server.

Save Log

The switch module management agent can upload its history log file to a TFTP server.

Note: An empty history file on the TFTP server must exist on the server before the switch can upload its history file.



Save Log using TFTP Server

Server IP Address 0.0.0.0

Path and File Name

Enter the IP address of the TFTP server in the **Server IP Address** field and the complete path and file name of the firmware code file for the switch. Click **Apply** to enter the server IP address into the switch RAM (select **Save Changes** to enter the address into the switch NVRAM). Click **Start** to initiate the file transfer.

The information on this window is described as follows:

Server IP Address
The IP address of the TFTP server.

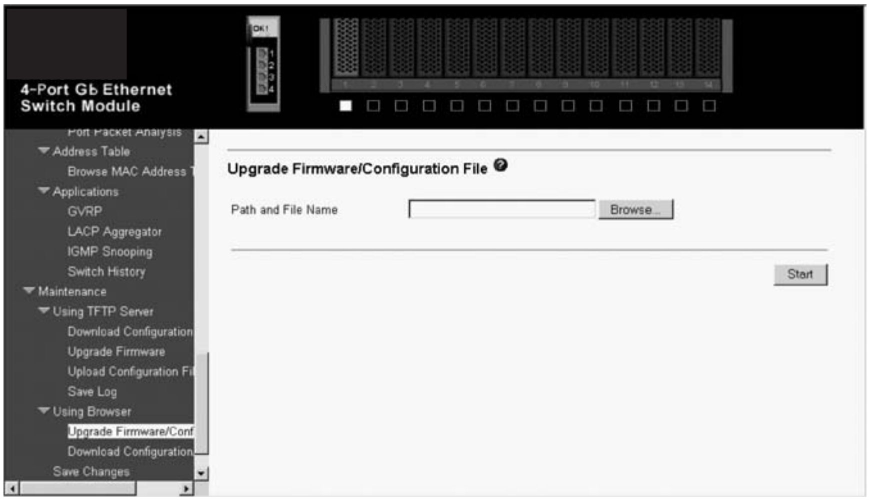
Path and File Name
The full file name (including path) of the new firmware code file on the TFTP server.

Using the Browser

This section contains information about the Upgrade Firmware/Configuration File and Download Configuration/Log Files windows.

Upgrade Firmware/Configuration File:

The Upgrade Firmware/Configuration File window contains the following information:

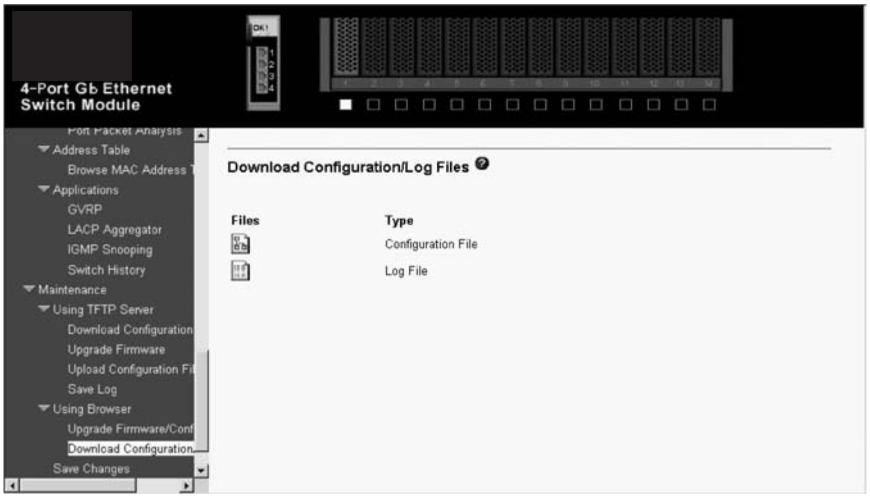


Enter the **Path** and **File Name** of the desired file or use the Browse button to access recently used entries. Click **Start** to begin.

Download Configuration/Log Files:

To download a switch configuration file from the browser, highlight **Configuration File** on the Download Configuration/Log Files menu and press Enter. To download a switch log file from the browser, highlight **Log File** on the Download Configuration/Log Files menu and press Enter.

The Download Configuration/Log Files window contains the following information:

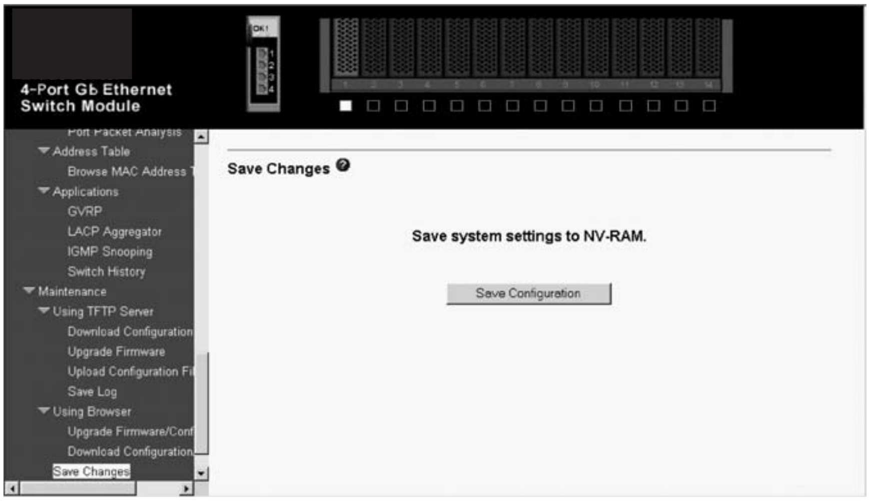


Download Configuration/Log Files

Files	Type
	Configuration File
	Log File

Saving changes

The Save Changes window contains the following information:



Save Changes

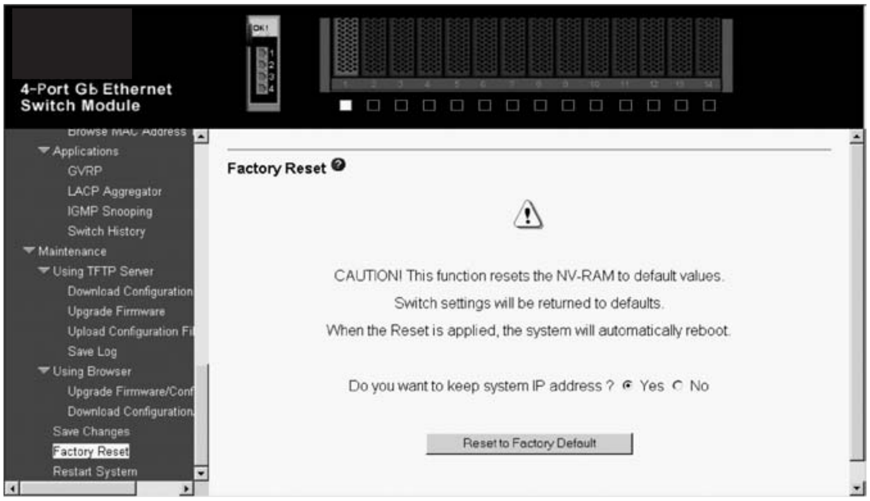
Save system settings to NV-RAM.

To save all the changes that you made to the switch flash memory in the current session, click the **Save Configuration** button.

When the switch configuration settings have been saved to NVRAM, they become the default settings for the switch. These settings will be used every time that the switch module is restarted.

Restoring the default configuration parameters

The Factory Reset window contains the following information:



Factory Reset

CAUTION! This function resets the NV-RAM to default values.

Switch settings will be returned to defaults.

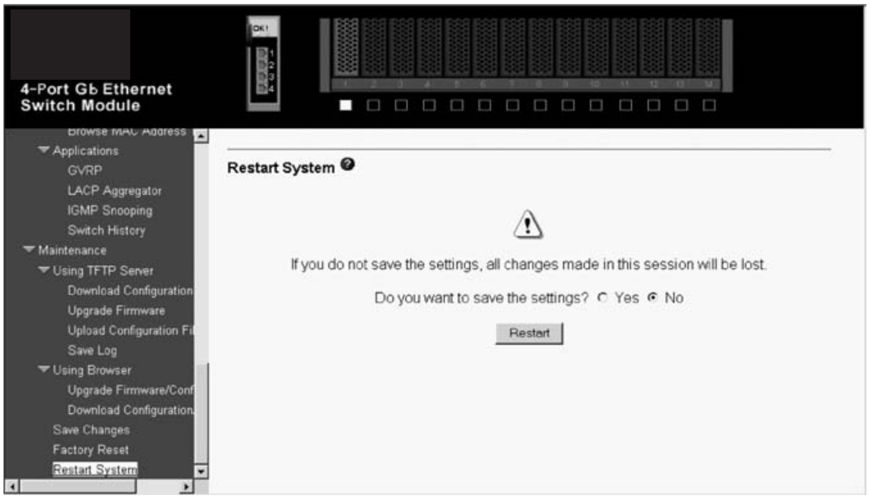
When the Reset is applied, the system will automatically reboot.

Do you want to keep system IP address ? ● Yes ○ No

A remote reset returns the device to the initial parameters that were set at the factory. Click **Reset to Factory Default** to reset the switch module.

Restarting the switch

The Restart System window contains the following information:



Restart System

If you do not save the settings, all changes made in this session will be lost.

Do you want to save the settings? ○ Yes ● No

To perform a restart of the switch, which resets the system, click the **Restart** button.

Chapter 6. Configuring the switch module through the Telnet interface

Your switch module supports a management interface that you can use to set up and control your device over the network using the TCP/IP Telnet protocol. You can use this facility to perform many basic network management functions. In addition, you can use the Telnet interface to configure the switch module for management using an SNMP-based network management system. This chapter describes how to use the Telnet interface to access the switch module, change its settings, and monitor its operation.

Important: Before you configure your Ethernet switch module, be sure that the management modules in your blade server system chassis are properly configured. In addition, to access and manage your Ethernet switch module from an external environment, you might need to enable certain features, such as the external ports and external management over all ports. See the applicable *SBCE Installation and User's Guide* publications on the *SBCE Resource CD* for more information.

Remotely managing the Ethernet switch module

The Ethernet switch module supports two remote-access modes for management through Ethernet connections. You can select the mode that is best suited for your environment. The Ethernet switch module has an internal Ethernet path to the management module and the four external Ethernet ports on the switch module.

The default mode uses the internal path to the management module only. In this mode, the remote-access link to the management console must be attached to the 10/100 Mbps Ethernet port on the management module. With this mode, the IP addresses and SNMP parameters of the Ethernet switch modules can be manually assigned by a Management and Configuration Program. This mode enables the system administrator to provide a secure LAN for management of the subsystems separately from the data network.

Important: With this mode, the Ethernet switch module does not respond to remote-management commands through the four external Ethernet ports on the switch module.

See the applicable *Intel® Server Blade Chassis Enterprise SBCE Installation and User's Guide* on the *SBCE Resource CD* for additional instructions for configuring the Ethernet switch module for this mode of operation.

The system administrator can select to enable remote management of the Ethernet switch module through the four external Ethernet ports on the switch module, instead of or in addition to access through the management module. This mode can only be enabled through the management module configuration interface. Once this mode is enabled, the external Ethernet ports will support both management traffic and system application data traffic. Also, the Ethernet switch module can transmit DHCP and BOOTP request frames through the external Ethernet ports.

This mode enables the Ethernet switch module IP addresses to reside on a different subnet than the management modules. This is useful when the Ethernet switch modules are to be managed and controlled as part of the overall network infrastructure, while maintaining secure management of other subsystems through the management module. However, management access to the Ethernet switch-module link will be lost if the Ethernet switch module IP address is not on the same subnet as the management module. This chapter contains additional instructions for configuring the Ethernet switch module for this mode of operation.

The two previously described modes are only applicable to the Ethernet switch module. The management module can only be remotely accessed through the 10/100 Mbps Ethernet port on the management module.

Connecting to the switch module

When you know the IP address for your switch module and provided that you have an existing network connection, you can use the Telnet program (in VT-100 compatible terminal mode) to access and control the switch module. If you need to obtain the IP address for your switch module or establish a network connection, consult your system or network administrator. Be sure to use the correct IP address in the required command, as specified in “First-time connection to the Ethernet switch module”.

Telnet usage conventions

The Telnet interface uses the following conventions:

Items in <angle brackets> can be toggled among several choices using the Spacebar.

Items in [square brackets] can be changed by typing a new value. You can use the backspace and delete keys to erase characters behind and in front of the cursor.

The Up and Down Arrow keys, the Left and Right Arrow keys, the Tab key, and the Backspace key can be used to move between selected items.

Items in UPPERCASE are commands. Moving the selection to a command (such as **APPLY**) and pressing Enter will issue that command.

Important: The command **APPLY** makes changes to the switch configuration for the current session only. If you want your changes to be permanent, select **Save Changes** in the main menu. Selecting **Save Changes** enters the current switch configuration, including all changes, into NVRAM and then restarts the switch module.

First-time connection to the Ethernet switch module

The switch module supports user-based security that you can use to prevent unauthorized users from accessing the switch module or changing its settings. This section tells how to log on to the switch module.

Note: The passwords used to access the switch module are case-sensitive; therefore, an uppercase *S* is not the same as a lowercase *s*.

Complete the following steps to connect to the switch module through the Telnet interface:

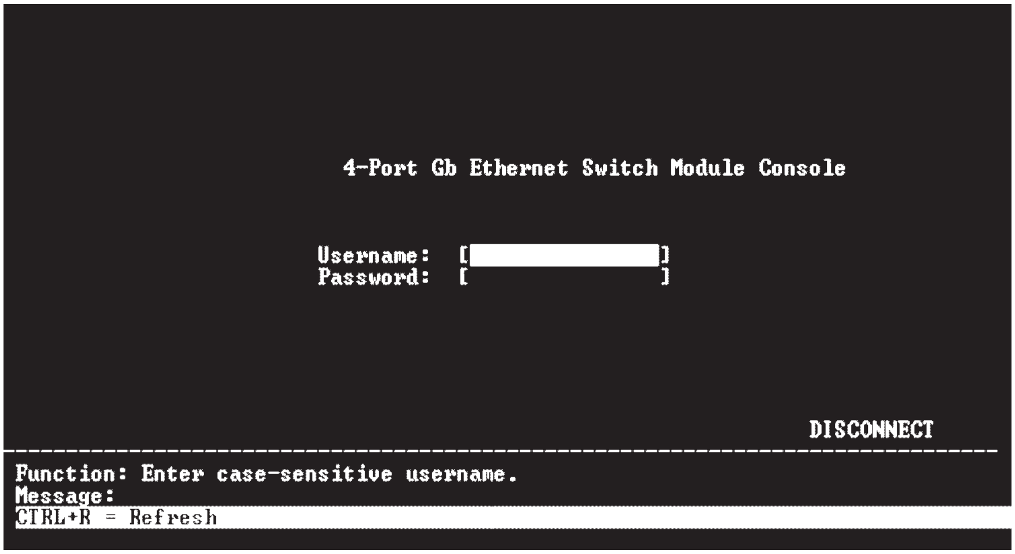
Display a window that contains a DOS prompt command line; for example, **C:\>**.

Type the following command on the DOS prompt command line and press Enter: **telnet x**

where **x** is the IP address for your switch module

When you first connect to the switch module, the first login window (shown in the following illustration) opens.

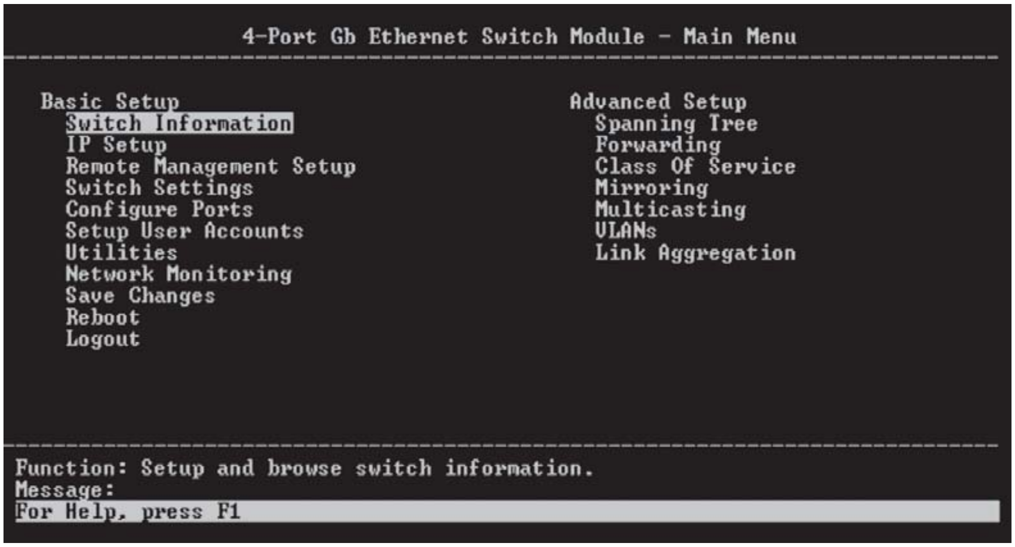
Note: Press Ctrl+R to refresh the window. This command can be used at any time to force the program in the switch module to refresh the current window.



```
                  4-Port Gb Ethernet Switch Module Console


                  Username:  [              ]
                  Password:  [              ]




                                                          DISCONNECT
--------------------------------------------------------------------------------
Function: Enter case-sensitive username.
Message:
CTRL+R = Refresh
```

Note: The initial user name in the **Username** field is USERID, and the initial password in the **Password** field is PASSW0RD (where the sixth alphanumeric character is the number zero). Remember that both the **Username** and **Password** fields are case-sensitive. To increase system security, change the password after you log onto the system for the first time and, be sure to store the new password in a safe location.

Press Enter in both the **Username** and **Password** fields. The main menu is displayed, as shown in the following illustration:



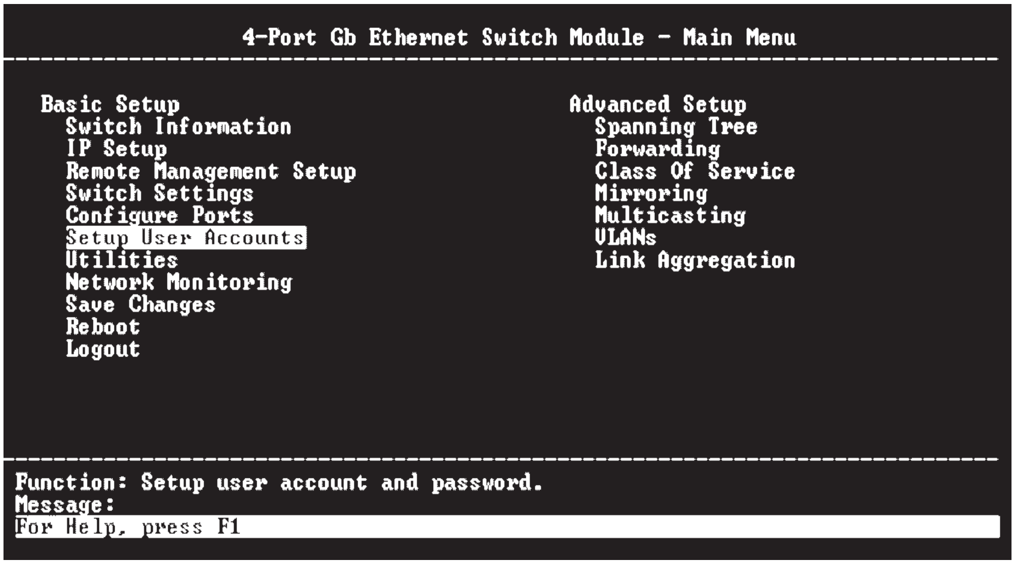
```
             4-Port Gb Ethernet Switch Module - Main Menu
--------------------------------------------------------------------------------

   Basic Setup                              Advanced Setup
     Switch Information                       Spanning Tree
     IP Setup                                 Forwarding
     Remote Management Setup                  Class Of Service
     Switch Settings                          Mirroring
     Configure Ports                          Multicasting
     Setup User Accounts                      VLANs
     Utilities                                Link Aggregation
     Network Monitoring
     Save Changes
     Reboot
     Logout




--------------------------------------------------------------------------------
Function: Setup and browse switch information.
Message:
For Help, press F1
```

Note: The first user automatically gets Root privileges. Create at least one Root-level user for the switch module, as described in “Setting up user accounts”.

Setting up user accounts

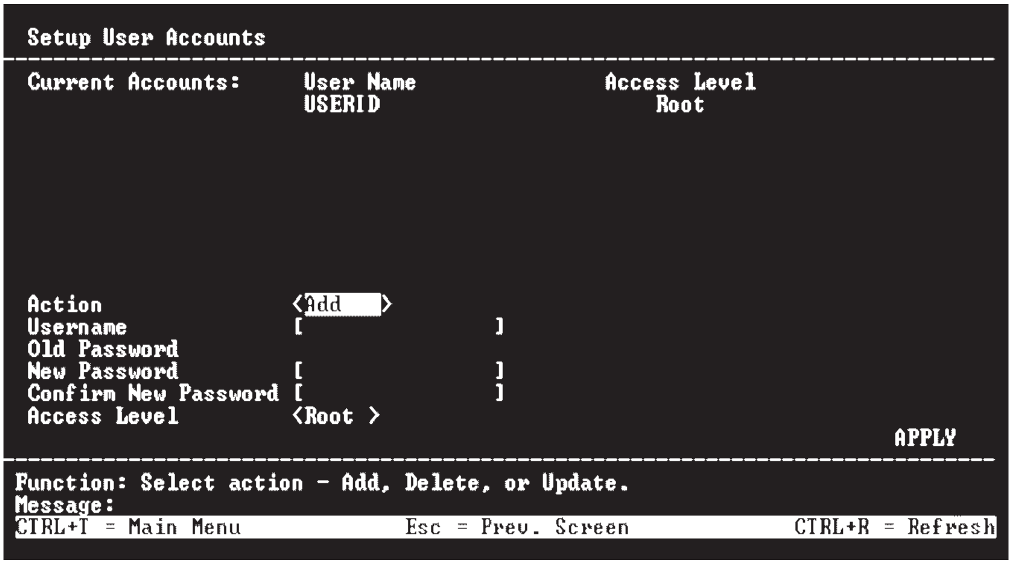
Only a user with Root privileges can add new user accounts or make changes to existing user accounts. Before you can update a user account, you must also enter the password for that user account. If you are updating or deleting an existing user account, see "Updating a user account" or "Deleting a user account" for more details.

To create a new user account, highlight **Setup User Accounts** in the main menu and press Enter:



```
                  4-Port Gb Ethernet Switch Module - Main Menu
--------------------------------------------------------------------------------

  Basic Setup                                 Advanced Setup
    Switch Information                          Spanning Tree
    IP Setup                                    Forwarding
    Remote Management Setup                     Class Of Service
    Switch Settings                             Mirroring
    Configure Ports                             Multicasting
    Setup User Accounts                         VLANs
    Utilities                                   Link Aggregation
    Network Monitoring
    Save Changes
    Reboot
    Logout

--------------------------------------------------------------------------------
Function: Setup user account and password.
Message:
For Help, press F1
```

The Setup User Accounts window opens, as shown in the following illustration.



```
  Setup User Accounts
--------------------------------------------------------------------------------
  Current Accounts:      User Name                Access Level
                         USERID                       Root






  Action                <Add     >
  Username              [               ]
  Old Password
  New Password          [               ]
  Confirm New Password  [               ]
  Access Level          <Root >
                                                                         APPLY
--------------------------------------------------------------------------------
Function: Select action - Add, Delete, or Update.
Message:
CTRL+T = Main Menu            Esc = Prev. Screen             CTRL+R = Refresh
```

Complete the following steps to create a new user account:

Toggle the **Action** field to **<Add>** using the Spacebar. This will enable the addition of a new user. The other options are:

<Delete>

Deletes a user entry.

<Update>

Makes changes to an existing user entry.

Enter the new user's name in the **Username** field, assign an initial password in the **New Password** field, and then confirm the new password in the **Confirm New Password** field. Determine whether the new user should have root, user+, or user privileges (see "Assigning Root, User+, and User privileges" for descriptions of these privileges). The Spacebar toggles among these three options in the **Access Level** field.

Highlight **APPLY** and press Enter to make the user addition effective.

Press Esc to return to the previous window or Ctrl+T to go to the root window.

A listing of all user accounts and access levels is displayed below the user setup menu. This list is updated when **APPLY** is processed.

Important: The command **APPLY** makes changes to the switch configuration for the current session only. If you want your changes to be permanent, select **Save Changes** in the main menu. Selecting **Save Changes** enters the current switch configuration, including all changes, into NVRAM, and then restarts the switch module.

Assigning Root, User+, and User privileges

There are three levels of user privileges: Root, User+, and User. Some menu selections that are available to users with Root privileges might not be available to those with User+ and User privileges.

Note: User privileges are also known as normal user privileges.

The following table summarizes the Root, User+, and User privileges.

Table 4. Root, User+, and User privileges

Switch configuration	Privilege		
Management	Root	User+	User
Configuration	Yes	Read only	Read only
Network monitoring	Yes	Read only	Read only
Community strings and trap stations	Yes	Read only	Read only
Update firmware and configuration files	Yes	No	No
System utilities	Yes	Ping only	Ping only
Factory reset	Yes	No	No
Reboot switch	Yes	Yes	No
User accounts management			
Add/update/delete user accounts	Yes	No	No
View user accounts	Yes	No	No

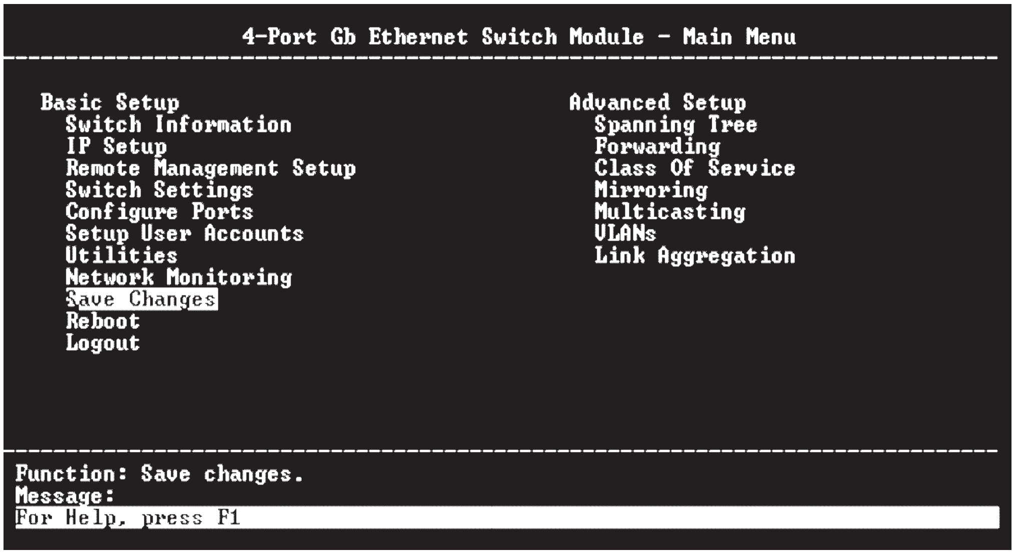
After establishing a user account with Root-level privileges, press Esc. Then, highlight **Save Changes** and press Enter (see "Saving changes"). The switch will save any changes to its NVRAM and restart. Log on with the new user name and password as described in "Logging onto the switch module" on page 683. You are now ready to continue configuring the switch.

Saving changes

The switch module has two levels of memory: normal random-access memory (RAM) and NVRAM. To make configuration changes effective, highlight **APPLY** and press Enter. When this is done, the settings will be immediately applied to the switching software in RAM and will immediately take effect.

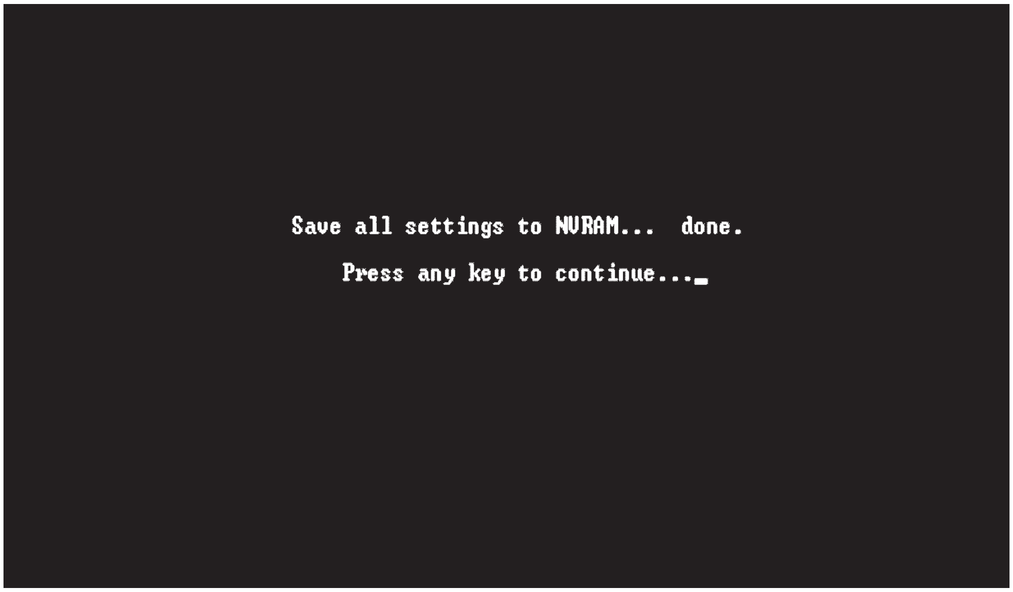
However, some settings require you to restart the switch before they will take effect. Restarting the switch erases all settings in RAM and reloads the stored settings from the NVRAM. Thus, it is necessary to save all setting changes to NVRAM before restarting the switch.

To keep any configuration changes permanently, highlight **Save Changes** in the main menu and press Enter.



```
                 4-Port Gb Ethernet Switch Module - Main Menu
-------------------------------------------------------------------------------

  Basic Setup                                  Advanced Setup
    Switch Information                           Spanning Tree
    IP Setup                                     Forwarding
    Remote Management Setup                      Class Of Service
    Switch Settings                              Mirroring
    Configure Ports                              Multicasting
    Setup User Accounts                          VLANs
    Utilities                                    Link Aggregation
    Network Monitoring
    Save Changes
    Reboot
    Logout

-------------------------------------------------------------------------------
Function: Save changes.
Message:
For Help, press F1
```

To verify that your new settings have been saved to NVRAM, the following window opens.

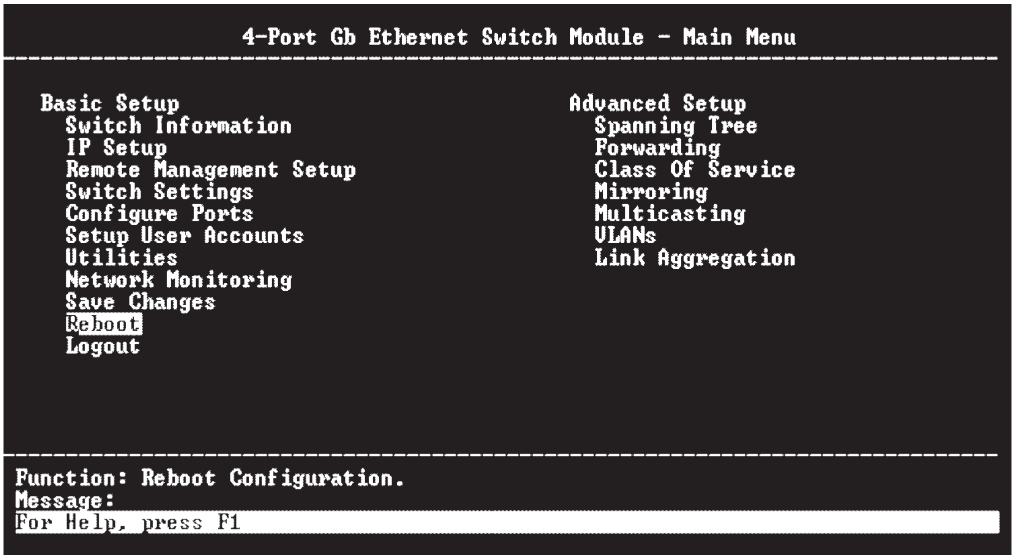


```
                      Save all settings to NVRAM...  done.

                          Press any key to continue...
```

When the switch configuration settings have been saved to NVRAM, they become the default settings for the switch. These settings will be used every time that the switch module is restarted.

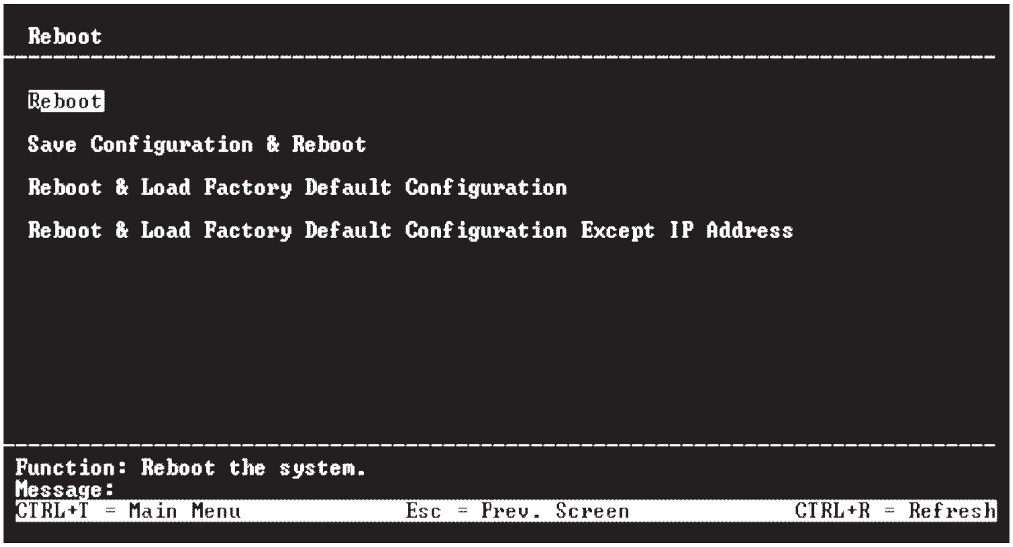
Restoring default configuration values

The only way to change the configuration stored in NVRAM is to save a new configuration using **Save Changes**, or to process a **Load Factory Default Configuration** function from the Reboot menu. This will clear all settings and restore them to their initial values listed in Appendix B, “Run-time switching software default settings” on page 117. These are the configuration settings that were entered at the factory.



```
                4-Port Gb Ethernet Switch Module - Main Menu
-----------------------------------------------------------------------------

  Basic Setup                                Advanced Setup
    Switch Information                         Spanning Tree
    IP Setup                                   Forwarding
    Remote Management Setup                    Class Of Service
    Switch Settings                            Mirroring
    Configure Ports                            Multicasting
    Setup User Accounts                        VLANs
    Utilities                                  Link Aggregation
    Network Monitoring
    Save Changes
    Reboot
    Logout

-----------------------------------------------------------------------------
Function: Reboot Configuration.
Message:
For Help, press F1
```

Highlight **Reboot** in the main menu and press Enter.



```
  Reboot
-----------------------------------------------------------------------------

  Reboot

  Save Configuration & Reboot

  Reboot & Load Factory Default Configuration

  Reboot & Load Factory Default Configuration Except IP Address

-----------------------------------------------------------------------------
Function: Reboot the system.
Message:
CTRL+T = Main Menu          Esc = Prev. Screen          CTRL+R = Refresh
```

Highlight the applicable choice and press Enter to reset the switch NVRAM to the factory default settings (or just restart the switch module). Loading the factory default configuration will erase any user accounts (and all other configuration settings) that you might have entered and return the switch module to its original state at the time of purchase. The **Load Factory Default Configuration Except IP Address** option is used when the IP address of the switch module needs to be preserved.

Logging onto the switch module

To log in after you have created a registered user, complete the following steps from the login window (see "First-time connection to the Ethernet switch module" for additional information).

Type your user name in the **Username** field and press Enter.

Type your password in the **Password** field and press Enter.

The main menu window opens based on your access level or privilege.

Viewing current user accounts

Access to the switch is controlled through using an authorized user name and password. The switch supports a maximum of eight user accounts. The interface does not permit deletion of the currently logged-in user, to prevent accidentally deleting all the users with Root privileges.

Only a user with Root privileges can delete users.

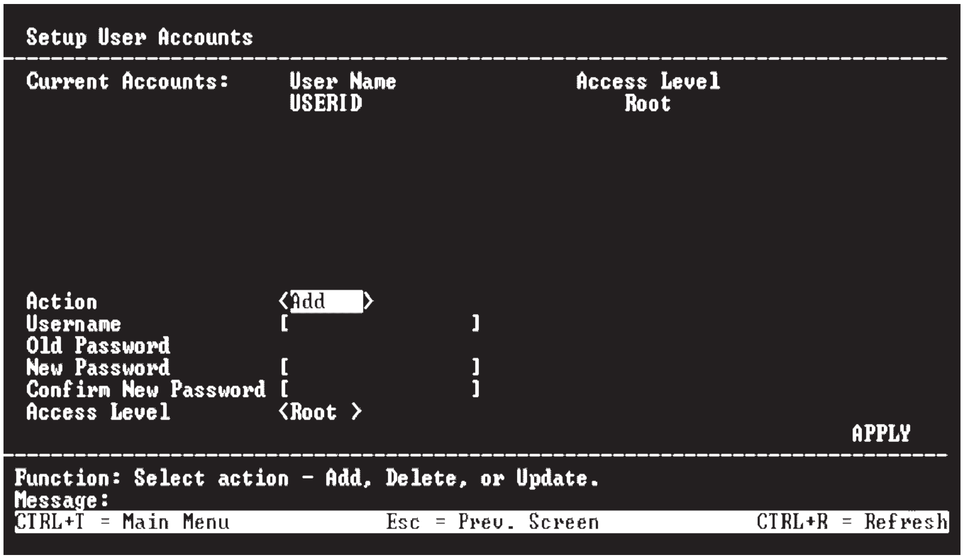
To view the current user accounts, highlight **Setup User Accounts** in the main menu and press Enter. You can read the current user accounts from the Setup User Accounts window.

Updating a user account

Only a user with Root privileges can add new user accounts or make changes to existing user accounts. Before you can update a user account, you must also enter the password for that user account. If you are adding a new user account, see "Setting up user accounts" for complete details".

Complete the following steps to update a user account:

Select **Setup User Accounts** in the main menu. The following Setup User Accounts window opens:



```
 Setup User Accounts
-------------------------------------------------------------------------------
 Current Accounts:      User Name                   Access Level
                        USERID                          Root







 Action                 <Add      >
 Username               [               ]
 Old Password
 New Password           [               ]
 Confirm New Password   [               ]
 Access Level           <Root >
                                                                       APPLY
-------------------------------------------------------------------------------
Function: Select action - Add, Delete, or Update.
Message:
CTRL+T = Main Menu             Esc = Prev. Screen             CTRL+R = Refresh
```

Toggle the **Action** field by using the Spacebar to select **Update**.

Type in the user’s name in the **Username** field for the user account that you want to change; then, press Enter. Type in the old password in the **Old Password** field for that user account; then, press Enter.

You can now modify the password or the privilege level for this user account.

To change the password, type in the **New Password** that you have chosen, and press Enter. Type in the same new password in the **Confirm New Password** field to verify that you have not mistyped it.

To change the privilege level, toggle the **Access Level** field until the appropriate level is displayed - **Root**, **User+**, or **User**.

Highlight **APPLY** and press Enter to make the change effective.

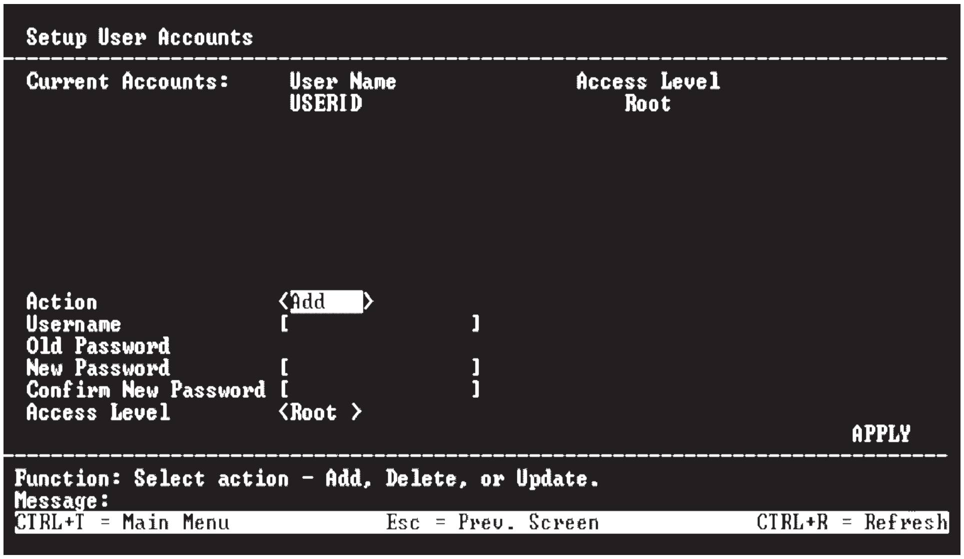
You must enter the configuration changes into the NVRAM through the **Save Changes** choice on the main menu if you want the configuration to be used after a switch restart.

Deleting a user account

Only a user with Root privileges can delete user accounts. Before you can delete a user account, you must also enter the password for that user account.

Complete the following steps to delete a user account and password:

Select **Setup User Accounts** in the main menu. The following Setup User Accounts window opens.



```
Setup User Accounts
--------------------------------------------------------------------------------
Current Accounts:     User Name               Access Level
                      USERID                      Root







Action               <Add     >
Username             [                ]
Old Password
New Password         [                ]
Confirm New Password [                ]
Access Level         <Root >
                                                                  APPLY
--------------------------------------------------------------------------------
Function: Select action - Add, Delete, or Update.
Message:
CTRL+T = Main Menu             Esc = Prev. Screen             CTRL+R = Refresh
```

Toggle the **Action** field to **Delete**.

Enter the applicable information in the **Username** and **Old Password** fields for the account that you want to delete.

Highlight **APPLY** and press Enter to make the deletion of the selected user effective.

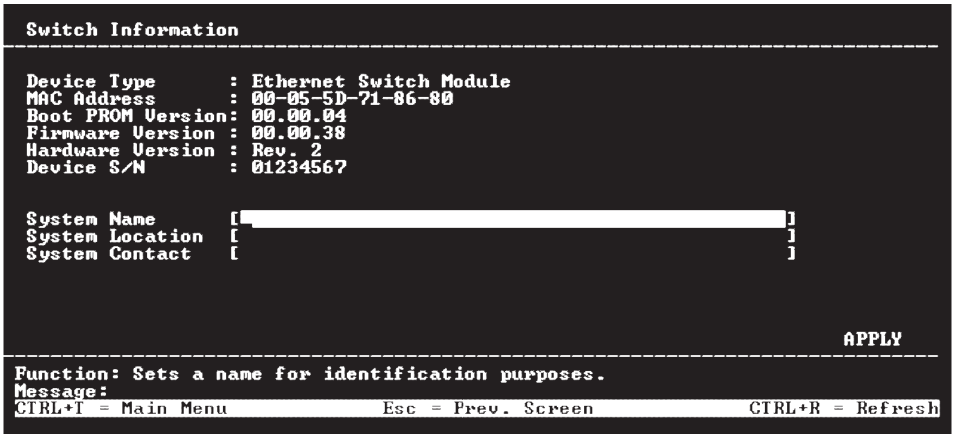
You must enter the configuration changes into the NVRAM through the **Save Changes** choice on the main menu if you want the configuration to be used after a switch module restart.

Basic Setup

The main menu is divided into two sections, **Basic Setup** and **Advanced Setup**. The **Basic Setup** menus are organized into 12 main categories: **Switch Information**, **IP Setup**, **Remote Management Setup**, **Switch Settings**, **Configure Ports**, **Setup User Accounts**, **Utilities**, **Network Monitoring**, **Save Changes**, **Reboot** and **Logout**

Switch Information

Highlight **Switch Information** on the main menu and press Enter. The following window opens:



```
 Switch Information
-------------------------------------------------------------------------------

 Device Type      : Ethernet Switch Module
 MAC Address      : 00-05-5D-71-86-80
 Boot PROM Version: 00.00.04
 Firmware Version : 00.00.38
 Hardware Version : Rev. 2
 Device S/N       : 01234567

 System Name      [                                              ]
 System Location  [                                              ]
 System Contact   [                                              ]



                                                                      APPLY
-------------------------------------------------------------------------------
Function: Sets a name for identification purposes.
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

The Switch Information window shows the type of switch module and its MAC address (assigned by the factory and unchangeable). In addition, the boot PROM and firmware version numbers are shown. This information is helpful to keep track of PROM and firmware code updates and to obtain the switch module MAC address for entry into another network device address table, if necessary.

You can also enter the name of the system, its location, and the name and telephone number of the system administrator. In this case, the system administrator is the person who is responsible for the maintenance of the network system on which this switch module is installed.

IP Setup

Some settings must be entered to enable the switch module to be managed from an SNMP-based Network Management System such as SNMP version 1 or to be able to access the switch module using the Telnet protocol.

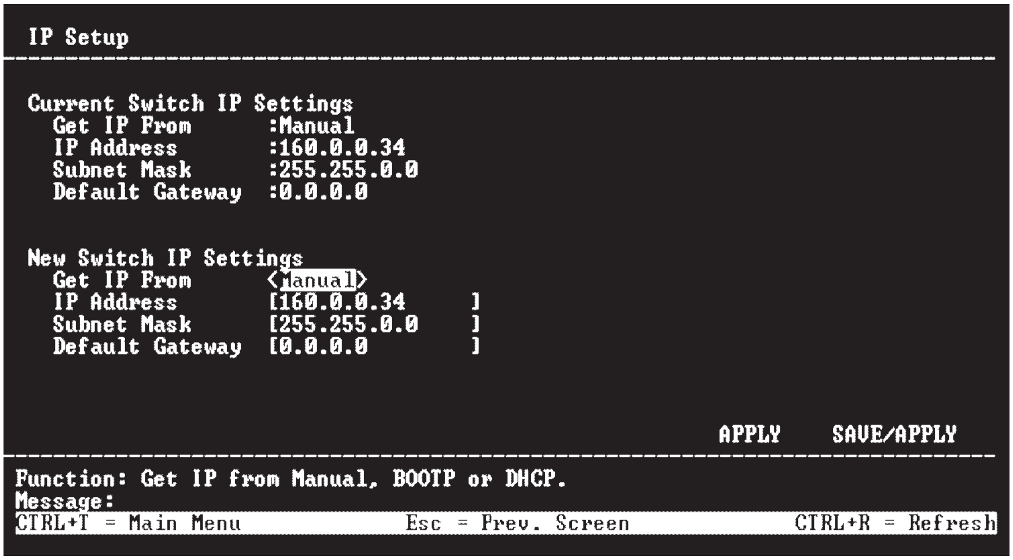
Select the **IP Setup** window to specify how the switch module will be assigned an IP address to enable it to be identified on the network.

The switch default IP address is 192.168.70.1*xx*, where *xx* depends on the number of the bay into which you have installed the switch module, as shown in Table 2.

Table 5. Default IP addresses based on switch-module bay numbers (IP Setup window of Telnet Basic Setup menu)

Bay number	Default IP address
Bay 1	192.168.70.127
Bay 2	192.168.70.128
Bay 3	192.168.70.129
Bay 4	192.168.70.130

To set up the switch module for remote management, highlight **IP Setup** in the main menu and press Enter. The following window opens.



```
IP Setup
--------------------------------------------------------------------------------

Current Switch IP Settings
  Get IP From      :Manual
  IP Address       :160.0.0.34
  Subnet Mask      :255.255.0.0
  Default Gateway  :0.0.0.0

New Switch IP Settings
  Get IP From      <Manual>
  IP Address       [160.0.0.34     ]
  Subnet Mask      [255.255.0.0    ]
  Default Gateway  [0.0.0.0        ]

                                                      APPLY    SAVE/APPLY
--------------------------------------------------------------------------------
Function: Get IP from Manual, BOOTP or DHCP.
Message:
CTRL+T = Main Menu           Esc = Prev. Screen           CTRL+R = Refresh
```

The switch module must have an IP address assigned to it so that a network management system (that is, Telnet) client can find it on the network.

The fields listed under the **Current Switch IP Settings** heading are those currently being used by the switch module. The fields listed under the **New Switch IP Settings** heading are those that will be used after the switch module has been restarted.

Toggle the **Get IP From** field using the Spacebar to select from **Manual**, **BOOTP**, or **DCHP**. This selects how the switch module will be assigned an IP address on the next restart (or startup).

Note: BOOTP and DHCP are only supported through the four external Ethernet ports on the switch module. To use BOOTP and DHCP, you must first enable these ports for remote-management access through the blade server system chassis management and configuration program. For a detailed description of this program, see the *Intel® Server Blade Chassis Enterprise SBCE Installation and the User's Guide* on the *Resource CD*.

The **Get IP From** options are:

BOOTP

The switch module will send out a BOOTP broadcast request when it is turned on. The BOOTP protocol enables IP addresses, network masks, and default gateways to be assigned by a central BOOTP server. If this option is selected, the switch module will first look for a BOOTP server to provide it with this information before using the default or previously entered settings.

DCHP

The switch module will send out a DCHP broadcast request when it is turned on. The DCHP protocol enables IP addresses, network masks, and default gateways to be assigned by a DCHP server. If this option is set, the switch will first look for a DCHP server to provide it with this information before using the default or previously entered settings.

Manual

This option enables the entry of an IP address, subnet mask, and a default gateway for the switch. These entries should be of the form *xxx.xxx.xxx.xxx*, where each *xxx* is a number (represented in decimal form) between 0 and 255. This address should be a unique address on the network assigned for use by the network administrator. The fields that require entries under this option are as follows:

Subnet Mask

A bitmask that determines the extent of the subnet that the switch module is on. It should be of the form *xxx.xxx.xxx.xxx*, where each *xxx* is a number (represented in decimal) between 0 and 255. The value should be 255.0.0.0 for a class A network, 255.255.0.0 for a class B network, and 255.255.255.0 for a class C network, but custom subnet masks are permitted.

Note: For switch communication with a remote management station through the management module external Ethernet port, the switch module internal network interface and the management module internal and external interfaces must be on the same subnet.

Default Gateway

An IP address that determines where packets with a destination address outside the current subnet should be sent. This is usually the address of a router or a host acting as an IP gateway. If your network is not part of an intranet, or if you do not want the device to be accessible outside your local network, you can enter a value of **0.0.0.0** in this field.

Remote Management Setup

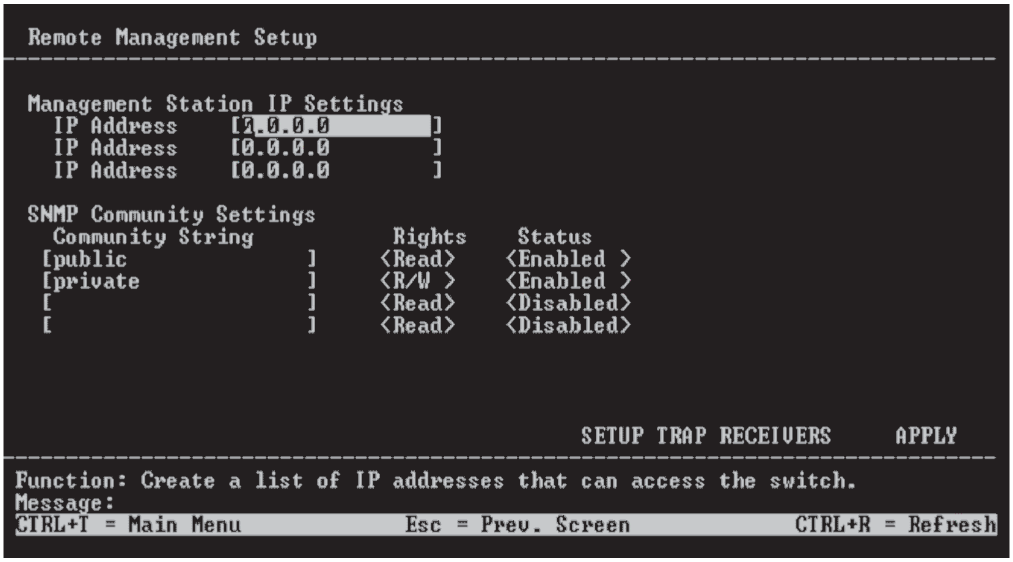
The switch sends out SNMP traps to network management stations whenever certain exceptional events occur, such as when the switch is turned on or when a system reset occurs. The switch enables traps to be routed to up to four different network management hosts.

For a detailed list of the trap types that are used for this switch, see "Traps".

SNMP (version 1) implements a rudimentary form of security by requiring that each request include a *community name*. A community name is an arbitrary string of characters used as a “password” to control access to the switch. If the switch receives a request with a community name that it does not recognize, it will trigger an authentication trap.

The SNMP enables up to four different community names to be defined. The community name **public** is defined by default; you can change this name and add others. You will need to coordinate these names with the community name settings that you use in your network management system.

When you select **Remote Management Setup** on the main menu, the following window opens.



```
 Remote Management Setup
--------------------------------------------------------------------------------

 Management Station IP Settings
   IP Address    [0.0.0.0        ]
   IP Address    [0.0.0.0        ]
   IP Address    [0.0.0.0        ]

 SNMP Community Settings
   Community String           Rights    Status
  [public              ]     <Read>    <Enabled >
  [private             ]     <R/W >    <Enabled >
  [                    ]     <Read>    <Disabled>
  [                    ]     <Read>    <Disabled>



                                            SETUP TRAP RECEIVERS     APPLY
--------------------------------------------------------------------------------
Function: Create a list of IP addresses that can access the switch.
Message:
CTRL+T = Main Menu            Esc = Prev. Screen            CTRL+R = Refresh
```

You can set the following parameters:

IP Address

The IP address of the network management station to receive traps.

Community String

The community string that will be included on SNMP packets sent to and from the switch. Any station that is not a member of this community will not receive the packet.

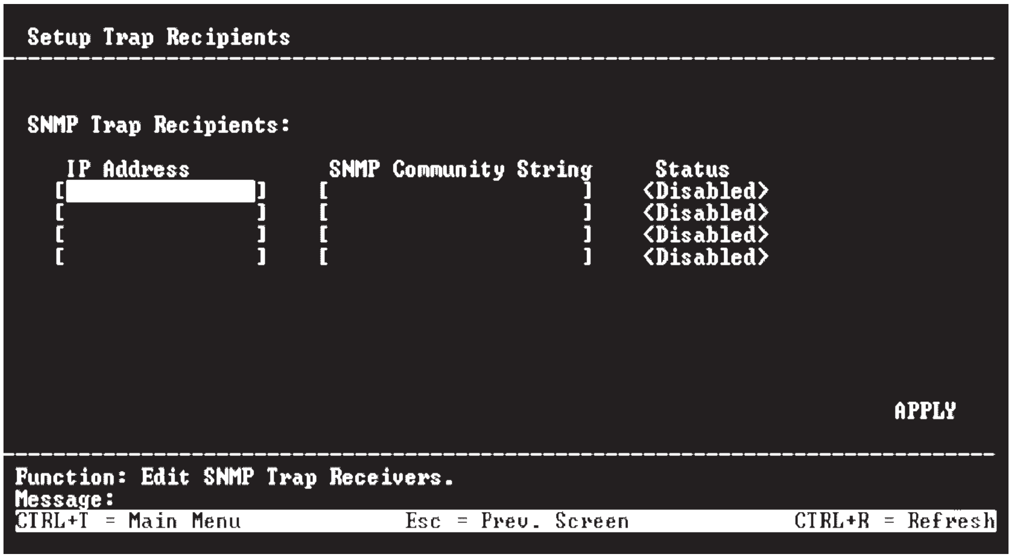
Rights

Enables each community to be separately set to either **Read** (read-only), meaning that the community member can only view switch settings or **R/W** (read/write), which enables the member to change settings in the switch.

Status

Determines whether this community name entry is **Enabled** or **Disabled**.

To set up trap recipients, highlight **SETUP TRAP RECEIVERS** at the bottom of the Remote Management Setup menu and press Enter.



```
 Setup Trap Recipients
--------------------------------------------------------------------------------

 SNMP Trap Recipients:

    IP Address          SNMP Community String     Status
   [               ]   [                     ]   <Disabled>
   [               ]   [                     ]   <Disabled>
   [               ]   [                     ]   <Disabled>
   [               ]   [                     ]   <Disabled>






                                                                      APPLY

--------------------------------------------------------------------------------
Function: Edit SNMP Trap Receivers.
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

You can set the following parameters:

IP Address

The IP address of the network management station to receive traps.

SNMP Community String

The community string that will be included on SNMP packets sent to and from the switch. Any station that is not a member of this community will not receive the packet.

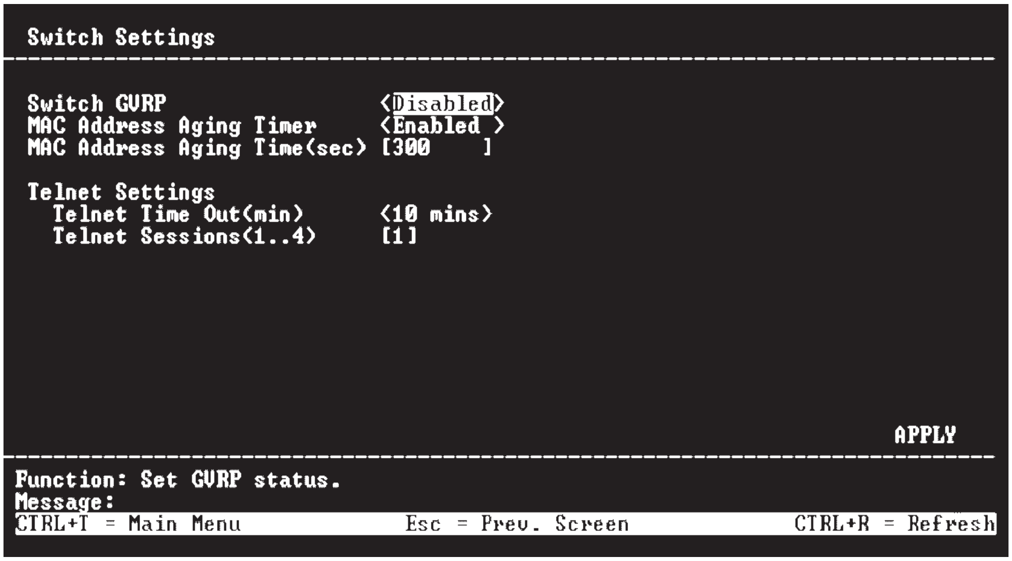
Status

Determines whether this community name entry is **Enabled** or **Disabled**.

Highlight **APPLY** and press Enter to make your changes effective.

Switch Settings

Highlight **Switch Settings** in the main menu and press Enter to set GVRP globally, enable the MAC address aging timer, and to set the upper threshold of the storm control.



```
 Switch Settings
------------------------------------------------------------------------------

 Switch GVRP                    <Disabled>
 MAC Address Aging Timer        <Enabled >
 MAC Address Aging Time(sec)    [300     ]

 Telnet Settings
   Telnet Time Out(min)         <10 mins>
   Telnet Sessions(1..4)        [1]









                                                                         APPLY
------------------------------------------------------------------------------
Function: Set GVRP status.
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

The user-changeable parameters in the switch are as follows:

Switch GVRP <Disabled>

Group VLAN Registration Protocol is a protocol that enables members to dynamically join VLANs. This option is used to enable or disable GVRP on the switch module.

MAC Address Aging Timer <Enabled>

This field specifies whether the aging timer is on or off.

MAC Address Aging Time(sec) [300]

The aging timer of MAC address entries can be set from 10 to 1000000 seconds.

Telnet Settings:

The user-changeable parameters in the switch are as follows:

Telnet Time Out (min) <10 mins>

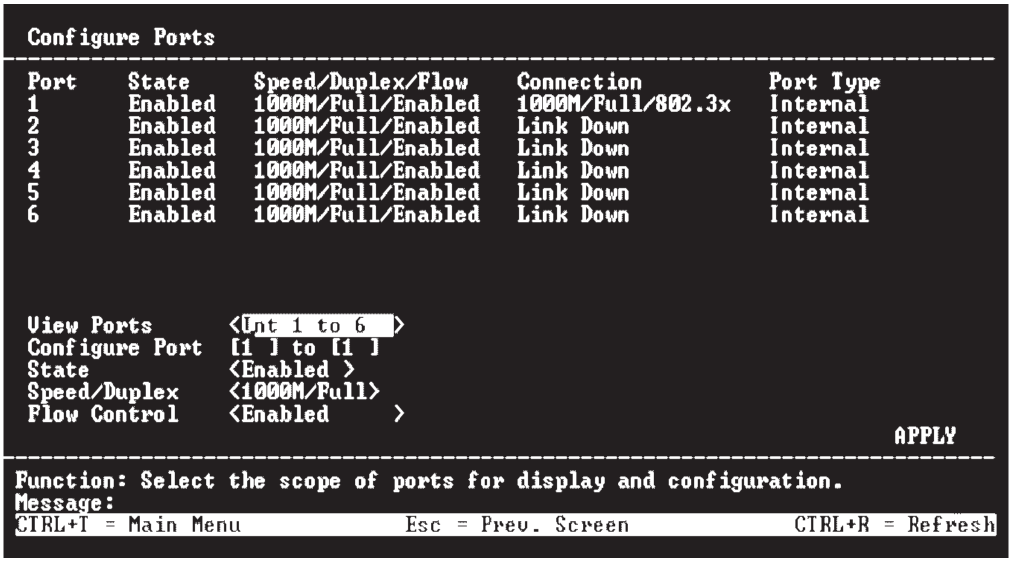
This sets the time that the Telnet interface can be idle before the switch automatically logs out the user. The options are **2 mins**, **5 mins**, **10 mins**, **15 mins**, and **Never**.

Telnet Sessions (1..4) [1]

This sets the maximum number of available Telnet sessions.

Configure Ports

Highlight **Configure Ports** in the main menu and press Enter. The following window opens.



```
 Configure Ports
--------------------------------------------------------------------------------
 Port    State     Speed/Duplex/Flow    Connection           Port Type
 1       Enabled   1000M/Full/Enabled   1000M/Full/802.3x    Internal
 2       Enabled   1000M/Full/Enabled   Link Down            Internal
 3       Enabled   1000M/Full/Enabled   Link Down            Internal
 4       Enabled   1000M/Full/Enabled   Link Down            Internal
 5       Enabled   1000M/Full/Enabled   Link Down            Internal
 6       Enabled   1000M/Full/Enabled   Link Down            Internal



 View Ports       <Int 1 to 6    >
 Configure Port   [1  ] to [1  ]
 State            <Enabled >
 Speed/Duplex     <1000M/Full>
 Flow Control     <Enabled       >
                                                                        APPLY
--------------------------------------------------------------------------------
Function: Select the scope of ports for display and configuration.
Message:
CTRL+T = Main Menu            Esc = Prev. Screen            CTRL+R = Refresh
```

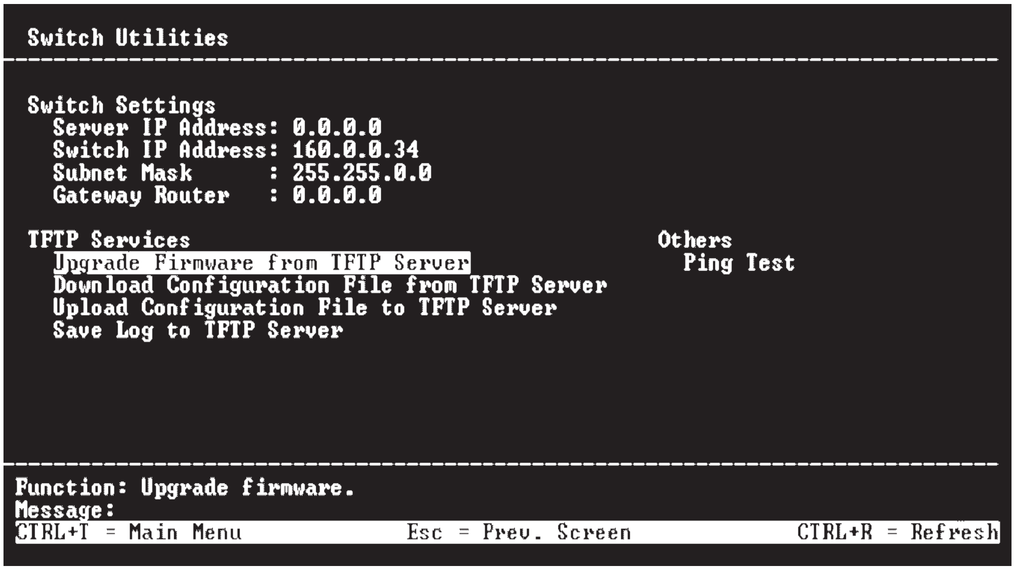
Toggle the **View Ports** field, using the Spacebar, to view the configuration of a range of internal or external ports. To configure a specific port, toggle the **Configure Port from [ ] to [ ]** field until the applicable port number or port range appears. Toggle the **State** field to either enable or disable a port.

Toggle the **Speed/Duplex** field to select the speed and duplex/half-duplex state of the four external ports **Ext1** to **Ext4**. **Auto** means auto-negotiation between 10, 100, and 1000 Mbps devices, in full-duplex or half-duplex mode. The **Auto** setting enables these ports to automatically determine the fastest settings that the device to which the port is connected can handle and then to use those settings. The other options are **100M/Full**, **100M/Half**, **10M/Full**, and **10M/Half**. There is no automatic adjustment of port settings with any option other than **Auto**. **Flow Control** can be enabled or disabled in conjunction with all of the **Speed/Duplex** settings except **10M/Half** and **100M/Half**. In these two cases, back pressure is automatically selected.

The 14 internal ports in the switch module support only **1000M/Full**, and each port can have **Flow Control** enabled or disabled.

Utilities

To access the Switch Utilities menu, highlight **Utilities** on the main menu and press Enter.



```
 Switch Utilities
------------------------------------------------------------------------------

 Switch Settings
   Server IP Address: 0.0.0.0
   Switch IP Address: 160.0.0.34
   Subnet Mask      : 255.255.0.0
   Gateway Router   : 0.0.0.0

 TFTP Services                                          Others
   Upgrade Firmware from TFTP Server                      Ping Test
   Download Configuration File from TFTP Server
   Upload Configuration File to TFTP Server
   Save Log to TFTP Server

------------------------------------------------------------------------------
Function: Upgrade firmware.
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

Notes:

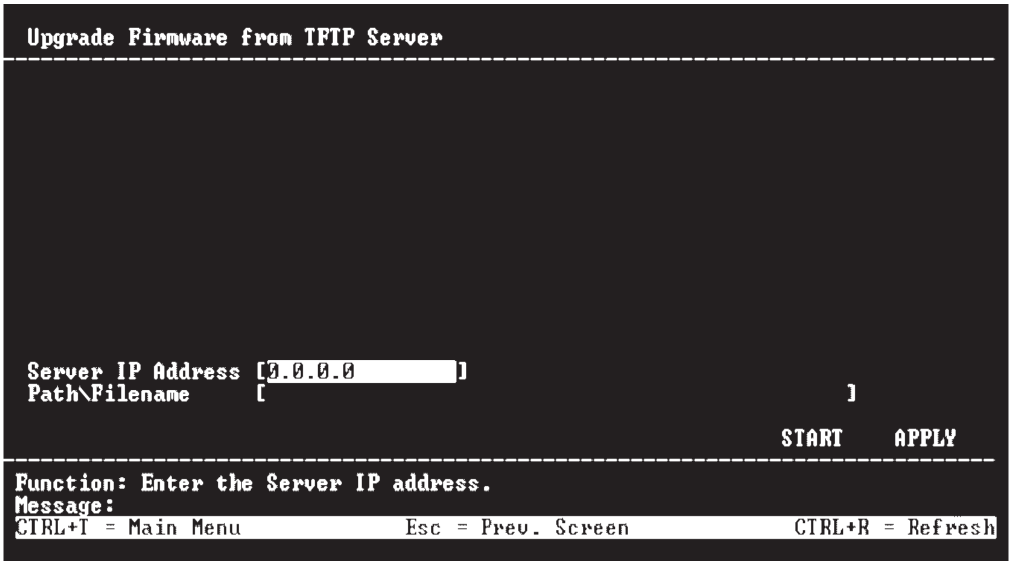
Trivial file transfer protocol (TFTP) services enable the switch firmware code to be upgraded by transferring a new firmware code file from a TFTP server to the switch. A configuration file can also be loaded into the switch from a TFTP server, switch settings can be saved to the TFTP server, and a history log can be uploaded from the switch to the TFTP server.

The TFTP server must be on the same IP subnet as the switch.

The TFTP server must be running TFTP server software to perform the file transfer. TFTP server software is a part of many network management software packages. Shareware packages also are available through the Internet.

Upgrade Firmware from TFTP Server:

To update the switch firmware code, highlight **Upgrade Firmware from TFTP Server** and press Enter.



```
 Upgrade Firmware from TFTP Server
------------------------------------------------------------------------------

 Server IP Address [0.0.0.0         ]
 Path\Filename     [                              ]

                                                          START    APPLY
------------------------------------------------------------------------------
Function: Enter the Server IP address.
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

Enter the IP address of the TFTP server in the **Server IP Address** field.

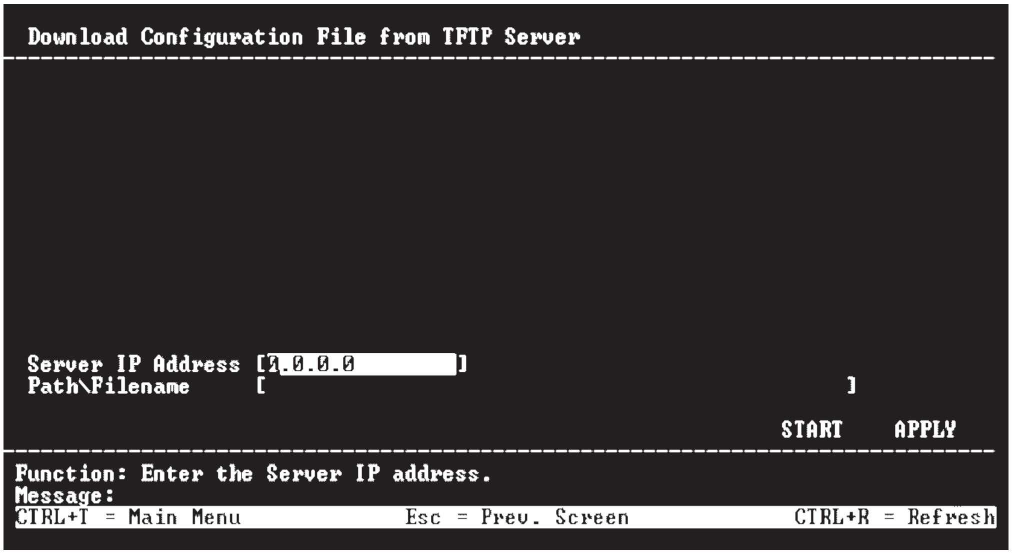
Enter the path and the file name for the firmware code file on the TFTP server.

Highlight **APPLY** and press Enter to record the IP address of the TFTP server. Select **Save Changes** in the main menu to enter the address into NVRAM.

Highlight **START** and press Enter to initiate the file transfer.

Download Configuration File from TFTP Server:

To download a switch configuration file from a TFTP server, highlight **Download Configuration File from TFTP Server** on the Switch Utilities menu and press Enter.



```
 Download Configuration File from TFTP Server
--------------------------------------------------------------------------------










 Server IP Address [0.0.0.0        ]
 Path\Filename     [                                              ]

                                                              START    APPLY
--------------------------------------------------------------------------------
Function: Enter the Server IP address.
Message:
CTRL+T = Main Menu               Esc = Prev. Screen               CTRL+R = Refresh
```

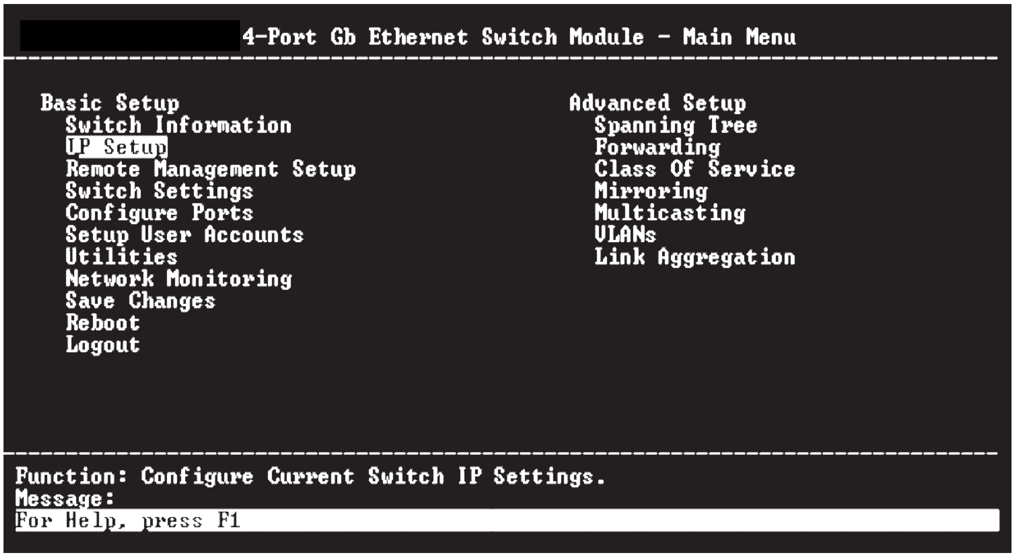
Enter the IP address of the TFTP server and specify the path and file name of the switch configuration file on the TFTP server.

Highlight **APPLY** and press Enter to record the IP address of the TFTP server. Select **Save Changes** in the main menu to enter the address into NVRAM.

Highlight **START** and press Enter to initiate the file transfer.

Upload Configuration File to TFTP Server:

To upload a configuration file to the TFTP server, highlight **Upload Configuration File to TFTP Server** on the Switch Utilities menu and press Enter.

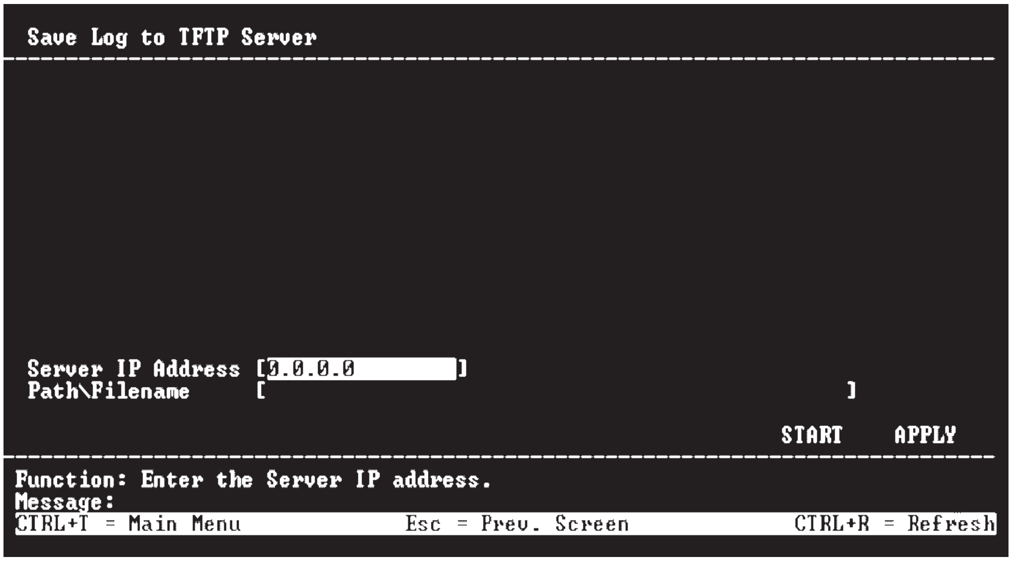


```
[redacted] 4-Port Gb Ethernet Switch Module - Main Menu
-------------------------------------------------------------------------------

  Basic Setup                                Advanced Setup
    Switch Information                         Spanning Tree
    IP Setup                                   Forwarding
    Remote Management Setup                    Class Of Service
    Switch Settings                            Mirroring
    Configure Ports                            Multicasting
    Setup User Accounts                        VLANs
    Utilities                                  Link Aggregation
    Network Monitoring
    Save Changes
    Reboot
    Logout

-------------------------------------------------------------------------------
Function: Configure Current Switch IP Settings.
Message:
For Help, press F1
```

Enter the IP address of the TFTP server and the path and specify the path and file name of the switch configuration file on the TFTP server and press **APPLY**. Highlight **START** and press Enter to initiate the file transfer.

Save Log to TFTP Server:

To save a history log on a TFTP server, highlight **Save Log File to TFTP Server** on the Switch Utilities menu and press Enter.

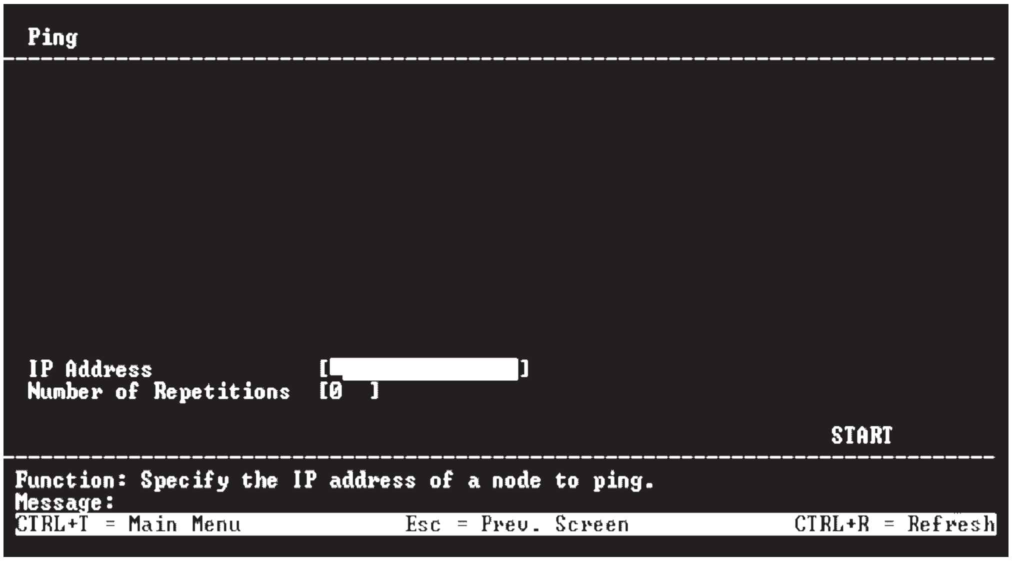


```
 Save Log to TFTP Server
-------------------------------------------------------------------------------









 Server IP Address [0.0.0.0        ]
 Path\Filename     [                                               ]

                                                          START    APPLY
-------------------------------------------------------------------------------
Function: Enter the Server IP address.
Message:
CTRL+T = Main Menu           Esc = Prev. Screen              CTRL+R = Refresh
```

Enter the IP address of the TFTP server and the path and file name for the history log on the TFTP server. Highlight **APPLY** and press Enter to make the changes current. Highlight **START** and press Enter to initiate the file transfer.

Ping Test:

To test the connection with another network device, highlight **Ping Test** on the Switch Utilities menu and press Enter.



```
Ping
--------------------------------------------------------------------------------

IP Address              [                ]
Number of Repetitions   [0  ]

                                                                 START
--------------------------------------------------------------------------------
Function: Specify the IP address of a node to ping.
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

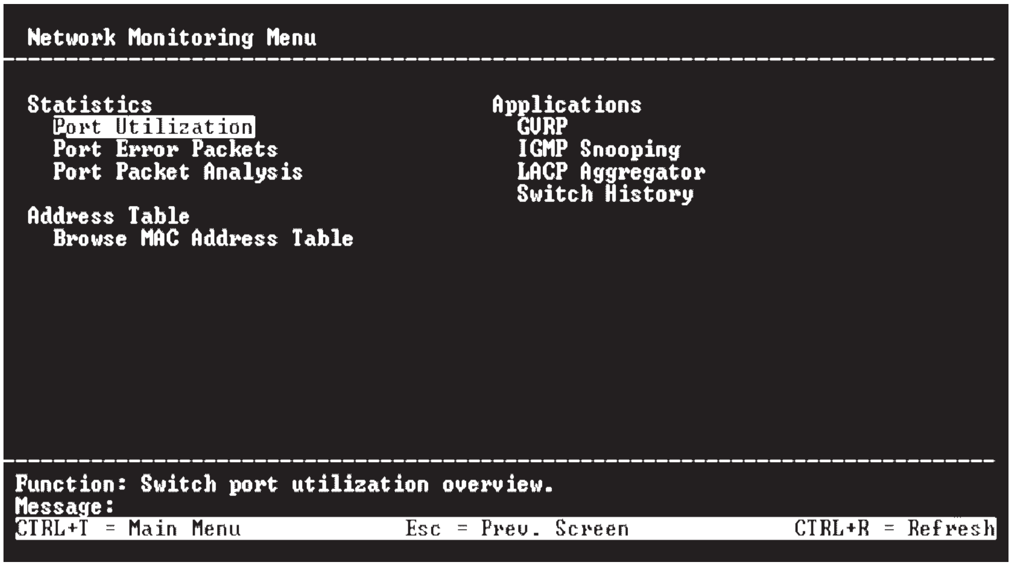
Enter the IP address of the network device to be pinged and the number of test packets to be sent (three is usually enough). Highlight **START** and press Enter to initiate the Ping test.

Note: The Ethernet switch module will issue Ping Requests through the internal Ethernet link to the management module and optionally, through the external Ethernet ports. When Ping Requests are issued on both of these paths, it is likely that one or more Pings will not reach the intended destination through one of these paths. Through the management module path, the Ethernet switch module can only Ping IP addresses that are on the same IP subnet as the IP addresses of the Ethernet switch module and management module.

Network Monitoring

The switch module provides extensive network monitoring capabilities.

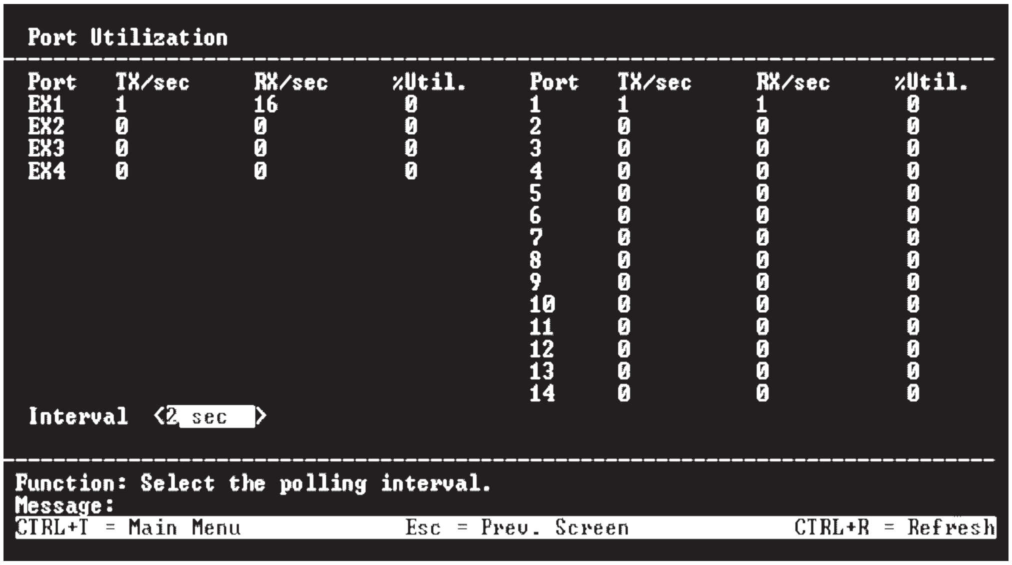
To display the network data compiled by the switch, highlight **Network Monitoring** on the main menu and press Enter.



```
Network Monitoring Menu
--------------------------------------------------------------------------------

Statistics                              Applications
  Port Utilization                        GVRP
  Port Error Packets                      IGMP Snooping
  Port Packet Analysis                    LACP Aggregator
                                          Switch History
Address Table
  Browse MAC Address Table

--------------------------------------------------------------------------------
Function: Switch port utilization overview.
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

Port Utilization:

To view the port utilization of all the ports on the switch, highlight **Port Utilization** on the **Network Monitoring** menu and press Enter.

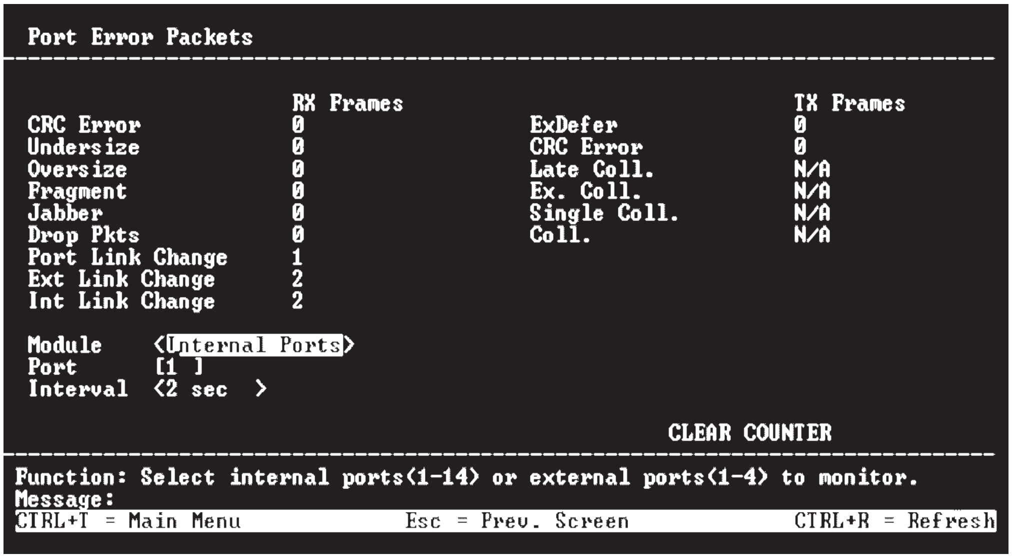


```
Port Utilization
--------------------------------------------------------------------------------
Port   TX/sec     RX/sec     %Util.     Port   TX/sec     RX/sec     %Util.
EX1    1          16         0          1      1          1          0
EX2    0          0          0          2      0          0          0
EX3    0          0          0          3      0          0          0
EX4    0          0          0          4      0          0          0
                                        5      0          0          0
                                        6      0          0          0
                                        7      0          0          0
                                        8      0          0          0
                                        9      0          0          0
                                        10     0          0          0
                                        11     0          0          0
                                        12     0          0          0
                                        13     0          0          0
                                        14     0          0          0
Interval  <2 sec  >
--------------------------------------------------------------------------------
Function: Select the polling interval.
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

The **Port Utilization** window shows the number of packets transmitted and received per second and calculates the percentage of the total available bandwidth being used on the port (displayed under **%Util**.). Highlight **CLEAR COUNTER** and press Enter to reset the counters.

Port Error Packets:

To view the error statistics for a port, highlight **Port Error Packets** on the **Network Monitoring** menu and press Enter.

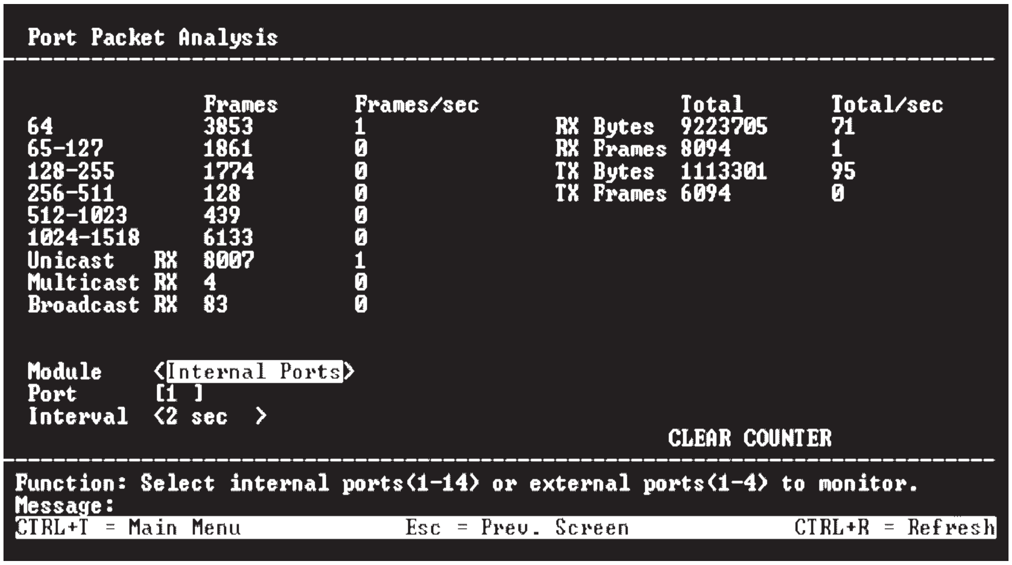


```
Port Error Packets
--------------------------------------------------------------------------------

                    RX Frames                               TX Frames
CRC Error           0                  ExDefer              0
Undersize           0                  CRC Error            0
Oversize            0                  Late Coll.           N/A
Fragment            0                  Ex. Coll.            N/A
Jabber              0                  Single Coll.         N/A
Drop Pkts           0                  Coll.                N/A
Port Link Change    1
Ext Link Change     2
Int Link Change     2

Module    <Internal Ports>
Port      [1 ]
Interval  <2 sec  >

                                                    CLEAR COUNTER
--------------------------------------------------------------------------------
Function: Select internal ports(1-14) or external ports(1-4) to monitor.
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

Enter the module and port number of the port to be viewed. The **Interval** field can be toggled among **2 seconds**, **1 minute**, and **suspend**. This sets the interval at which the error statistics are updated. Highlight **CLEAR COUNTER** and press Enter to reset the counters.

Port Packet Analysis:

To view an analysis of the size of packets received or transmitted by a port, highlight **Port Packet Analysis** on the **Network Monitoring** menu and press Enter.

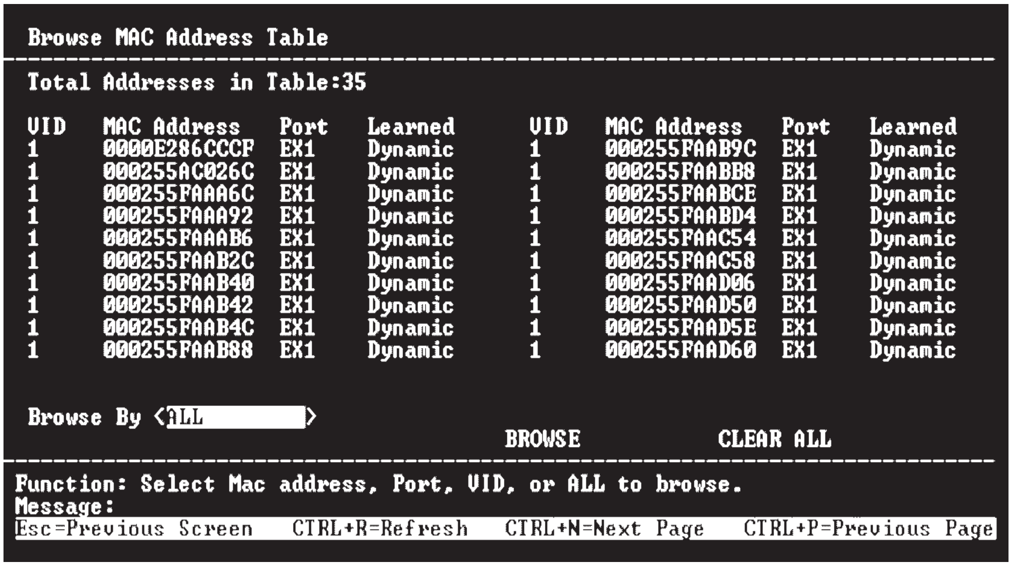


```
 Port Packet Analysis
------------------------------------------------------------------------------

              Frames      Frames/sec                Total       Total/sec
 64           3853        1                RX Bytes  9223705     71
 65-127       1861        0                RX Frames 8094        1
 128-255      1774        0                TX Bytes  1113301     95
 256-511      128         0                TX Frames 6094        0
 512-1023     439         0
 1024-1518    6133        0
 Unicast   RX 8007        1
 Multicast RX 4           0
 Broadcast RX 83          0


 Module    <Internal Ports>
 Port      [1 ]
 Interval  <2 sec  >
                                                     CLEAR COUNTER
------------------------------------------------------------------------------
Function: Select internal ports(1-14) or external ports(1-4) to monitor.
Message:
CTRL+T = Main Menu            Esc = Prev. Screen            CTRL+R = Refresh
```

In addition to the size of packets received or transmitted by the selected port, statistics on the number of unicast, multicast, and broadcast packets are displayed. Highlight **CLEAR COUNTER** and press Enter to reset the counters.

Browse MAC Address Table:

To set the MAC address aging time and view the MAC address forwarding table, highlight **Browse MAC Address Table** on the **Network Monitoring** menu and press Enter:



```
 Browse MAC Address Table
---------------------------------------------------------------------------
 Total Addresses in Table:35

 VID   MAC Address    Port   Learned      VID   MAC Address    Port   Learned
 1     0000E286CCCF   EX1    Dynamic      1     000255FAAB9C   EX1    Dynamic
 1     000255AC026C   EX1    Dynamic      1     000255FAABB8   EX1    Dynamic
 1     000255FAAA6C   EX1    Dynamic      1     000255FAABCE   EX1    Dynamic
 1     000255FAAA92   EX1    Dynamic      1     000255FAABD4   EX1    Dynamic
 1     000255FAAAB6   EX1    Dynamic      1     000255FAAC54   EX1    Dynamic
 1     000255FAAB2C   EX1    Dynamic      1     000255FAAC58   EX1    Dynamic
 1     000255FAAB40   EX1    Dynamic      1     000255FAAD06   EX1    Dynamic
 1     000255FAAB42   EX1    Dynamic      1     000255FAAD50   EX1    Dynamic
 1     000255FAAB4C   EX1    Dynamic      1     000255FAAD5E   EX1    Dynamic
 1     000255FAAB88   EX1    Dynamic      1     000255FAAD60   EX1    Dynamic


 Browse By <ALL          >
                                        BROWSE          CLEAR ALL
---------------------------------------------------------------------------
Function: Select Mac address, Port, VID, or ALL to browse.
Message:
Esc=Previous Screen   CTRL+R=Refresh   CTRL+N=Next Page   CTRL+P=Previous Page
```

The **Browse By** field can be toggled between **ALL**, **MAC Address**, **Port**, and **VLAN**. This sets a filter to determine which MAC addresses from the forwarding table are displayed. **ALL** specifies no filter.

Note:A very long aging time can result with the out-of-date dynamic entries that might cause incorrect packet filtering or forwarding decisions. A very short aging time might cause entries to be aged out too soon, resulting in a high percentage of received packets whose source addresses cannot be found in the address table, In this case, the switch will broadcast the packet to all ports, thus negating many of the benefits of having a switch.

Complete the following steps to search for a particular MAC address:

Toggle the **Browse By** field to **MAC Address**. A **MAC Address** field will appear. Enter the MAC address in the field and press Enter. Highlight **BROWSE** and press Enter to initiate the browsing action. Highlight **CLEAR ALL** and press Enter to reset the table counters.

Complete the following steps to search for a particular port:

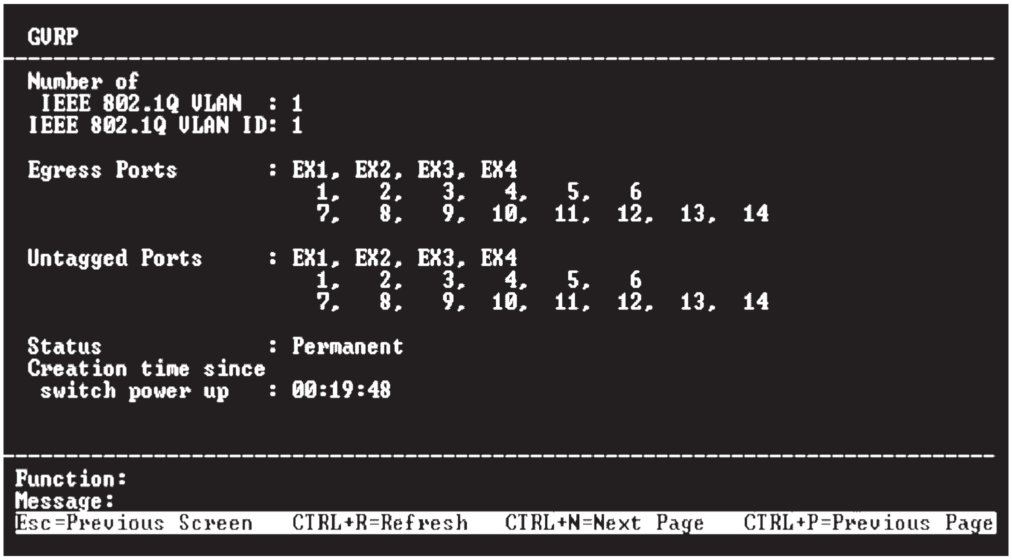
Toggle the **Browse By** field to **Port**. The **Module** and **Port** fields will appear. Enter the desired information in the respective fields and press Enter. Highlight **BROWSE** and press Enter to reset the table counters.

Complete the following steps to search for a particular VLAN:

Toggle the **Browse By** field to **VLAN**. A **VLAN** field will appear. Enter the VID in the field and press Enter. Highlight **BROWSE** and press Enter to initiate the browsing action.

GVRP:

To view the GVRP table, highlight **GVRP** on the **Network Monitoring** menu and press Enter.



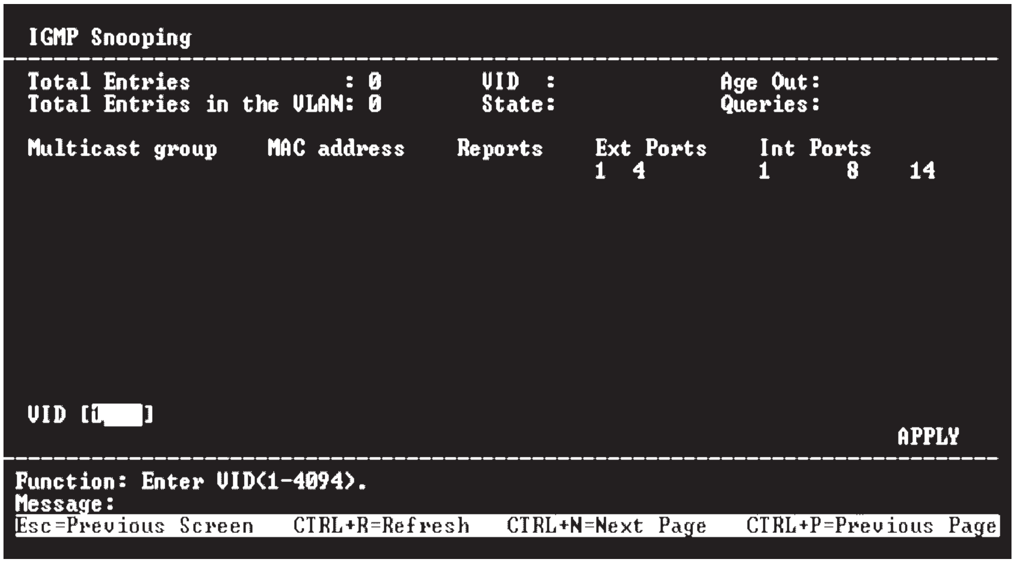
```
 GVRP
--------------------------------------------------------------------------------
 Number of
  IEEE 802.1Q VLAN  : 1
 IEEE 802.1Q VLAN ID: 1

 Egress Ports       : EX1, EX2, EX3, EX4
                        1,   2,   3,   4,   5,   6
                        7,   8,   9,  10,  11,  12,  13,  14

 Untagged Ports     : EX1, EX2, EX3, EX4
                        1,   2,   3,   4,   5,   6
                        7,   8,   9,  10,  11,  12,  13,  14

 Status             : Permanent
 Creation time since
  switch power up   : 00:19:48

--------------------------------------------------------------------------------
Function:
Message:
Esc=Previous Screen   CTRL+R=Refresh   CTRL+N=Next Page   CTRL+P=Previous Page
```

This read-only window displays Group VLAN Registration Protocol (GVRP) information.

IGMP Snooping:

This enables the switch IGMP Snooping table to be viewed. IGMP Snooping enables the switch to read the multicast group IP address and the corresponding MAC address from IGMP packets that pass through the switch. The ports where the IGMP packets were snooped are displayed, indicated by an *M*. The number of IGMP reports that were snooped is also displayed in the **Reports** field.

To view the IGMP Snooping table, highlight **IGMP Snooping** in the **Network Monitoring** menu and press Enter.



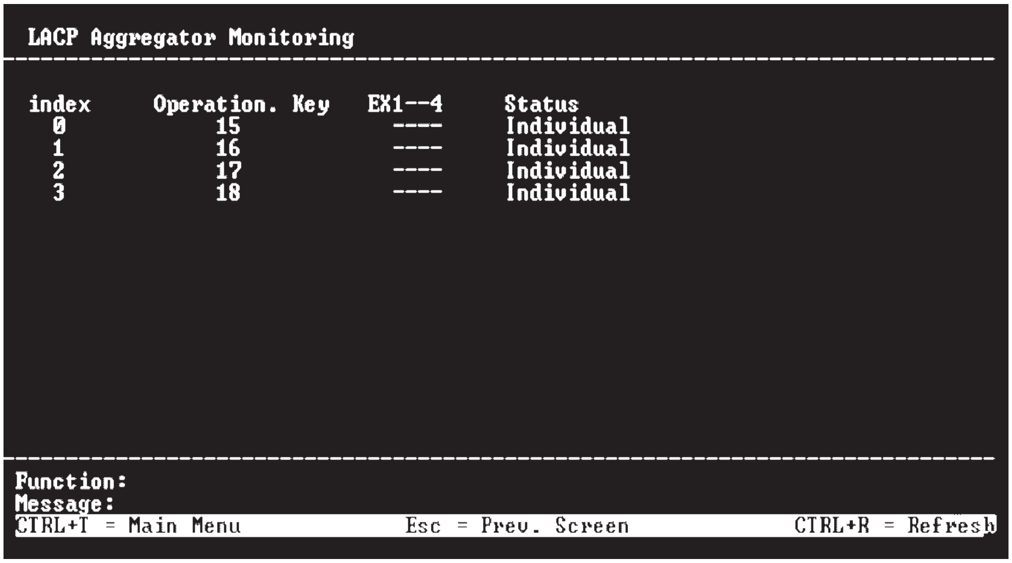
```
 IGMP Snooping
--------------------------------------------------------------------------------
 Total Entries            : 0       VID  :             Age Out:
 Total Entries in the VLAN: 0       State:             Queries:

 Multicast group    MAC address    Reports    Ext Ports    Int Ports
                                              1  4         1      8    14









 VID [1   ]
                                                                    APPLY
--------------------------------------------------------------------------------
Function: Enter VID(1-4094).
Message:
Esc=Previous Screen   CTRL+R=Refresh   CTRL+N=Next Page   CTRL+P=Previous Page
```

Enter a VLAN ID number in the first field and select GO to display the IGMP Snooping Status window that you selected.

LACP Aggregator:

The Link Aggregation Control Protocol (LACP) aggregator displays the status of dynamic LACP trunked ports from the group point of view.

To view the LACP Aggregator Monitoring window, highlight **LACP Aggregator** in the **Network Monitoring** menu and press Enter.



```
 LACP Aggregator Monitoring
-------------------------------------------------------------------------------

 index     Operation. Key   EX1--4     Status
   0            15            ----     Individual
   1            16            ----     Individual
   2            17            ----     Individual
   3            18            ----     Individual

-------------------------------------------------------------------------------
Function:
Message:
CTRL+T = Main Menu            Esc = Prev. Screen            CTRL+R = Refresh
```

The information on this read-only window is described as follows:

Index

The LACP Aggregator ID number.

Operation Key

Displays the operational key used by the aggregator to communicate with other aggregators.

Member Port

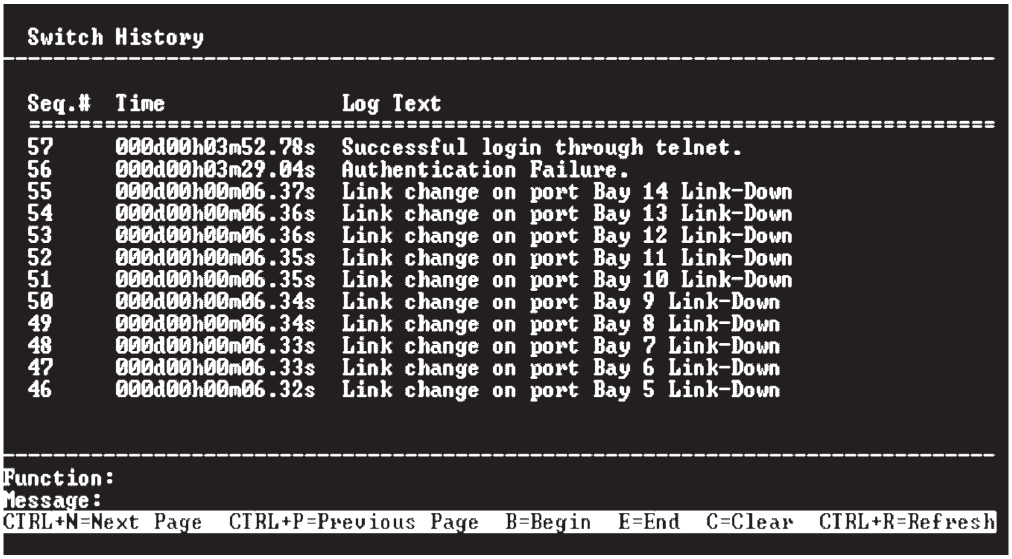
Displays the port member status in the aggregator group.

Status

Displays the status of each aggregator. When there is only one port member in the aggregator, the aggregator acts as a normal individual port (by default, each LACP-enabled port is assigned to its own aggregator group). Otherwise, it will start to aggregate when there is more than one port that wants to join the aggregator group.

Switch History:

To view the switch history log, highlight **Switch History** from the **Network Monitoring** menu and press Enter.

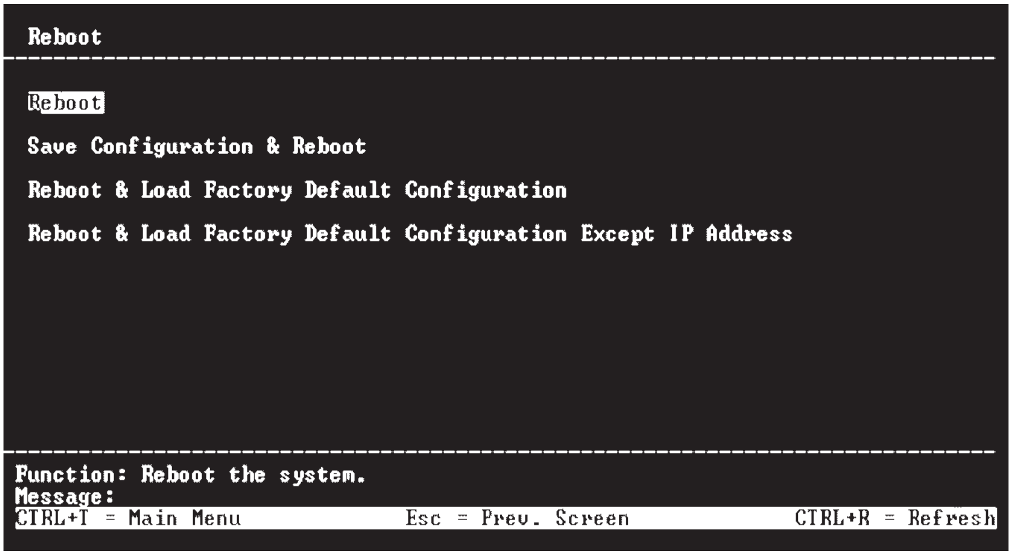


```
  Switch History
--------------------------------------------------------------------------------

  Seq.#  Time              Log Text
  ==============================================================================
  57     000d00h03m52.78s  Successful login through telnet.
  56     000d00h03m29.04s  Authentication Failure.
  55     000d00h00m06.37s  Link change on port Bay 14 Link-Down
  54     000d00h00m06.36s  Link change on port Bay 13 Link-Down
  53     000d00h00m06.36s  Link change on port Bay 12 Link-Down
  52     000d00h00m06.35s  Link change on port Bay 11 Link-Down
  51     000d00h00m06.35s  Link change on port Bay 10 Link-Down
  50     000d00h00m06.34s  Link change on port Bay 9 Link-Down
  49     000d00h00m06.34s  Link change on port Bay 8 Link-Down
  48     000d00h00m06.33s  Link change on port Bay 7 Link-Down
  47     000d00h00m06.33s  Link change on port Bay 6 Link-Down
  46     000d00h00m06.32s  Link change on port Bay 5 Link-Down

--------------------------------------------------------------------------------
Function:
Message:
CTRL+N=Next Page  CTRL+P=Previous Page  B=Begin  E=End  C=Clear  CTRL+R=Refresh
```

Restarting the switch module

The switch module has several reboot (restart) options.

To restart the switch, highlight **Reboot** in the main menu and press Enter.



```
  Reboot
--------------------------------------------------------------------------------

  Reboot

  Save Configuration & Reboot

  Reboot & Load Factory Default Configuration

  Reboot & Load Factory Default Configuration Except IP Address









--------------------------------------------------------------------------------
 Function: Reboot the system.
 Message:
 CTRL+T = Main Menu            Esc = Prev. Screen              CTRL+R = Refresh
```

The reboot options are as follows:

Reboot

Restarts the switch. Any configuration settings that are not saved through **Save Changes** in the main menu will be lost. The switch configuration will be restored to the last configuration that was saved in NVRAM.

Save Configuration & Reboot

Saves the configuration to NVRAM (identical to using **Save Changes**) and then restarts the switch.

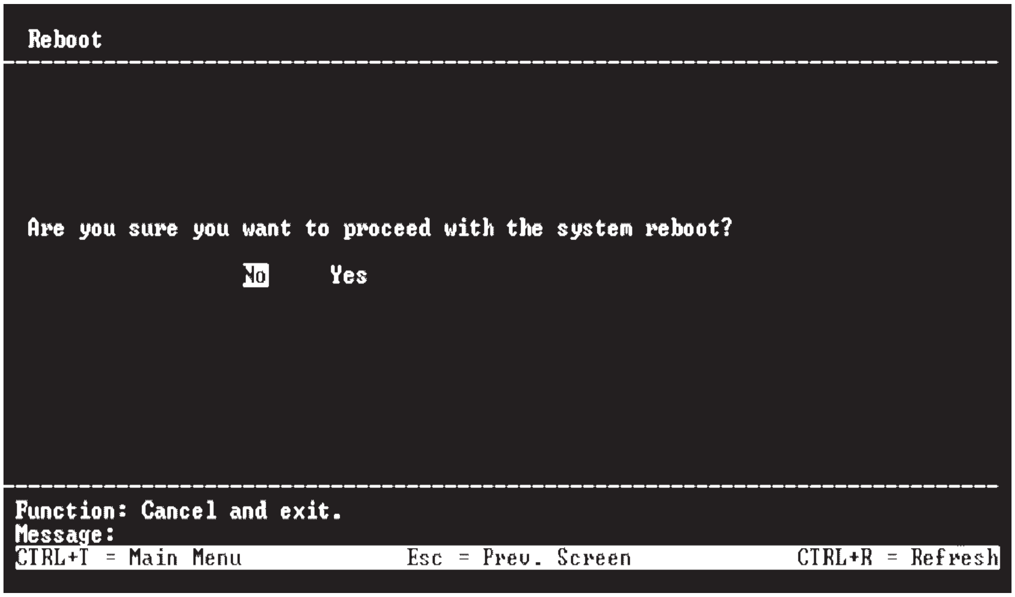
Reboot & Load Factory Default Configuration

Restarts the switch using the default factory configuration. All configuration data will be lost. This is identical to using **Factory Reset** and then **Reboot**.

Reboot & Load Factory Default Configuration Except IP Address

Restarts the switch using the default factory configuration, except the user configured IP address will be retained. All other configuration data will be lost.

A confirmation window will open.



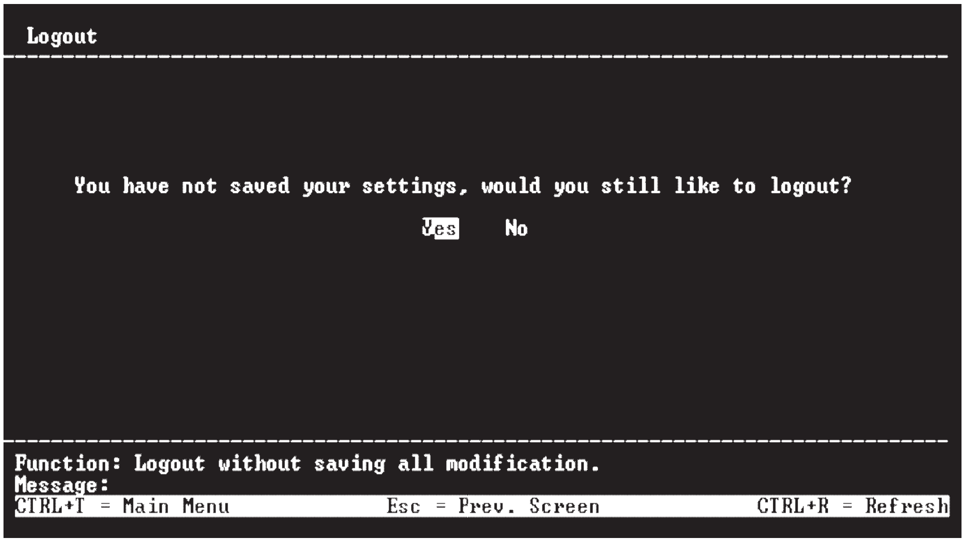
```
 Reboot
------------------------------------------------------------------------------



 Are you sure you want to proceed with the system reboot?

                  No     Yes






------------------------------------------------------------------------------
Function: Cancel and exit.
Message:
CTRL+T = Main Menu             Esc = Prev. Screen             CTRL+R = Refresh
```

To restart the switch, in the mode entered in the preceding window, highlight **Yes** and press Enter.

Logging out

When you are finished with the current switch-module session, select **Logout** from the main menu. You can select one of two methods for processing the changes that you made during the current switch-module session:

If you made changes and used the **APPLY** function during the current switch-module session, but did not save your changes on the main menu, the following window will open:



```
Logout
------------------------------------------------------------------------------

      You have not saved your settings, would you still like to logout?
                                  Yes    No

------------------------------------------------------------------------------
Function: Logout without saving all modification.
Message:
CTRL+T = Main Menu            Esc = Prev. Screen            CTRL+R = Refresh
```

If you do not want to save your changes, select **Yes** to log out without saving your changes. The current switch-module session will close and, the login window will open so that you can start a new switch-module session (see "First-time connection to the Ethernet switch module" for more information).

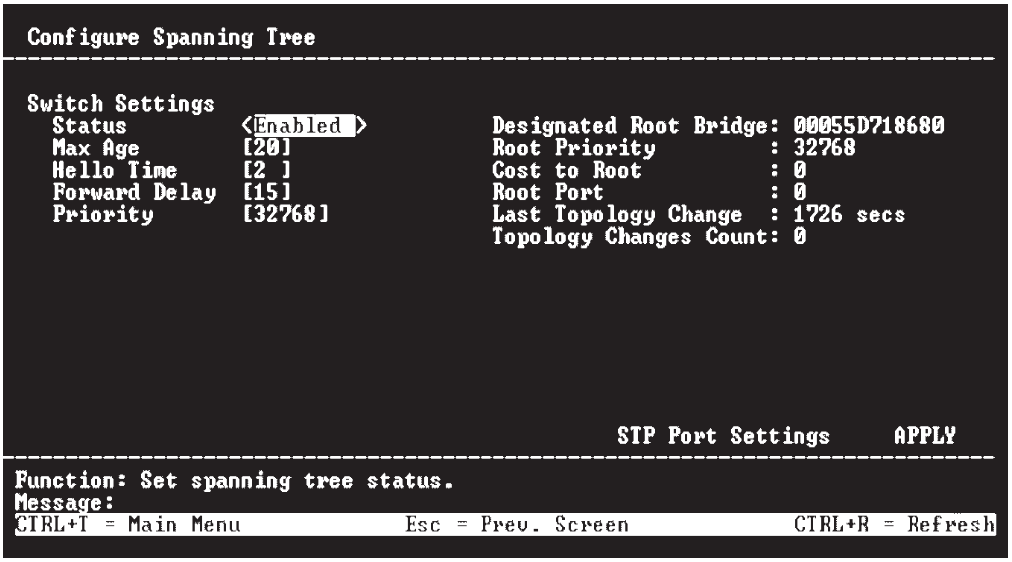
If you either saved your changes on the main menu or did not make any changes during the current switch-module session, the Logout window will not open when you select **Logout**. Instead, the current switch-module session will immediately close and, the Login window will open so that you can start a new switch-module session (see "First-time connection to the Ethernet switch module" for more information).

Advanced Setup

The main menu is divided into two sections, **Basic Setup** and **Advanced Setup**. The **Advanced Setup** menus are organized into seven main categories: **Spanning Tree**, **Forwarding**, **Class of Service**, **Mirroring**, **Multicasting**, **VLANs**, and **Link Aggregation**.

Spanning Tree

To globally configure the Spanning Tree Protocol (STP) on the switch, select **Spanning Tree** on the main menu and press Enter. The following window opens:



```
 Configure Spanning Tree
--------------------------------------------------------------------------------

 Switch Settings
   Status          <Enabled >          Designated Root Bridge: 00055D718680
   Max Age         [20]                Root Priority         : 32768
   Hello Time      [2 ]                Cost to Root          : 0
   Forward Delay   [15]                Root Port             : 0
   Priority        [32768]             Last Topology Change  : 1726 secs
                                       Topology Changes Count: 0




                                                STP Port Settings     APPLY
--------------------------------------------------------------------------------
Function: Set spanning tree status.
Message:
CTRL+T = Main Menu            Esc = Prev. Screen           CTRL+R = Refresh
```

The STP operates on two levels. On the switch level, the settings are globally implemented, and on the port level, the settings are implemented on a per user-defined group basis.

Note: The factory default settings should cover the majority of installations. Therefore, it is advisable to keep the default settings as set at the factory unless it is absolutely necessary to change them.

The user-changeable parameters in the switch are as follows:

Status: <Disabled>

Toggle to **Enabled** to implement the Spanning Tree Protocol on the switch.

Max Age: [20]

The maximum age can be set from 6 to 40 seconds. At the end of the Max Age, if a BPDU has still not been received from the root bridge, your switch will start sending its own BPDU to all other switches for permission to become the root bridge. If your switch has the lowest bridge identifier, it will become the root bridge.

Hello Time: [2]

The Hello Time can be set from 1 to 10 seconds. This is the interval between two transmissions of BPDU packets sent by the root bridge to tell all other switches that it is indeed the root bridge. If you set a Hello Time for your switch, and it is not the root bridge, the set Hello Time will be used if and when your switch becomes the root bridge.

Note: The Hello Time cannot be longer than the Max. Age. Otherwise, a configuration error will occur.

Forward Delay: [15]

The Forward Delay can be from 4 to 30 seconds. This is the time any port on the switch spends in the listening state while moving from the blocking state to the forwarding state.

Priority: [32768]

A priority for the switch can be set from 0 to 65535. Zero is equal to the highest priority. This number is used in the voting process between switches on the network to determine which switch will be the root switch. A low number indicates a high priority, and a high probability that this switch will be elected as the root switch.

Note: Observe the following formulas when setting the preceding parameters:

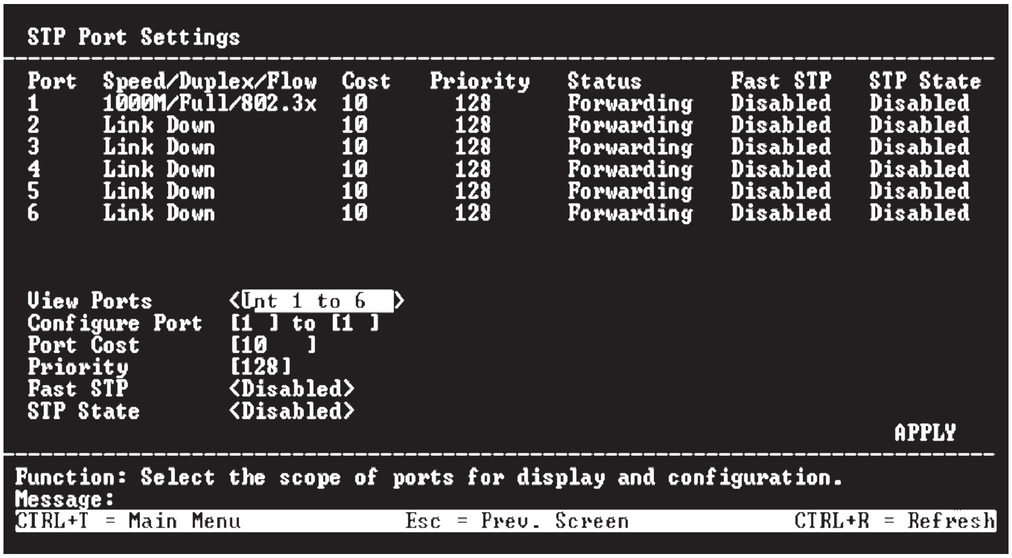
Max. Age ≤ 2 x (Forward Delay - 1 second)

Max. Age ≥ 2 x (Hello Time + 1 second)

STP Port Settings

In addition to setting Spanning Tree parameters for use on the switch level, the switch module enables the configuration of Spanning Tree Protocol on individual ports.

To define individual ports, highlight **STP Port Settings** on the Configure Spanning Tree menu in "Spanning Tree" and press Enter. The following window opens:



```
 STP Port Settings
-------------------------------------------------------------------------------
 Port   Speed/Duplex/Flow  Cost    Priority   Status        Fast STP   STP State
 1      1000M/Full/802.3x  10        128      Forwarding    Disabled   Disabled
 2      Link Down          10        128      Forwarding    Disabled   Disabled
 3      Link Down          10        128      Forwarding    Disabled   Disabled
 4      Link Down          10        128      Forwarding    Disabled   Disabled
 5      Link Down          10        128      Forwarding    Disabled   Disabled
 6      Link Down          10        128      Forwarding    Disabled   Disabled


 View Ports       <Unt 1 to 6  >
 Configure Port   [1  ] to [1  ]
 Port Cost        [10    ]
 Priority         [128]
 Fast STP         <Disabled>
 STP State        <Disabled>
                                                                          APPLY
-------------------------------------------------------------------------------
Function: Select the scope of ports for display and configuration.
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

Toggle the **View Ports** field to the range of ports to be configured. Enter the port number or port range in the **Configure Port from [ ] to [ ]** field. When the **STP State** is **Enabled**, you can set the spanning tree port cost and priority.

View Ports

Enter the range of ports to be configured and displayed.

Configure Port

Enter the specific ports to be configured, inputting the starting port in the first field and the ending port in the second field.

Port Cost [10]

The spanning tree port cost can be set between 1 and 65535. The lower the cost, the greater the probability that the port will be chosen as the designated port (chosen to forward packets).

Priority [128]

The spanning tree port priority can be set between 0 and 255. The lower the priority, the greater the probability that the port will be chosen as the root port.

Fast STP <Disabled>

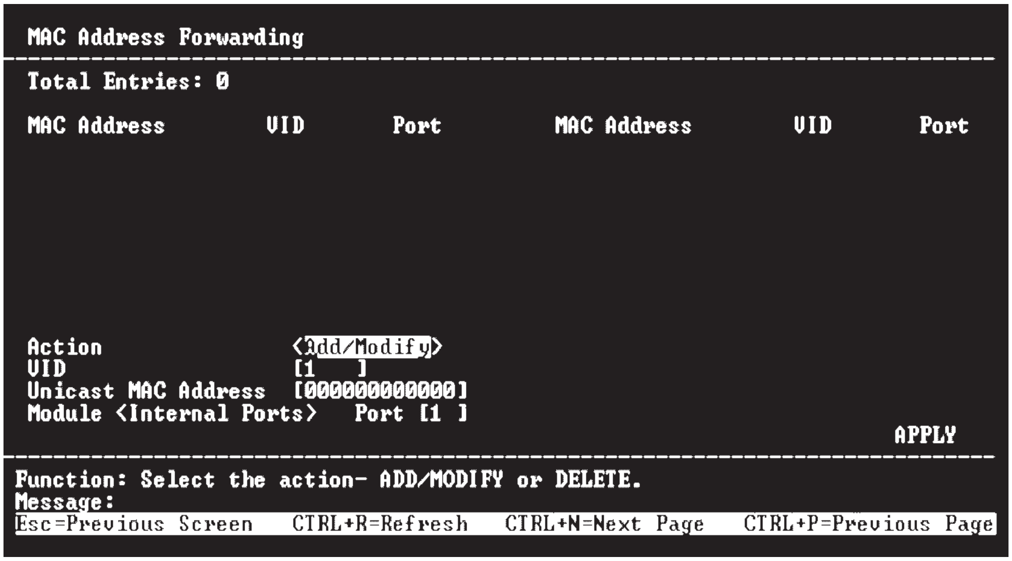
Toggle between **Enabled** and **Disabled**. When the STP is turned on, a change from link-down to link-up will trigger the STP. The STP will set the port to the listening state. After the forward delay, the STP will set the port to the learning state. After another forward delay, the STP will set the port to the forwarding state. If the forward delay is 15 seconds, the port will take 30 seconds to forward packets. However, when Fast STP is **Enabled** on a port, the port will only take 15 seconds from link-up to the time that it starts forwarding packets. This is because enabling the Fast STP option will skip the learning state, jumping directly to the forwarding state from the listening state.

STP State <Enabled>

The Spanning Tree Protocol state for a selected port can either be **Enabled** or **Disabled**.

Forwarding

Highlight **Forwarding** on the main menu to access the following MAC Address Forwarding window:



```
 MAC Address Forwarding
--------------------------------------------------------------------------------
 Total Entries: 0

 MAC Address        VID       Port         MAC Address        VID       Port









 Action              <Add/Modify>
 VID                 [1    ]
 Unicast MAC Address  [000000000000]
 Module <Internal Ports>   Port [1 ]
                                                                         APPLY
--------------------------------------------------------------------------------
Function: Select the action- ADD/MODIFY or DELETE.
Message:
Esc=Previous Screen   CTRL+R=Refresh   CTRL+N=Next Page   CTRL+P=Previous Page
```

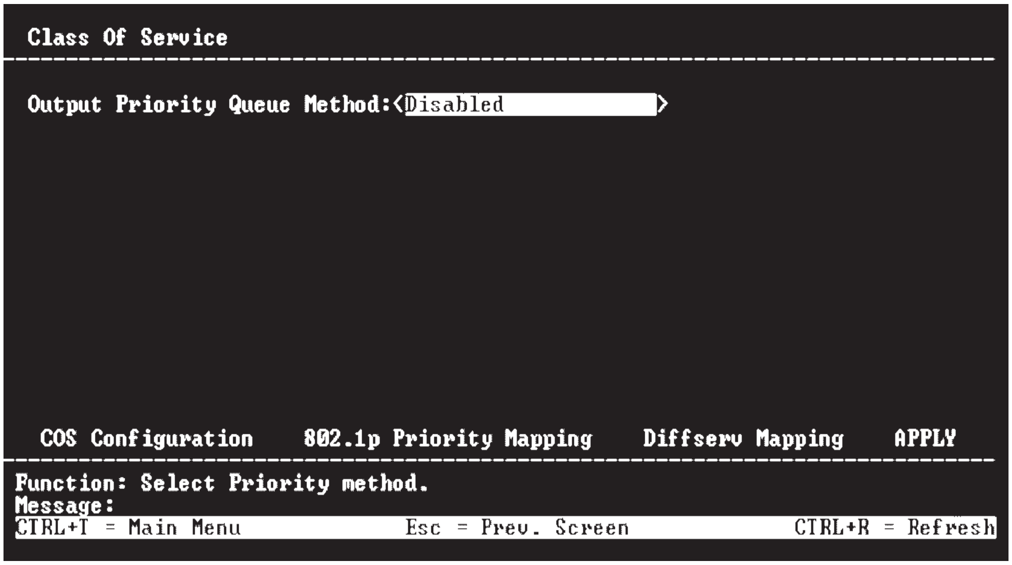
The **Action** field can be toggled between **Add/Modify** and **Delete** using the Spacebar. Enter the VLAN ID in the **VID** field, the MAC address to be entered in the forwarding table in the **Unicast MAC Address** field, and select either internal or external ports in the **Module** field. Enter the port number in the **Port** field.

Highlight **APPLY** and press Enter to make the changes current. Use **Save Changes** in the main menu to enter the changes into NVRAM.

Class of Service

The switch module enables you to customize class of service settings on the Class of Service menu.

Select **Class of Service** on the main menu and press Enter. The following window opens:



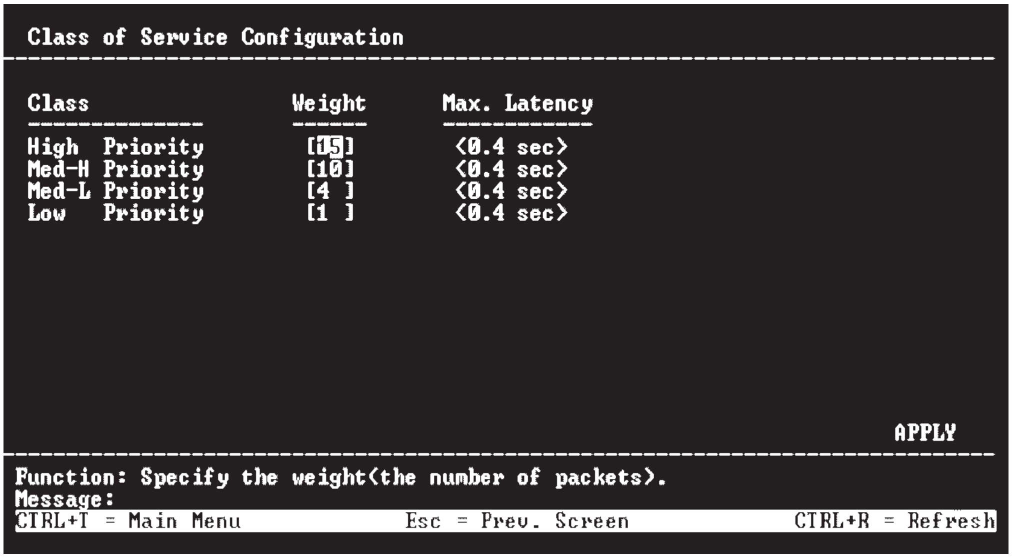
```
Class Of Service
------------------------------------------------------------------------------

Output Priority Queue Method:<Disabled              >

  COS Configuration    802.1p Priority Mapping    Diffserv Mapping    APPLY
------------------------------------------------------------------------------
Function: Select Priority method.
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

To enable priority queuing on the switch module, toggle the field on the preceding window from **Disabled** to **Weighted Round Robin** and press **APPLY**.

Class of Service Configuration:

Select **COS Configuration** on the Class of Service menu and press Enter to access the Class of Service Configuration window.

The Class of Service Configuration window contains the following information:



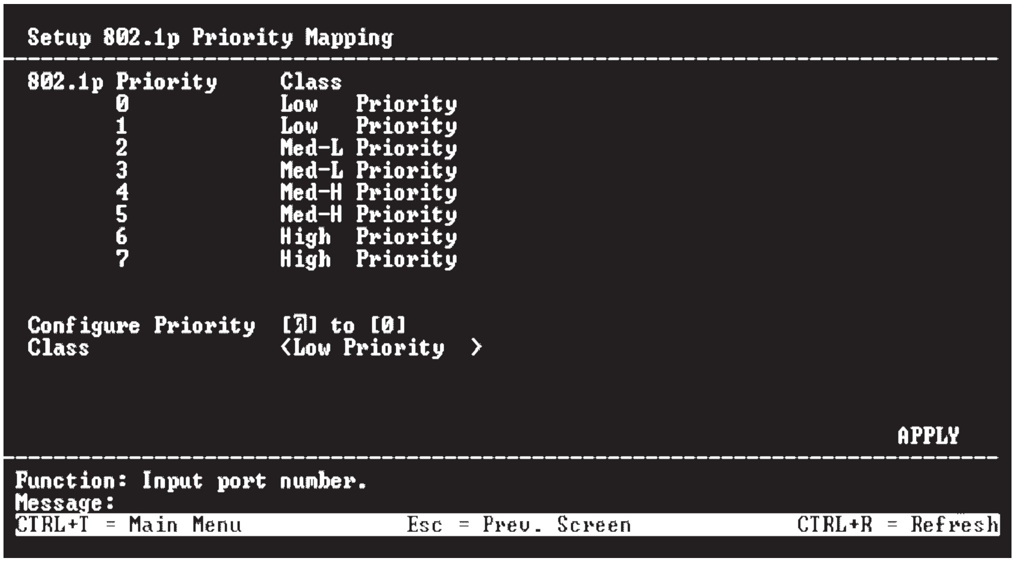
```
Class of Service Configuration
------------------------------------------------------------------------------

Class                Weight      Max. Latency
--------------       ------      ------------
High  Priority        [15]        <0.4 sec>
Med-H Priority        [10]        <0.4 sec>
Med-L Priority        [4 ]        <0.4 sec>
Low   Priority        [1 ]        <0.4 sec>

                                                                         APPLY
------------------------------------------------------------------------------
Function: Specify the weight(the number of packets).
Message:
CTRL+T = Main Menu              Esc = Prev. Screen              CTRL+R = Refresh
```

The switch module supports 802.1p priority queuing; four priority queues are supported per port. The switch module provides user-programmable mapping (four Priority Queue assignments: High, Med-High, Med-Low, Low) for the eight 802.1p priority classes (0 to 7). For the priority queue feature to take effect, users must first enable the Output Priority Queue Method on the Class of Service menu. Otherwise, only the round-robin method can be used to schedule the packets in four different priority queues.

When the Output Priority Queue Method is enabled, the weight and latency specified in the preceding Class of Service Configuration window will take effect. Note that the weight can only be a value between 1 and 16. A higher priority queue always has a larger weight than a lower priority queue.

802.1p Priority Mapping:

Select **802.1p Priority Setting** on the Class of Service menu and press Enter to access the following window:



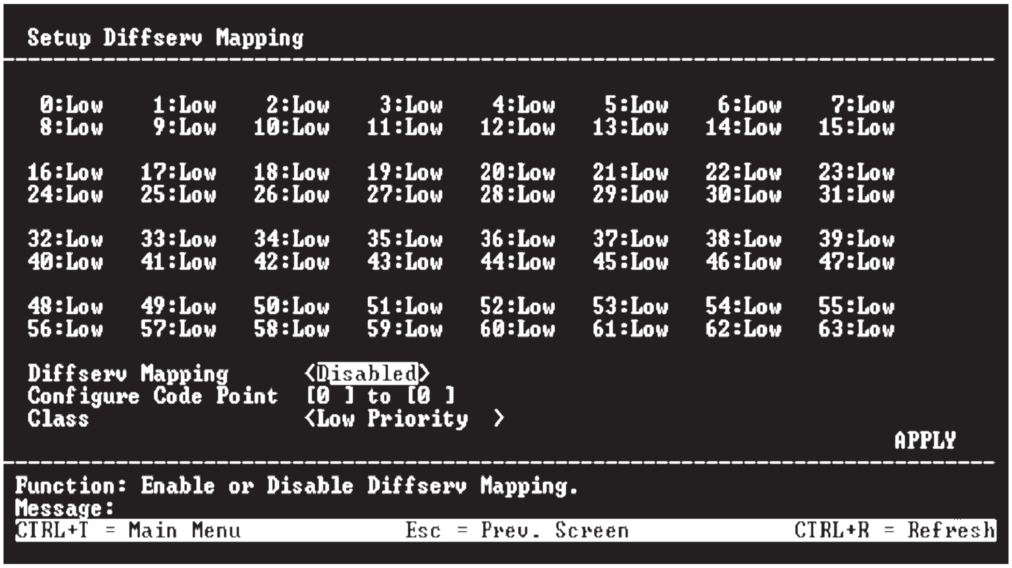
```
 Setup 802.1p Priority Mapping
--------------------------------------------------------------------------------
 802.1p Priority     Class
        0            Low   Priority
        1            Low   Priority
        2            Med-L Priority
        3            Med-L Priority
        4            Med-H Priority
        5            Med-H Priority
        6            High  Priority
        7            High  Priority


 Configure Priority  [7] to [0]
 Class               <Low Priority  >



                                                                    APPLY
--------------------------------------------------------------------------------
Function: Input port number.
Message:
CTRL+T = Main Menu             Esc = Prev. Screen             CTRL+R = Refresh
```

This window enables you to configure traffic class priority by specifying the class value, from **Low Priority** to **High Priority**, of the switch eight levels of priority. Press **APPLY** to make your changes effective.

Diffserv Mapping:

The switch module supports DiffServ Mapping (Differential Services RFC 2475) for Ipv4 frames when DiffServ Mapping is enabled on the Setup DiffServ Mapping window. If the frame is not an Ipv4 frame or DiffServ is not enabled, 802.1p is used. The size of the switch module DiffServ table is 64 by 4. This specifies the mapping of 64 DiffServ code points to the four priority queues.

Select **Diffserv Mapping** on the Class of Service menu and press Enter to access the following window:



```
 Setup Diffserv Mapping
--------------------------------------------------------------------------------

   0:Low    1:Low    2:Low    3:Low    4:Low    5:Low    6:Low    7:Low
   8:Low    9:Low   10:Low   11:Low   12:Low   13:Low   14:Low   15:Low

  16:Low   17:Low   18:Low   19:Low   20:Low   21:Low   22:Low   23:Low
  24:Low   25:Low   26:Low   27:Low   28:Low   29:Low   30:Low   31:Low

  32:Low   33:Low   34:Low   35:Low   36:Low   37:Low   38:Low   39:Low
  40:Low   41:Low   42:Low   43:Low   44:Low   45:Low   46:Low   47:Low

  48:Low   49:Low   50:Low   51:Low   52:Low   53:Low   54:Low   55:Low
  56:Low   57:Low   58:Low   59:Low   60:Low   61:Low   62:Low   63:Low

 Diffserv Mapping      <Disabled>
 Configure Code Point  [0 ] to [0 ]
 Class                 <Low Priority  >
                                                                    APPLY
--------------------------------------------------------------------------------
Function: Enable or Disable Diffserv Mapping.
Message:
CTRL+T = Main Menu             Esc = Prev. Screen             CTRL+R = Refresh
```

To set up DiffServ Mapping, toggle DiffServ Mapping to **Enabled**, enter a beginning and ending Code Point (0 to 63) in the second field, and select the desired Class in the next field (**Low Priority**, **Med-L Priority**, **Med-H Priority**, and **High Priority**). When you are finished, highlight **APPLY** and press Enter to make your change effective.

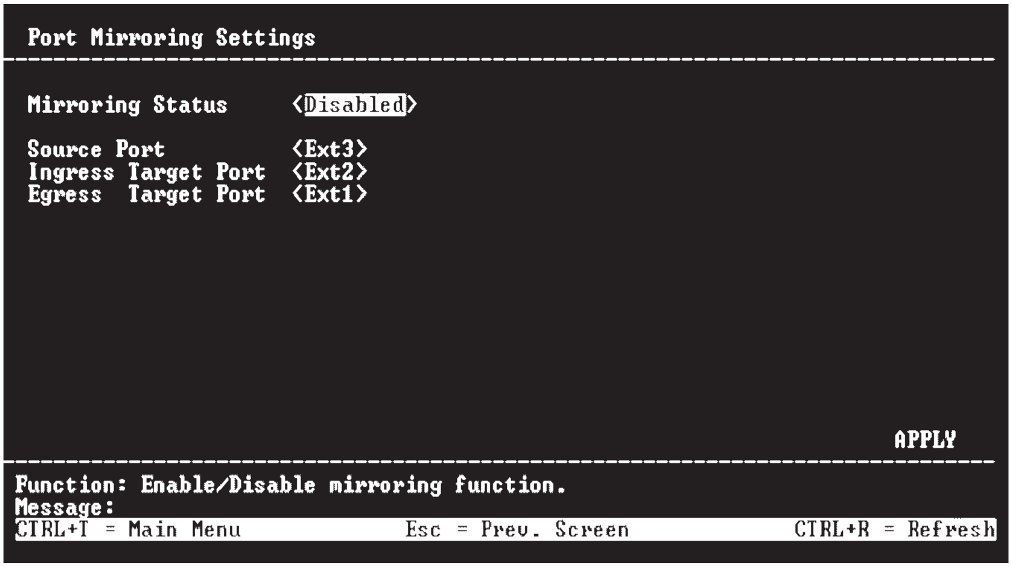
Mirroring

The switch module enables you to copy frames that were transmitted and received on a source port and to redirect the copies to another target port. The source port can be one of the four 10/100/1000 Mbps external ports, while the target port is where you will connect a monitoring/troubleshooting device, such as a sniffer or an RMON probe and, it must be one of the four 10/100/1000 Mbps external ports.

You can attach a monitoring device to the mirrored port, such as a sniffer or an RMON probe, to view details about the packets that pass through the first port. This is useful for network monitoring and troubleshooting purposes.

The default setting for port mirroring is **Disabled**.

Select **Mirroring** in the main menu to access the following window:



```
Port Mirroring Settings
--------------------------------------------------------------------------------

Mirroring Status     <Disabled>

Source Port          <Ext3>
Ingress Target Port  <Ext2>
Egress  Target Port  <Ext1>









                                                                          APPLY
--------------------------------------------------------------------------------
Function: Enable/Disable mirroring function.
Message:
CTRL+T = Main Menu          Esc = Prev. Screen          CTRL+R = Refresh
```

To configure a mirror port, enter the port from where you want to copy frames in the **Source Port** field, and the Ingress and/or Egress port in the appropriate **Target Port** field(s). The source port must be one of the four external ports (Ext1, Ext2, Ext3, or Ext4). The target port must be one of the four external ports (Ext1, Ext2, Ext3, or Ext4).

Finally, toggle the **Mirroring Status** field to **Enabled**, highlight **APPLY**, and press Enter.

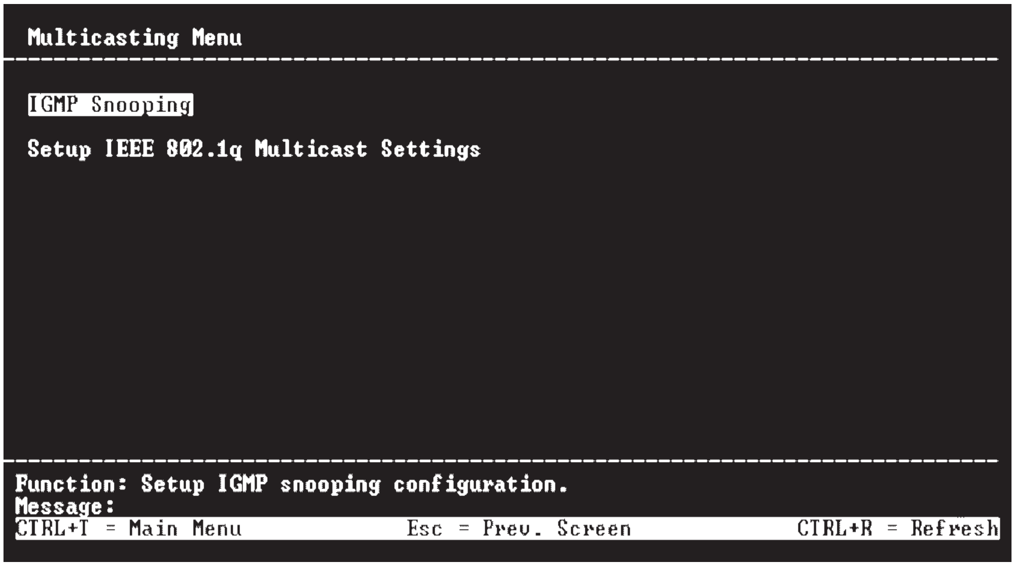
Notes:

You should not mirror a faster port or higher traffic ports on to a slower port. For example, if you try to mirror the traffic from a 100 Mbps port onto a 10 Mbps port, this can cause throughput problems. The port from which you are copying frames should always support an equal or lower speed than the port to which you are sending the copies. Also, the target port cannot be a member of a trunk group.

Port mirroring is not possible if you use the same egress and ingress target port.

Multicasting

Select **Multicasting** on the main menu to access the following window:

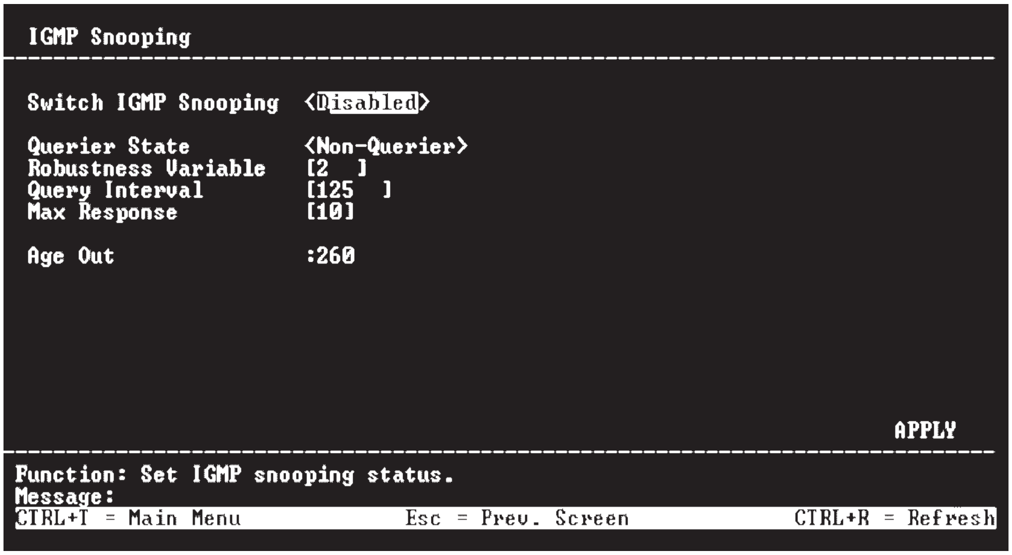


```
 Multicasting Menu
--------------------------------------------------------------------------------

 IGMP Snooping

 Setup IEEE 802.1q Multicast Settings












--------------------------------------------------------------------------------
Function: Setup IGMP snooping configuration.
Message:
CTRL+T = Main Menu            Esc = Prev. Screen            CTRL+R = Refresh
```

IGMP Snooping:

IGMP Snooping can be globally enabled or disabled from the IGMP Snooping window.

To configure IGMP Snooping, highlight **IGMP Snooping** on the Multicasting Menu and press Enter:



```
 IGMP Snooping
--------------------------------------------------------------------------------

 Switch IGMP Snooping  <Disabled>

 Querier State         <Non-Querier>
 Robustness Variable   [2  ]
 Query Interval        [125   ]
 Max Response          [10]

 Age Out               :260







                                                                       APPLY
--------------------------------------------------------------------------------
Function: Set IGMP snooping status.
Message:
CTRL+T = Main Menu            Esc = Prev. Screen            CTRL+R = Refresh
```

To configure IGMP Snooping, complete the following steps:

Toggle the **Switch IGMP Snooping** field to **Enabled**. Toggle the **Querier State** field to the appropriate choice among **Non-Querier**, **V1-Querier**, and **V2-Querier** to determine the version of IGMP that is used in your network. You can enter a value between 1 and 255 for the **Robustness Variable** (default is 2). You can set the **Query Interval** between 1 and 65500 seconds (default is 125 seconds). This sets the time between IGMP queries. The **Max Response** enables a setting between 1 and 25 seconds (default is 10) and specifies the maximum amount of time available before sending a response report. The **Age Out** timer is fixed at 260 seconds.

Highlight **APPLY** and press Enter to make the settings effective.

The user-changeable parameters in the switch are as follows:

Switch IGMP Snooping: <Disabled>

This field can be toggled using the Spacebar between **Disabled** and **Enabled**. This is used to enable or disable IGMP Snooping, globally, on the switch.

Querier State: <Non-Querier>

This field can be toggled among **Non-Querier**, **V1-Querier**, and **V2-Querier**. This is used to specify the IGMP version (1 or 2) that will be used by the IGMP interface when making queries.

Robustness Variable: [2]

A tuning variable to allow for sub-networks that are expected to lose a large number of packets. You can enter a value between 1 and 255, with larger values being specified for sub-networks that are expected to lose larger numbers of packets.

Query Interval: [125]

Enables the entry of a value between 1 and 65500 seconds, with a default of 125 seconds. This specifies the length of time between sending IGMP queries.

Max Response: [10]

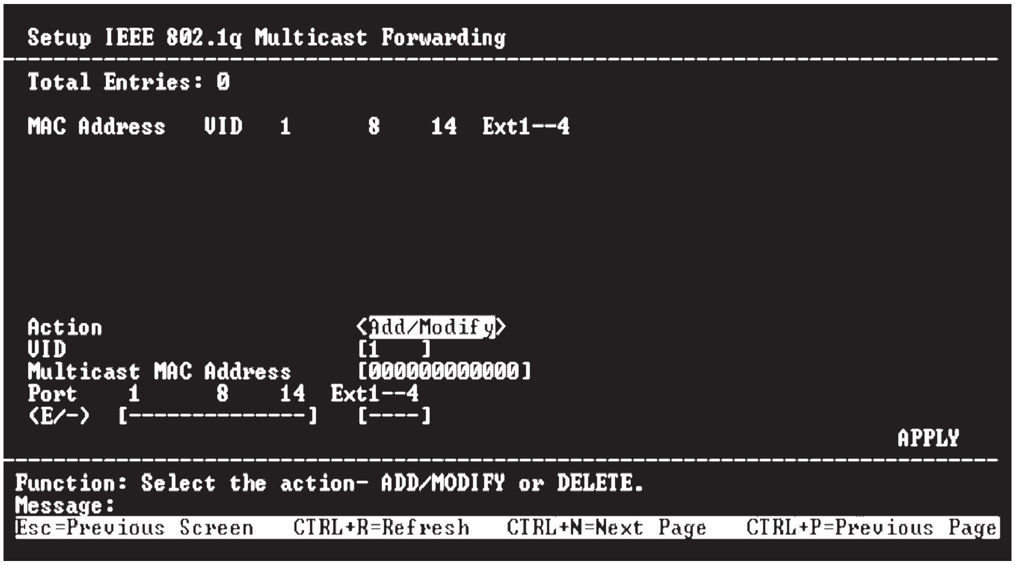
Sets the maximum amount of time available before sending an IGMP response report. You can enter a value between 1 and 25 seconds, with a default of 10 seconds.

Age Out

The time out function is fixed at 260 seconds.

Setup IEEE 802.1q Multicast Settings:

To edit the IEEE 802.1q multicast settings, highlight **Setup IEEE 802.1q Multicast Settings** on the Multicasting Menu to access the following window:



```
Setup IEEE 802.1q Multicast Forwarding
------------------------------------------------------------------------------
Total Entries: 0

MAC Address   VID   1      8    14  Ext1--4




Action                      <Add/Modify>
VID                         [1    ]
Multicast MAC Address       [000000000000]
Port    1      8    14  Ext1--4
<E/->  [--------------]   [----]
                                                                  APPLY
------------------------------------------------------------------------------
Function: Select the action- ADD/MODIFY or DELETE.
Message:
Esc=Previous Screen   CTRL+R=Refresh   CTRL+N=Next Page   CTRL+P=Previous Page
```

The **Action** field can be toggled between **Add/Modify** and **Delete** using the Spacebar. To add a new entry to the multicast forwarding table, select **Add/Modify** and enter the VLAN ID number of the VLAN that will be receiving the multicast packets in the **VID** field. Enter the MAC address of the multicast source in the **Multicast MAC Address** field, and then enter the member ports. Each port can be Egress or a non-member of the multicast group, on a per-VLAN basis.

To set a port multicast group membership status, highlight the first field of **(E/-)**. Each port multicast group membership can be set individually by highlighting the port entry using the arrow keys, and then toggling between **E** and **-** using the Spacebar.

E (Egress Member)

Specifies the port as being a static member of the multicast group. Egress member ports are ports that will be transmitting traffic for the multicast group.

- (Non-Member)

Specifies the port as not being a member of the multicast group, but the port can become a member of the multicast group dynamically.

Highlight **APPLY** and press Enter to make the changes current. Use **Save Changes** in the main menu to enter the changes into NVRAM.

VLANs

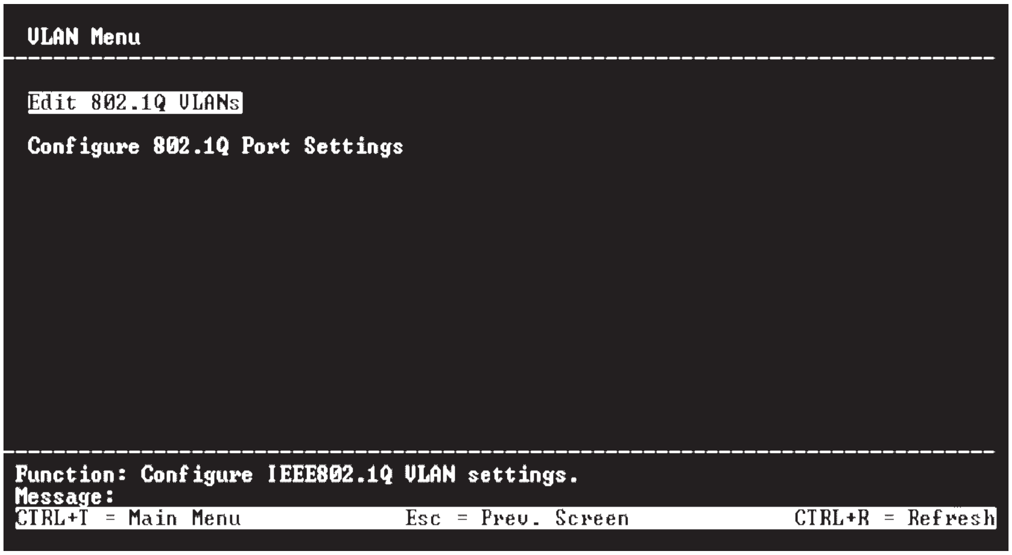
The switch reserves one VLAN, VID = 1, called the DEFAULT_VLAN, for internal use. The factory default setting assigns all ports on the switch to the DEFAULT_VLAN. As new VLANs are configured, their respective member ports are removed from the DEFAULT_VLAN. If the DEFAULT_VLAN is reconfigured, all ports are again assigned to it. Ports that are not wanted as part of the DEFAULT_VLAN are removed during the configuration.

Packets cannot cross VLANs. If a member of one VLAN wants to connect to another VLAN, it must be through a router.

Note: The switch default is to assign all ports to a single 802.1Q VLAN named DEFAULT_VLAN. As new VLANs are created, the member ports assigned to the new VLAN will be removed from the default VLAN port member list.

VLAN Menu:

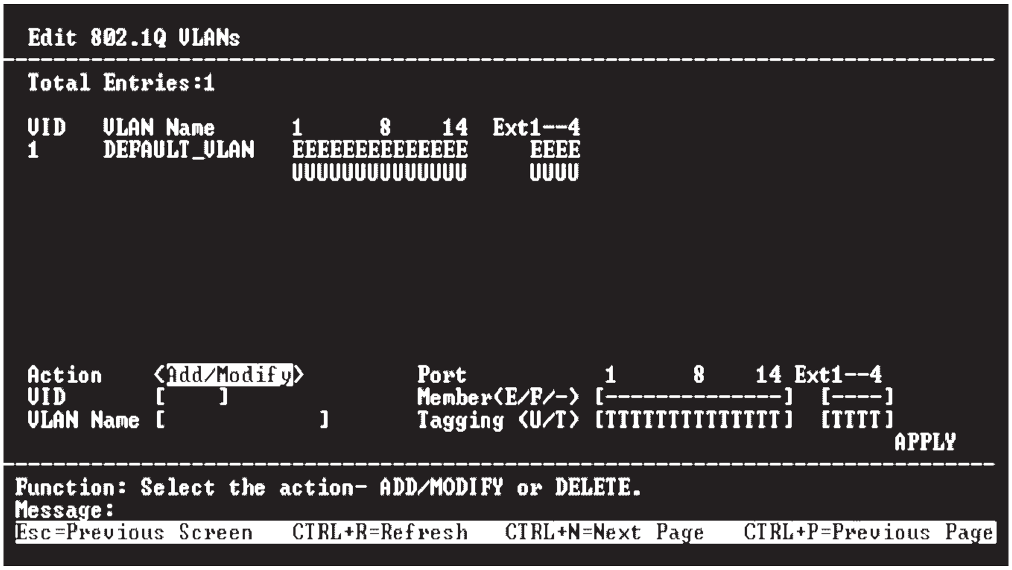
The first item on the VLAN Menu enables you to add or modify an 802.1Q VLAN, and to edit the VLAN definitions. The second item enables you to configure the port settings for IEEE 802.1Q VLAN support. Highlight **VLANs** in the main menu and press Enter.



```
VLAN Menu
--------------------------------------------------------------------------------

Edit 802.1Q VLANs

Configure 802.1Q Port Settings

--------------------------------------------------------------------------------
Function: Configure IEEE802.1Q VLAN settings.
Message:
CTRL+T = Main Menu             Esc = Prev. Screen            CTRL+R = Refresh
```

Edit 802.1Q VLANs:

To create or modify an 802.1Q VLAN, highlight Edit 802.1Q **Edit 802.1Q VLANs** on the VLAN Menu and press Enter:



```
Edit 802.1Q VLANs
--------------------------------------------------------------------------------
Total Entries:1

VID   VLAN Name      1      8    14  Ext1--4
1     DEFAULT_VLAN   EEEEEEEEEEEEEE     EEEE
                     UUUUUUUUUUUUUU     UUUU


Action    <Add/Modify>        Port           1      8    14 Ext1--4
VID       [    ]              Member<E/F/-> [--------------]  [----]
VLAN Name [            ]      Tagging <U/T> [TTTTTTTTTTTTTT]  [TTTT]
                                                                   APPLY
--------------------------------------------------------------------------------
Function: Select the action- ADD/MODIFY or DELETE.
Message:
Esc=Previous Screen   CTRL+R=Refresh   CTRL+N=Next Page   CTRL+P=Previous Page
```

To create an 802.1Q VLAN, complete the following steps:

Select **Add/Modify** in the **Action** field.

Enter a VLAN ID number in the **VID** field and a name for the new VLAN in the **VLAN Name** field.

Set the membership and tagging status.

Highlight **APPLY** and press Enter to make your changes effective.

To modify an existing 802.1Q VLAN, complete the following steps:

Select **Add/Modify** in the **Action** field.

Enter a VLAN ID number in the **VID** field and the name for the VLAN in the **VLAN Name** field.

Make the required changes to the membership and tagging status.

Highlight **APPLY** and press Enter to make your changes effective.

To delete an 802.1Q VLAN, complete the following steps:

Select **Delete** in the **Action** field.

Enter a VLAN ID number in the **VID** field and the name for the VLAN in the **VLAN Name** field.

Highlight **APPLY** and press Enter to make your changes effective.

To set the 802.1Q VLAN membership status of a port, go to the **Membership (E/F/-)** line in the preceding window. Each port 802.1Q VLAN membership can be set individually by highlighting the port entry using the arrow keys, and then toggling among **E**, **F**, and **-** using the Spacebar.

E (Egress Member)

Specifies the port as being a static member of the VLAN. Egress Member Ports are ports that will be transmitting traffic for the VLAN. These ports can be either tagged or untagged.

F (Forbidden Non-Member)

Defines the port as a non-member and also forbids the port from joining a VLAN dynamically.

- (Non-Member)

Specifies the port as not being a member of the VLAN, but the port can become a member of the VLAN dynamically.

Next, determine which of the ports that are members of the new VLAN will be tagged or untagged ports.

To set a port as either a tagged or an untagged port, highlight the first field of **Tagging (U/T)** field. The state of each port can be set by highlighting the port entry using the arrow keys and then toggling between **U** or **T** using the Spacebar.

U

Specifies the port as an Untagged member of the VLAN. When an untagged packet is transmitted by the port, the packet header remains unchanged. When a tagged packet exits the port, the tag is stripped and the packet is changed to an untagged packet.

T Specifies the port as a Tagged member of the VLAN. When an untagged packet is transmitted by the port, the packet header is changed to include the 32-bit tag associated with the Port VLAN Identifier (PVID). When a tagged packet exits the port, the packet header is unchanged.

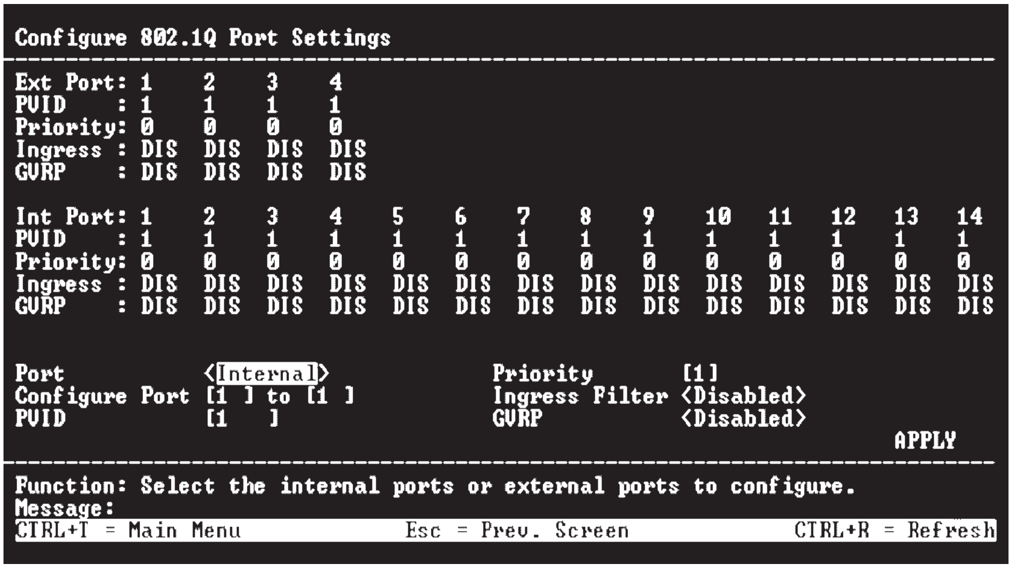
If the port is attached to a device that is not IEEE 802.1Q VLAN compliant (VLAN-tag unaware), then the port should be set to **U** - Untagged.

If the port is attached to a device that is IEEE 802.1Q VLAN compliant, (VLAN-tag aware), then the port should be set to **T** - Tagged.

Press **APPLY** to make the changes effective for the current session. To enter the changes into NVRAM, highlight **Save Changes** in the main menu and press Enter.

Configure 802.1Q Port Settings:

To configure an 802.1Q VLAN, highlight **Configure 802.1Q Port Settings** on the VLAN Menu and press Enter:



```
Configure 802.1Q Port Settings
-----------------------------------------------------------------------------
Ext Port: 1    2    3    4
PVID    : 1    1    1    1
Priority: 0    0    0    0
Ingress : DIS  DIS  DIS  DIS
GVRP    : DIS  DIS  DIS  DIS

Int Port: 1    2    3    4    5    6    7    8    9    10   11   12   13   14
PVID    : 1    1    1    1    1    1    1    1    1    1    1    1    1    1
Priority: 0    0    0    0    0    0    0    0    0    0    0    0    0    0
Ingress : DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS
GVRP    : DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS  DIS


Port           <Internal>            Priority       [1]
Configure Port [1 ] to [1 ]          Ingress Filter <Disabled>
PVID           [1   ]                GVRP           <Disabled>
                                                                 APPLY
-----------------------------------------------------------------------------
Function: Select the internal ports or external ports to configure.
Message:
CTRL+T = Main Menu             Esc = Prev. Screen             CTRL+R = Refresh
```

To assign a port a Port VLAN Identifier (PVID), select the desired module and port(s) in the first two fields, and enter the PVID for the VLAN member ports that you want to configure in the third field.

PVID is a classification mechanism that associates a port with a specific VLAN and is used to make forwarding decisions for untagged packets received by the port. For example, if port #2 is assigned a PVID of 3, then all untagged packets received on port #2 will be assigned to VLAN 3. This number is generally the same as the VID# number assigned to the port in the **Edit 802.1Q VLANs** window shown in “Edit 802.1Q VLANs:” on page 6115.

To set the priority of a port, select the desired module and port(s) in the first two fields and then enter the desired priority value in the **Priority** field.

To set an Ingress Filter, select the desired module and port(s) in the first two fields and then use the Spacebar to toggle between **Enabled** and **Disabled** in the **Ingress Filter** field.

An Ingress Filter enables the port to compare the VID tag of an incoming packet with the both the VIDs and PVIDs of VLANs assigned to the port. If the VID tag of an incoming port is different from either the VID or PVID assigned to the port, the port filters (drops) the packet.

You can enable a port to dynamically become a member of a VLAN, enable or disable GARP VLAN Registration Protocol (GVRP), where GARP is the Generic Attribute Registration Protocol, on an individual port. To set GVRP, complete the following steps:

Enter the module and range of ports to be configured in the first two fields and then toggle the GVRP State to **Enabled**.

Press **APPLY** to make your changes effective.

GVRP is a GARP application that provides 802.1Q-compliant VLAN pruning and dynamic VLAN creation on 802.1Q trunk ports. With GVRP, the switch can exchange VLAN configuration information with other GVRP switches, prune unnecessary broadcast and unknown unicast traffic, and dynamically create and manage VLANs on switches connected through 802.1Q trunk ports. GVRP updates dynamic VLAN registration entries and communicates the new VLAN information across the network. This enables, among other things, stations to physically move to other switch ports and keep their same VLAN settings, without having to reconfigure VLAN settings on the switch.

Link Aggregation

The switch module supports Link Aggregation, or port trunking. Port trunks (aggregated ports) can be used to increase the bandwidth of a network connection or to ensure fault recovery.

You can configure up to two trunk connections (combining two to four ports into one fat pipe) between any two switches or other Layer 2 switches. However, before making any physical connections between devices, use the Link Aggregation menus to specify the ports that will belong to the trunking group on both switches.

When using a port trunk, note that:

The ports used in a trunk must all be of the same speed (100 Mbps or 1000 Mbps) and operate in full-duplex mode only.

The ports that can be assigned to the same trunk have certain other restrictions, as described in this section.

Each port can only be assigned to one trunk group, whether a static or dynamic group.

The ports at both ends of a connection must be configured as trunk ports.

All of the ports in a trunk have to be treated as a whole when moved from/to, added, or deleted from a VLAN.

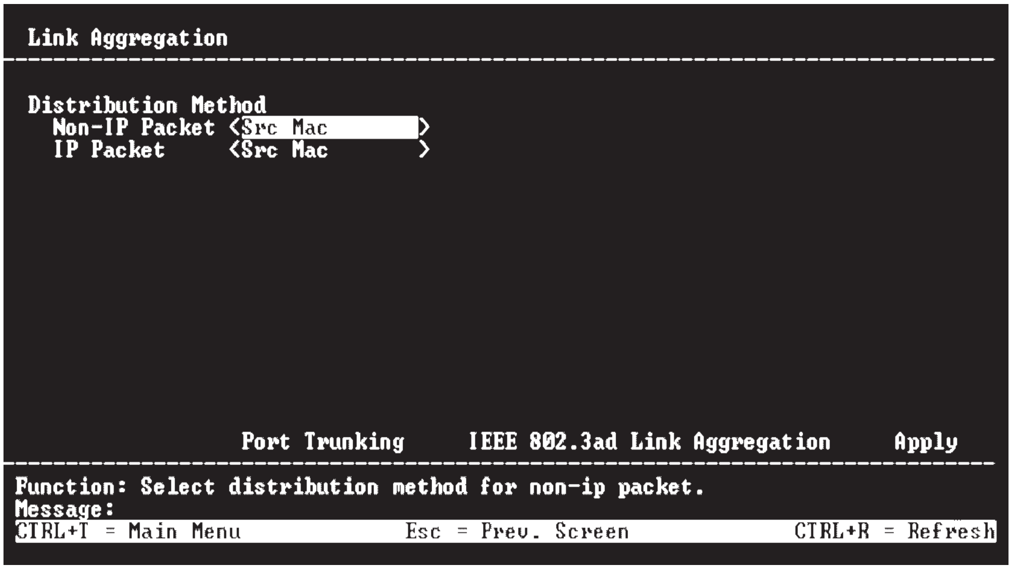
The Spanning Tree Protocol (STP) will treat all the ports in a trunk as a whole.

Enable the trunk before connecting any cable between the switches to avoid creating a data loop.

Disconnect all trunk port cables or disable the trunk ports before removing a port trunk to avoid creating a data loop.

Trunking can be set as a static port/group using the Port Trunking window or as a dynamic port/group using the IEEE 802.3ad Link Aggregation window.

To configure a port trunking group, highlight **Link Aggregation** on the main menu and press Enter.



```
 Link Aggregation
--------------------------------------------------------------------------------

 Distribution Method
   Non-IP Packet <Src Mac       >
   IP Packet     <Src Mac       >











                   Port Trunking     IEEE 802.3ad Link Aggregation     Apply
--------------------------------------------------------------------------------
Function: Select distribution method for non-ip packet.
Message:
CTRL+T = Main Menu            Esc = Prev. Screen             CTRL+R = Refresh
```

Link aggregation, or port trunking, enables several ports to be grouped together and to act as a single link. This gives a bandwidth that is a multiple of a single-link bandwidth.

Port trunking is most commonly used to link a bandwidth intensive network device or devices, such as a server, to the backbone of a network.

The switch module offers link aggregation on four external ports for up to two static trunk groups or two LACP 802.3ad link aggregation groups. The trunked ports can be non-continuous (that is, have non-sequential port numbers). All of the ports in the group must be members of the same VLAN. In addition, the trunked ports must all have the same speed and be configured as full duplex.

The configuration of the lowest numbered port in the group becomes the configuration for all of the ports in the port trunking group. This port is called the Master Port of the group, and all configuration options, including the VLAN configuration, that can be applied to the Master Port are applied to the entire port trunking group.

Load balancing is automatically applied to the ports in the trunked group, and a link failure within the group causes the network traffic to be directed to the remaining links in the group.

The STP will treat a port trunking group as a single link, on the switch level. On the port level, the STP will use the port parameters of the Master Port in the calculation of port cost and in determining the state of the port trunking group. If two redundant port trunking groups are configured on the switch, STP will block one entire group, in the same way that STP will block a single port that has a redundant link.

Use the Link Aggregation menu to set the distribution method for both IP packets and non-IP packets and then click **APPLY** to make your change effective.

The information on the preceding window includes:

Distribution Method

The switch module permits different load sharing methods when ports are trunked together. In some environments, a different method can improve balancing the packet traffic between trunked ports. Generally, you should select the method that can best differentiate packets that go through your trunked ports. If you do not know which method will be the best for your environment, use the trial-and-error approach, checking the network monitoring windows to see which method will yield the best results in terms of efficiency. The selected method is used as a hashing function to determine which packets will go to which port.

Non-IP Packet <Src Mac>

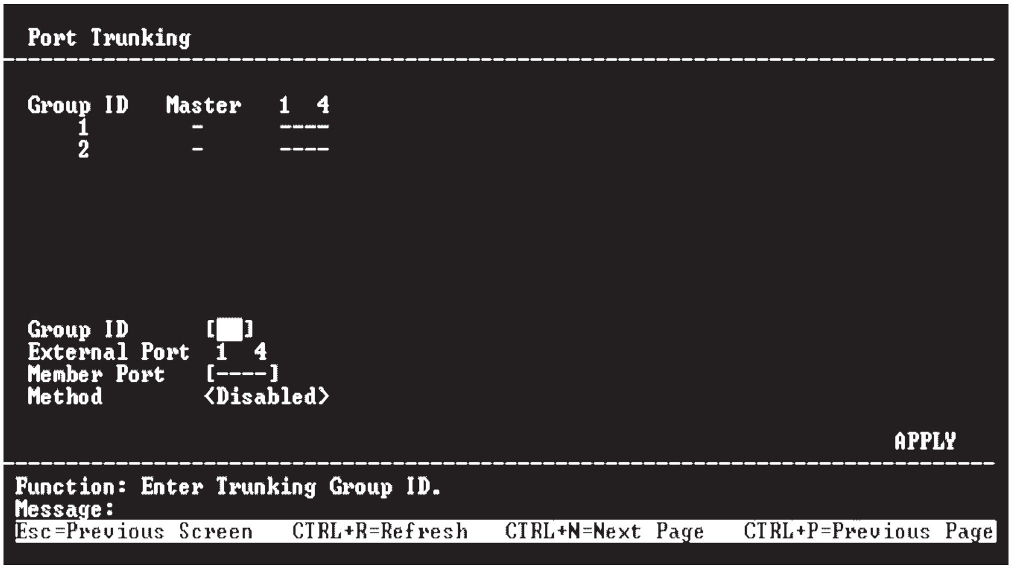
For non-IP packets, the available methods are: **Src Mac**, **Dest Mac**, or **Src & Dest Mac**.

IP Packet <Src Mac>

For IP packets, the available methods are: **Src Mac**, **Dest Mac**, **Src & Dest Mac**, **Src IP**, **Dest IP**, or **Src & Dest IP**.

Port Trunking:

To set up a static port trunking group, select **Port Trunking** on the Link Aggregation menu:



```
 Port Trunking
--------------------------------------------------------------------------------

 Group ID   Master   1  4
     1        -      ----
     2        -      ----







 Group ID       [  ]
 External Port  1  4
 Member Port    [----]
 Method         <Disabled>
                                                                       APPLY
--------------------------------------------------------------------------------
Function: Enter Trunking Group ID.
Message:
Esc=Previous Screen   CTRL+R=Refresh   CTRL+N=Next Page   CTRL+P=Previous Page
```

Enter a Group ID in the first field, use the Spacebar to toggle the **Member Port** field to M for each port that will be part of the trunking group, and select **TRUNK** in the **Method** field to enable this feature. After you click **APPLY**, the new port trunking group will be displayed in the table in the lower portion of the preceding window.

The user-changeable parameters on this window are as follows:

Group ID

The switch module enables up to two port trunk groups to be configured. The group number identifies each of these groups.

Member Port

Toggle between **M** to indicate membership of the port trunking group, or a dash (**-**) to indicate non-membership.

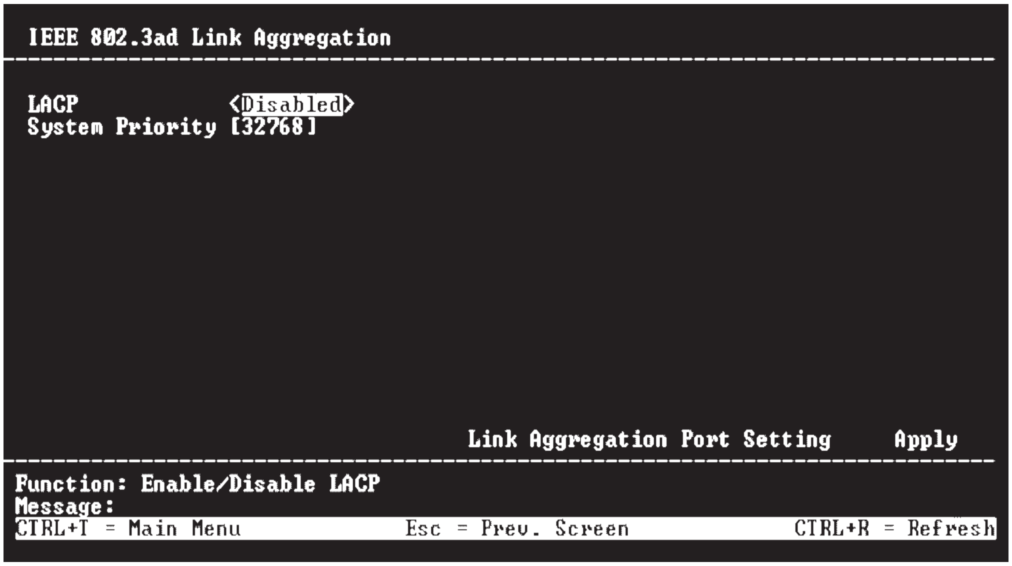
Method <Disabled>

This field can be toggled between **TRUNK** and **Disabled**. This is used to turn a port trunking group on or off. This is useful for diagnostics, to quickly isolate a bandwidth intensive network device or to have an absolute backup aggregation group that is not under automatic control.

IEEE 802.3ad Link Aggregation:

Use the IEEE 802.3ad Link Aggregation menu to set up dynamic port trunking.

To enable Link Aggregation Control Protocol and set the System Priority, value select **Setup IEEE 802.3ad Link Aggregation** on the Link Aggregation menu:



```
 IEEE 802.3ad Link Aggregation
-------------------------------------------------------------------------------

 LACP            <Disabled>
 System Priority [32768]




                                    Link Aggregation Port Setting     Apply
-------------------------------------------------------------------------------
Function: Enable/Disable LACP
Message:
CTRL+T = Main Menu            Esc = Prev. Screen            CTRL+R = Refresh
```

The user-changeable parameters on this window are as follows:

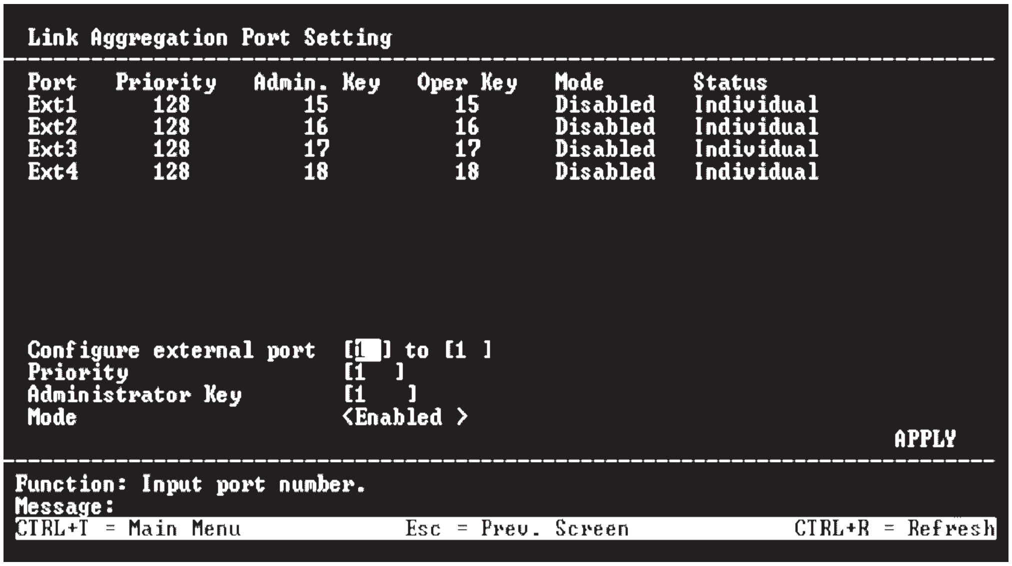
LACP

This parameter enables Link Aggregation to be **Enabled** or **Disabled**. Disabling LACP when it is not in use can eliminate some traffic on the network. Enabling Link Aggregation creates an active LACP switch module.

System Priority

An admin ID can be assigned to the switch module to differentiate other LACP switches running on the network.

To set up dynamic port trunking on individual ports, select **Link Aggregation Port Setting** on the IEEE 802.3ad Link Aggregation menu:



```
 Link Aggregation Port Setting
------------------------------------------------------------------------------
 Port   Priority   Admin. Key   Oper Key   Mode       Status
 Ext1      128         15          15      Disabled   Individual
 Ext2      128         16          16      Disabled   Individual
 Ext3      128         17          17      Disabled   Individual
 Ext4      128         18          18      Disabled   Individual







 Configure external port  [1  ] to [1 ]
 Priority                 [1   ]
 Administrator Key        [1    ]
 Mode                     <Enabled >
                                                                     APPLY
------------------------------------------------------------------------------
Function: Input port number.
Message:
CTRL+T = Main Menu            Esc = Prev. Screen            CTRL+R = Refresh
```

Select the range of ports to be configured in the first field, assign a Priority in the second field, enter the Admin. Key in the next field, and select **Enabled** in the **Mode** field to enable this feature. After you click **APPLY**, the new port settings will be displayed in the table in the lower portion of the preceding window.

The information on the preceding window includes:

Configure external port [1] to [1]

Enter the ports that will form the external port trunking group in this field.

Priority [1]

Lower port priority means a higher priority over other enabled link aggregation ports in the group.

Administrator Key [1]

This is the administrative key to control the way that links are aggregated. In order to aggregate ports together, the ports must have an equal Administrator Key.

Mode <Enabled>

A port or ports can be enabled to permit them to join or create a link aggregation group.

Oper Key

This displays the operational key used by the port to communicate with other LACP switches.

Status

This displays the current status of a link aggregation port.

Appendix A. RJ-45 pin specifications

When you connect the switch to another switch, a bridge, or a hub, a normal cable is necessary. Review the documentation that comes with these products for matching cable pin assignments.

The following illustration and table show the standard RJ-45 receptacle/connector and their corresponding pin assignments for the switch-to-network adapter connection, and the normal cable for the switch-to-switch/hub/bridge connection.

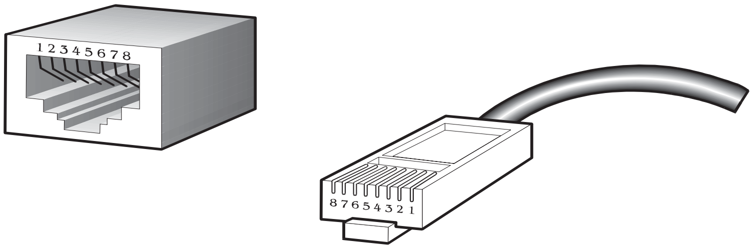


Table 6. Standard Category 3 cable, RJ-45 pin assignment

RJ-45 Connector pin assignment	
Contact (pin number)	**Media direct interface signal**
1	Tx + (transmit)
2	Tx - (transmit)
3	Rx + (receive)
4	Not used
5	Not used
6	Rx - (receive)
7	Not used
8	Not used

The four external Ethernet ports of this switch module are auto-configuring and do not require straight-through or crossover cables.

Appendix B. Run-time switching software default settings

Table 7 contains the default settings for the run-time switching software variables.

Table 7. Default settings for run-time switching software variables

Variable	Default value
Load mode	Ethernet
Configuration update	Disable
Firmware update	Disable
Out-of-band baud rate	9600
IP address	192.168.70.1*xx*, where *xx* depends on the number of the bay into which you have installed the switch module, as shown in Table 1 on page 17
Subnet mask	255.0.0.0
Default gateway	0.0.0.0
BOOTP service	Disable
TFTP server IP address	0.0.0.0
Auto log-out	10 min
User name	None
Password	None
MAC address aging time	300 secs
IGMP snooping	Disable
Switch GVRP	Disable
Telnet status	Enable
Web status	Enable
Device STP	Disable
Port STP	Enable
Port enable	Enable
Scheduling mechanism for COS queues	Strict
Trunk load sharing algorithm	Src address
Bridge max age	20 secs
Bridge hello time	2 secs
Bridge forward delay	15 secs
Bridge priority	32768
Port STP cost	100
Port STP priority	128
NWay	Enable
Flow control	Enable
Community string	“public”, “private”
VLAN mode	IEEE 802.1Q
Default port VID	1

Table 7. Default settings for run-time switching software variables (continued)

Variable	Default value
Ingress rule checking	Disable

Appendix C. Cable lengths

Use the following table as a guide for the maximum cable lengths:

Table 8. Maximum cable lengths

Standard	Data Transmission Rate	Media type	Maximum distance
1000BASE-T	1000 Mbps	Category 5e UTP cable Category 5 UTP cable	100 meters (328.1 ft)
100BASE-TX	100 Mbps	Category 5 UTP cable	100 meters (328.1 ft)
10BASE-T	10 Mbps	Category 3 UTP cable	100 meters (328.1 ft)

Appendix D. Understanding and troubleshooting the Spanning Tree Protocol

This appendix provide details about how the STP works and describes how to troubleshoot it.

STP operation levels

STP calculates the bridge identifier (ID) for each switch and then sets the root bridge and the designated bridges.

The following table shows the user-configurable STP parameters for the switch level.

Table 9. STP parameters -- switch level

Parameter	Description	Default value
Bridge identifier (Not user-configurable except by setting the priority as described in this table)	A combination of the user-set priority and the switch MAC address. The bridge identifier consists of two parts: a 16-bit priority and a 48-bit Ethernet MAC address.	32768 + MAC
Priority	A relative priority for each switch. Lower numbers assign a higher priority and increase the probability of a switch being elected as the root bridge	32768
Hello time	The length of time between broadcasts of the hello message by the switch	2 seconds
Maximum age timer	Measures the age of a received bridge protocol data unit (BPDU) for a port and ensures that the BPDU is discarded when its age exceeds the value of the maximum age timer	20 seconds
Forward delay timer	The amount time spent by a port in the learning and listening states waiting for a BPDU that might return the port to the blocking state	15 seconds

The following table shows the user-configurable STP port parameters for the switch level.

Table 10. STP port parameters -- switch level

Variable	Description	Default value
Port priority	A relative priority for each port. Lower numbers give a higher priority and a greater chance of a given port being elected as the root port.	32768
Port cost	A value used by STP to evaluate paths	19

Bridge protocol data units

For STP to arrive at a stable network topology, the following information is used:

- The unique switch identifier

- The path cost to the root associated with each switch port
- The port identifier

STP communicates between switches on the network using bridge protocol data units (BPDUs). Each BPDU contains the following information:

- The unique identifier of the switch that the transmitting switch currently recognizes as the root switch
- The path cost to the root from the transmitting port
- The port identifier of the transmitting port

The switch sends BPDUs to communicate and construct the spanning-tree topology. All switches connected to the LAN on which a packet is transmitted will receive the BPDU. BPDUs are not directly forwarded by the switch, but the receiving switch uses the information in the frame to calculate a BPDU, and, if the topology changes, initiates a BPDU transmission.

The communication between switches through BPDUs causes the following results:

- One switch is elected as the root switch.
- The shortest distance to the root switch is calculated for each switch.
- A designated switch is selected. This is the switch closest to the root switch through which packets will be forwarded to the root.
- A port for each switch is selected. This is the port providing the best path from the switch to the root switch.
- Ports included in the STP are selected.

Creating a stable topology

If all switches have STP enabled with default settings, the switch with the lowest MAC address in the network will become the root switch. By increasing the priority (lowering the priority number) of the best switch, STP can be forced to select the best switch as the root switch.

When STP is enabled using the default parameters, the path between source and destination stations in a switched network might not be ideal. For example, connecting higher-speed links to a port that has a higher number than the current root port can cause a root-port change. The goal is to make the fastest link the root port.

STP port states

The BPDUs take some time to pass through a network. This propagation delay can result in topology changes in which a port that changed directly from a blocking state to a forwarding state could create temporary data loops. Ports must wait for new network topology information to propagate throughout the network before starting to forward packets. They must also wait for the packet lifetime to expire for BPDU packets that were forwarded based on the old topology. The forward delay timer is used to enable the network topology to stabilize after a topology change. In addition, STP specifies a series of states a port must go through to further ensure that a stable network topology is created after a topology change.

Each port on a switch using STP exists in one of the following five states:

Blocking

The port is blocked from forwarding or receiving packets. For additional information, see “Blocking state” on page 126.

Listening

The port is waiting to receive BPDU packets that might tell the port to go back to the blocking state. For additional information, see “Listening state” on page 127.

Learning

The port is adding addresses to its forwarding database but not yet forwarding packets. For additional information, see “Learning state” on page 128.

Forwarding

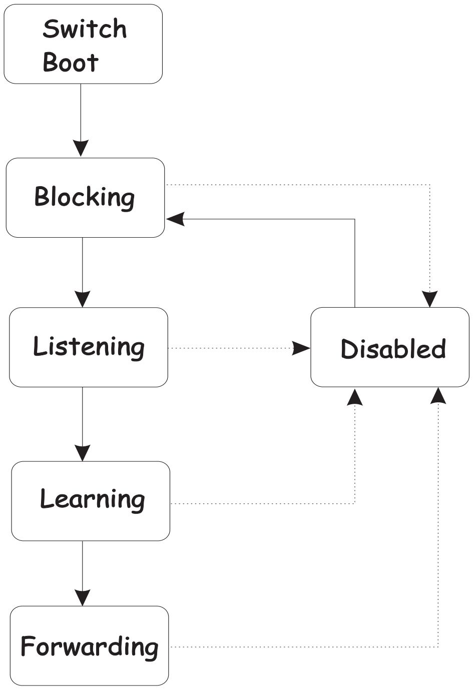
The port is forwarding packets. For additional information, see “Forwarding state” on page 129.

Disabled

The port responds only to network management messages and must return to the blocking state first. For additional information, see “Disabled state” on page 131.

A port changes from one state to another as follows:

- From initialization (switch startup) to blocking
- From blocking to listening or to disabled
- From listening to learning or to disabled
- From learning to forwarding or to disabled
- From forwarding to disabled
- From disabled to blocking



When you enable STP, every port on every switch in the network goes through the blocking state and then goes through the states of listening and learning at startup. If properly configured, each port stabilizes to the forwarding or blocking state.

No packets (except BPDUs) are forwarded from, or received by, STP enabled ports until the forwarding state is enabled for that port.

Table 11 shows the default spanning-tree configuration.

Table 11. Default STP parameters

Feature	Default Value
Enable state	STP enabled for all ports
Port priority	128
Port cost	19
Bridge priority	32768

Setting user-changeable STP parameters

The factory default settings are compatible with the majority of installations. However, it is advisable to keep the default settings as set at the factory, unless it is absolutely necessary to change them. The user-changeable parameters in the switch are as follows:

Priority

You can set a priority for the switch from 0 to 65535. A value of 0 indicates the highest priority.

Hello Time

The hello time can be from 1 to 10 seconds. This is the interval between two transmissions of BPDU packets sent by the root bridge to tell all other switches that it is indeed the root bridge. If you set a hello time for your switch, and it is not the root bridge, the set hello time will be used if and when your switch becomes the root bridge.

Note: The hello time cannot be longer than the Max. Age. Otherwise, a configuration error will occur.

Max. Age

The Max. Age can be from 6 to 40 seconds. At the end of the Max. Age, if a BPDU has still not been received from the root bridge, your switch will start sending its own BPDU to all other switches for permission to become the root bridge. If your switch has the lowest bridge identifier, it will become the root bridge.

Forward Delay

The Forward Delay can be from 4 to 30 seconds. This is the time that any port on the switch spends in the listening state while moving from the blocking state to the forwarding state.

Note: Observe the following formulas when setting the previously described parameters:

- Max. Age ≤ 2 x (Forward Delay - 1 second)
- Max. Age ≥ 2 x (Hello Time + 1 second)

Port Priority

You can set a port priority from 0 to 255. The lower the number, the greater the probability that the port will be chosen as the root port.

Port Cost

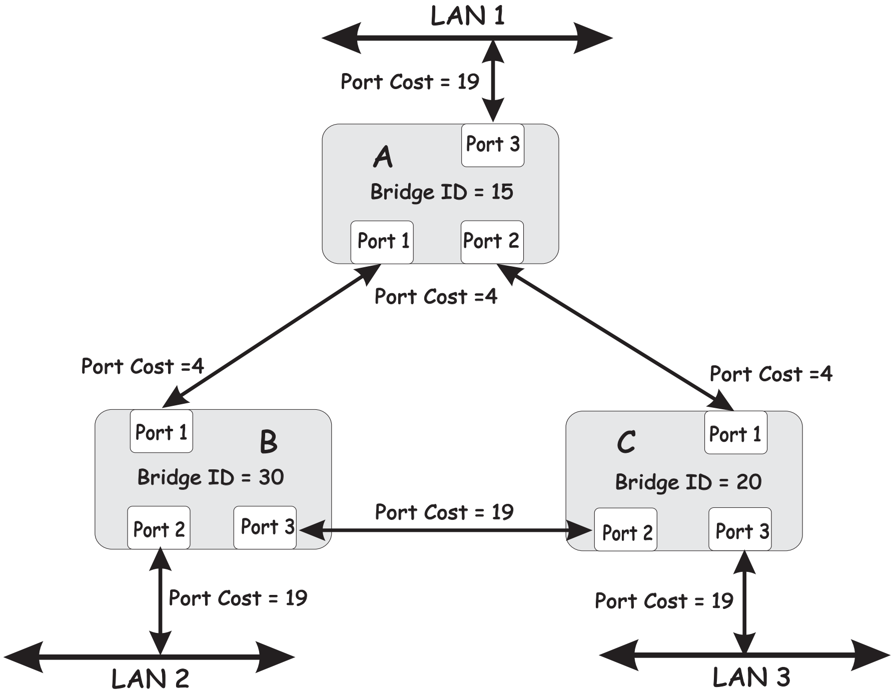
You can set a port cost from 1 to 65535. The lower the number, the greater the probability that the port will be chosen to forward packets.

Illustration of STP

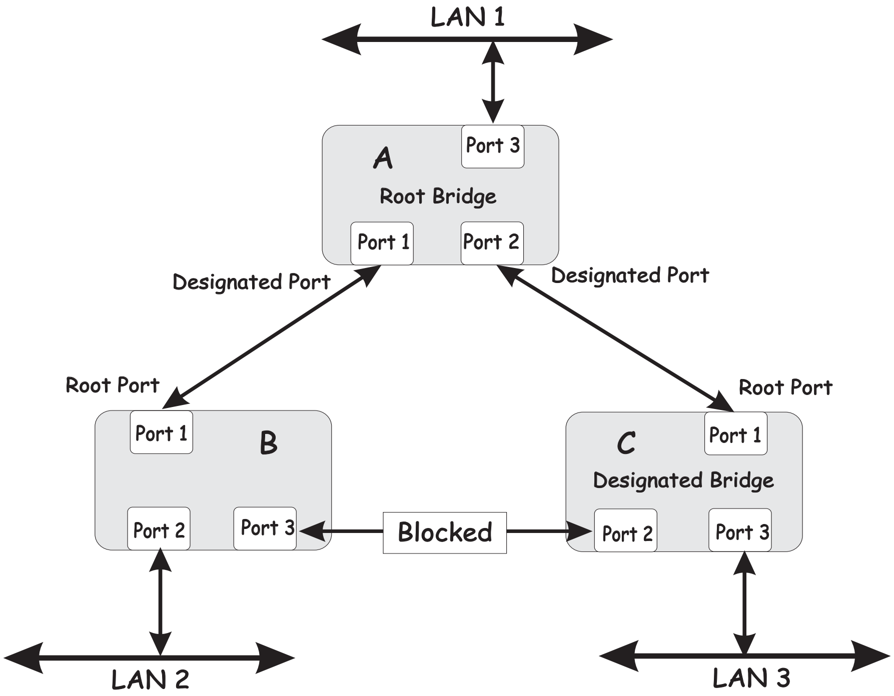
A simple illustration of three bridges (or three switches) connected in a loop is depicted in this section. In this example, you can anticipate some major network problems if the STP assistance is not applied. If bridge A broadcasts a packet to bridge B, bridge B will broadcast it to bridge C, and bridge C will broadcast it to back to bridge A, and so on. The broadcast packet will be passed indefinitely in a loop, potentially causing a network failure.

STP can be applied as shown in the following illustration. In this example, STP breaks the loop by blocking the connection between bridges B and C. The decision to block a particular connection is based on the STP calculation of the most current bridge and port settings. If bridge A broadcasts a packet to bridge C, bridge C will drop the packet at port 2, and the broadcast will end there.

Setting up STP using values other than the defaults can be complex. Therefore, keep the default factory settings, and STP will automatically assign root bridges, ports, and block loop connections. However, influencing STP to choose a particular switch as the root bridge using the **Priority** setting, or influencing STP to choose a particular port to block using the **Port Priority** and **Port Cost** settings is relatively straightforward.



Note: In this example, only the default STP values are used.



The switch with the lowest bridge ID (switch A) was elected the root bridge, and the ports were selected to give a high port cost between switches B and C.

Note also that the example network topology is intended to provide redundancy to protect the network against a link or port failure, not a switch failure or removal. For example, a failure of switch A would isolate LAN 1 from connecting to LAN 2 or LAN 3.

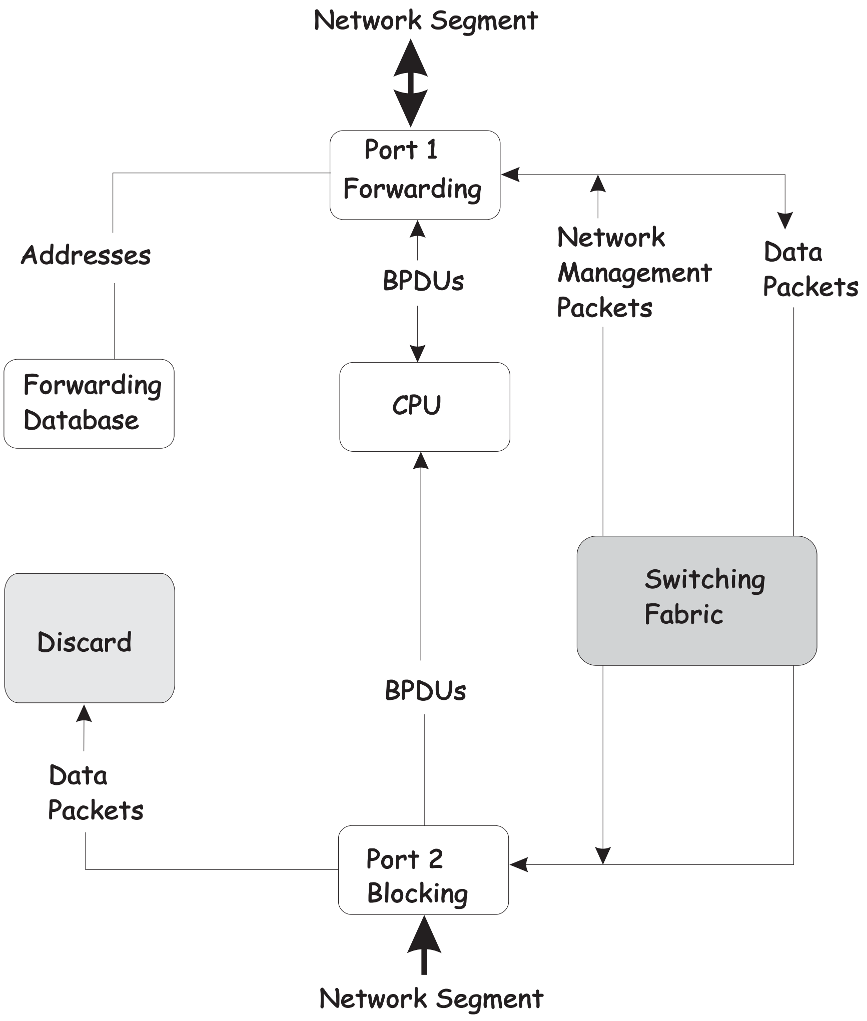
Blocking state

A port in the blocking state does not forward packets. When the switch is started, a BPDU is sent to each port in the switch putting these ports into the blocking state. A switch initially assumes it is the root, and then begins the exchange of BPDUs with other switches. This will determine which switch in the network is the best choice for the root switch. If there is only one switch on the network, no BPDU exchange occurs, the forward delay timer expires, and the ports move to the listening state. All STP enabled ports enter the blocking state following the switch startup.

A port in the blocking state does the following:

- Discards packets received from the network segment to which it is attached.
- Discards packets sent from another port on the switch for forwarding.
- Does not add addresses to its forwarding database
- Receives BPDUs and directs them to the central processing unit (CPU).
- Does not transmit BPDUs received from the CPU.
- Receives and responds to network management messages.

The following illustration shows the actions that occur when a port is in the blocking state.



Listening state

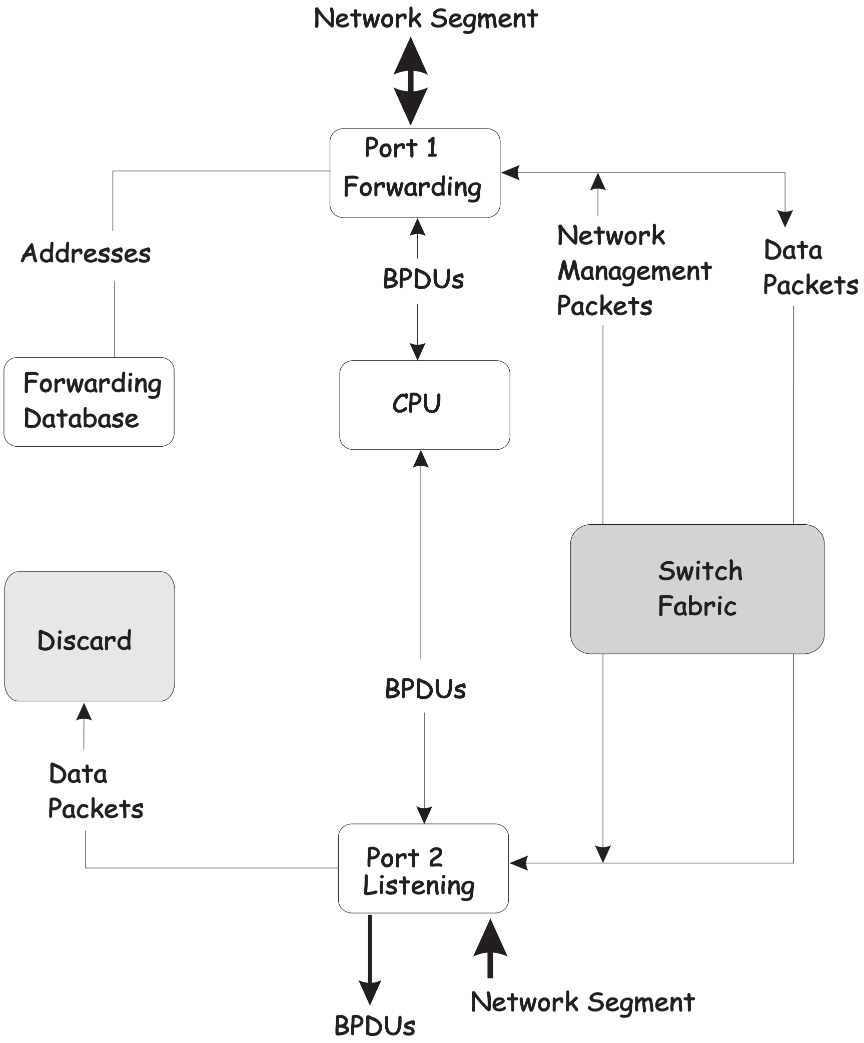
The listening state is the first change for a port from the blocking state. Listening is an opportunity for the switch to receive BPDUs that might tell the switch that the port should not continue to change to the forwarding state, but should return to the blocking state (that is, a different port is a better choice).

There is no address learning or packet forwarding from a port in the listening state.

A port in the listening state does the following:

- Discards frames received from the network segment to which it is attached
- Discards packets sent from another port on the switch for forwarding
- Does not add addresses to its forwarding database
- Receives BPDUs and directs them to the CPU
- Processes BPDUs received from the CPU
- Receives and responds to network management messages

The following illustration shows the actions that occur when a port is in the listening state.



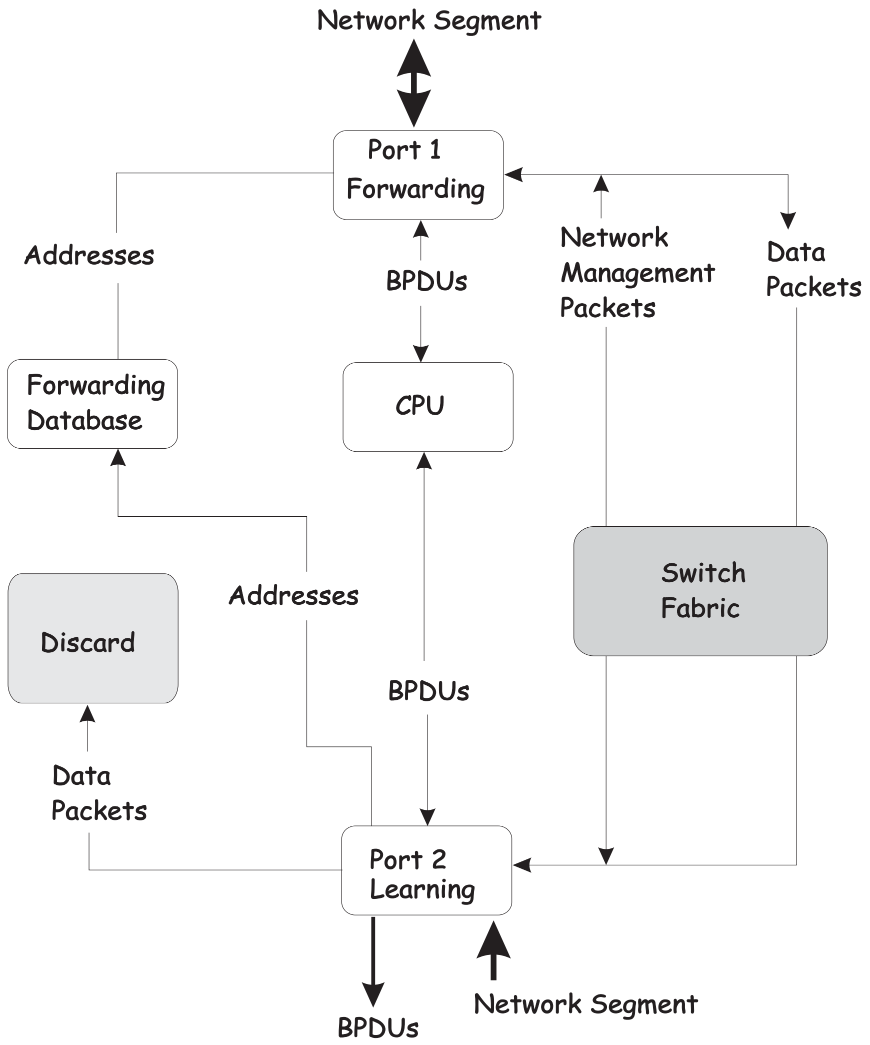
Learning state

A port in the learning state prepares to participate in frame forwarding. The port enters the learning state from the listening state.

A port in the learning state does the following:

- Discards frames received from the network segment to which it is attached
- Discards packets sent from another port on the switch for forwarding
- Adds addresses to its forwarding database
- Receives BPDUs and directs them to the CPU
- Processes and transmits BPDUs received from the CPU
- Receives and responds to network management messages

The following illustration shows the actions that occur when a port is in the learning state.



Forwarding state

A port in the forwarding state forwards packets. The port enters the forwarding state from the learning state when the forward delay timer expires.

When the spanning-tree algorithm determines that a port should be changed to the forwarding state, the following occurs:

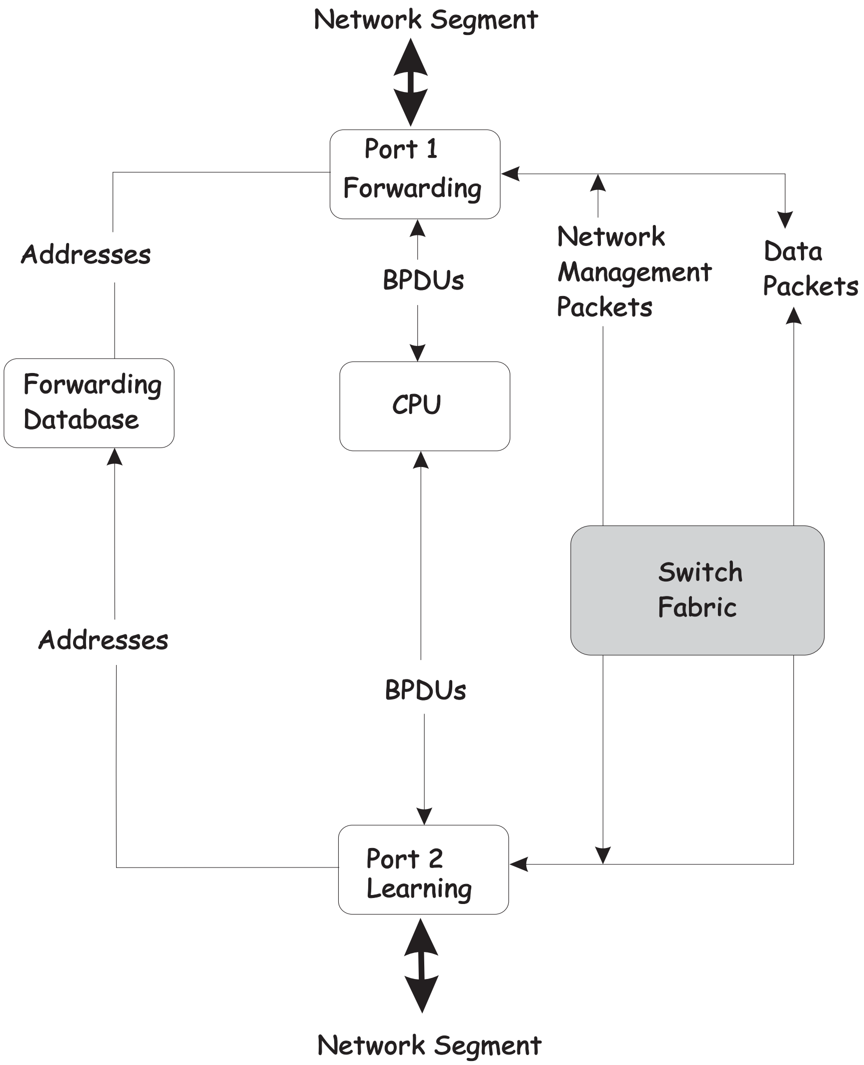
The port is put into the listening state, where it receives bridge protocol data units (BPDUs) and passes them to the switch CPU. BPDU packets from the CPU are processed. If no BPDUs are received, this indicates that the port should go to the blocking state:

- The port waits for the expiration of the forward delay timer. It then moves to the learning state.
- In the learning state, the port learns station location information from the source address of packets and adds this information to its forwarding database.
- The expiration of the forwarding delay timer moves the port to the forwarding state, where both learning and forwarding are enabled. At this point, packets are forwarded by the port.

A port in the forwarding state does the following:

- Forwards packets received from the network segment to which it is attached.
- Forwards packets sent from another port on the switch for forwarding.
- Incorporates station location information into its address database.
- Receives BPDUs and directs them to the system CPU.
- Receives and responds to network management messages.

The following illustration shows the actions that occur when a port is in the forwarding state.



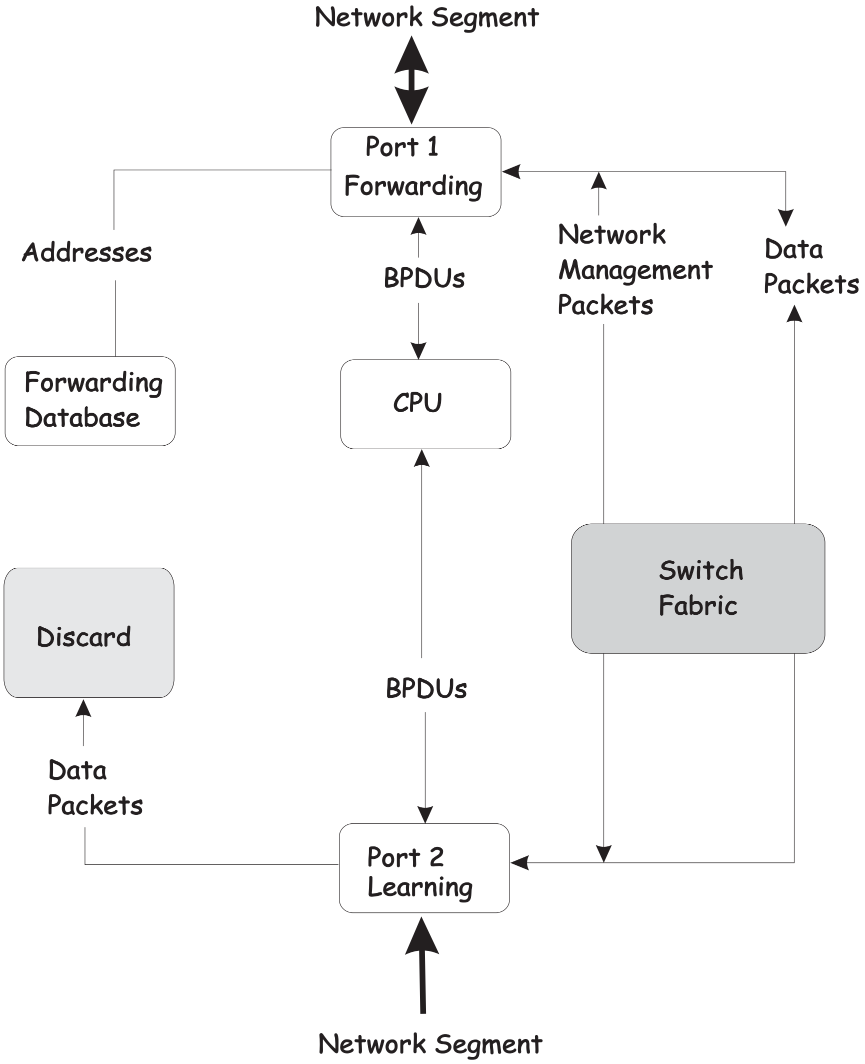
Disabled state

A port in the disabled state does not participate in frame forwarding or STP. A port in the disabled state is virtually non-operational.

A disabled port does the following:

- Discards packets received from the network segment to which it is attached.
- Discards packets sent from another port on the switch for forwarding.
- Does not add addresses to its forwarding database.
- Receives BPDUs, but does not direct them to the system CPU.
- Does not receive BPDUs for transmission from the system CPU.
- Receives and responds to network management messages.

The following illustration shows the actions that occur when a port is in the disabled state.

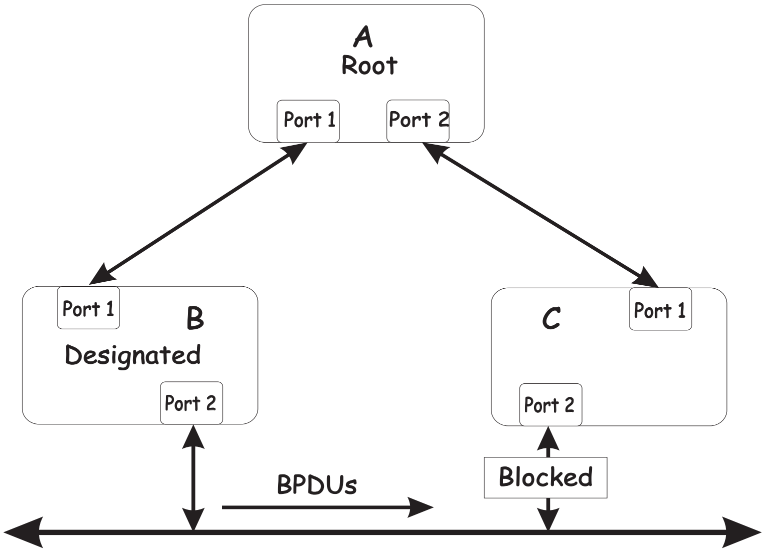


Troubleshooting STP

This section describes how to troubleshoot the STP.

Spanning Tree Protocol Failure

A failure in the STA generally leads to a bridging loop. A bridging loop in an STP environment comes from a port that should be in the blocking state, but is forwarding packets.



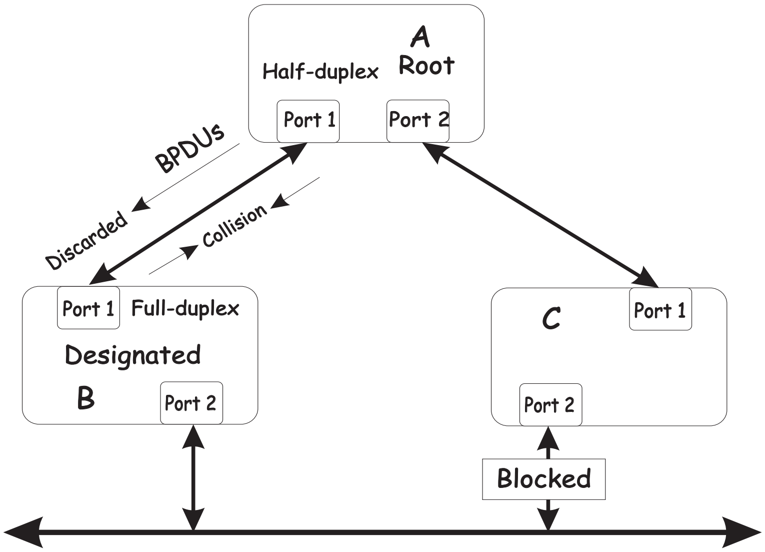
In this example, B has been elected as the designated bridge and port 2 on bridge C is in the blocking state. The election of B as the designated bridge is determined by the exchange of BPDUs between bridges B and C. Bridge B had a better BPDU than bridge C. Bridge B continues sending BPDUs that advertise its superiority over the other bridges on this LAN. If bridge C fails to receive these BPDUs for longer than the Max. Age (default of 20 seconds), it could start to change its port 2 from the blocking state to the forwarding state.

Note: To remain in the blocking state, a port must continue to receive BPDUs that advertise superior paths.

There are several circumstances in which the STA can fail, mostly related to the loss of a large number of BPDUs. These situations will cause a port in the blocking state to change to the forwarding state.

Full/half duplex mismatch

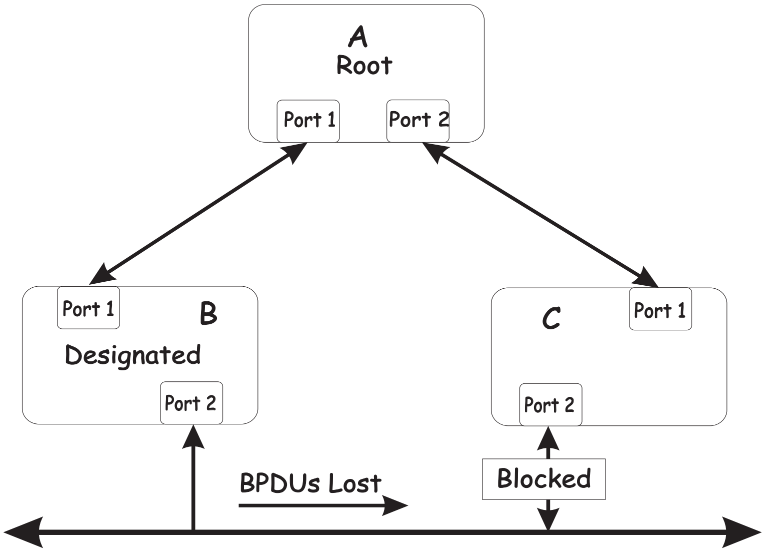
A mismatch in the duplex state of two ports is a very common configuration error for a point-to-point link. If one port is configured as a full duplex, and the other port is left in auto-negotiation mode, the second port will end up in half-duplex because ports configured as half- or full-duplex do not negotiate.



In the preceding example, port 1 on bridge B is configured as a full-duplex port and port 1 on bridge A is either configured as a half-duplex port, or left in auto-negotiation mode. Because port 1 on bridge B is configured as a full-duplex port, it does not do the carrier sense when accessing the link. Bridge B will then start sending packets even if bridge A is using the link. A will then detect collisions and begin to run the flow control algorithm. If there is enough traffic between bridges B and A, all packets (including BPDUs) will be dropped. If the BPDUs sent from bridge A to bridge B are dropped for longer than the Max. Age, bridge B will lose its connection to the root (bridge A) and will unblock its connection to bridge C. This will create a data loop.

Unidirectional link

Unidirectional links can be caused by an undetected failure in one side of a fiber cable, or a problem with a ports transceiver. Any failure that enables a link to remain up while providing one-way communication is very dangerous for STP.



In this example, port 2 on bridge B can receive but not transmit packets. Port 2 on bridge C should be in the blocking state, but since it can no longer receive BPDUs from port 2 on bridge

B, it will change to the forwarding state. If the failure exists at boot, STP will not converge and restarting the bridges will have no effect.

Note: In the previous example, restarting the bridges will provide a temporary resolution.

This type of failure is difficult to detect because the Link-state LEDs for Ethernet links rely on the transmit side of the cable to detect a link. If a unidirectional failure on a link is suspected, it is usually required to go to the console or other management software and look at the packets received and transmitted for the port. For example, a unidirectional port will have many packets transmitted but none received, or vice versa.

Packet corruption

Packet corruption can lead to the same type of failure. If a link is experiencing a high rate of physical errors, a large number of consecutive BPDUs can be dropped and a port in the blocking state would change to the forwarding state. The blocking port would have to have the BPDUs dropped for 50 seconds (at the default settings) and a single BPDU would reset the timer. If the Max. Age is set too low, this time is reduced.

Resource errors

The switch performs its switching and routing functions primarily in hardware, using specialized application specific integrated circuits (ASICs). STP is implemented in software and is thus reliant upon the speed of the CPU and other factors to converge. If the CPU is over-utilized, it is possible that BPDUs might not be sent in a timely fashion. STP is generally not very CPU intensive and is given priority over other processes, so this type of error is rare.

It can be seen that very low values for the Max. Age and the Forward Delay can result in an unstable spanning tree. The loss of BPDUs can lead to data loops. The diameter of the network can also cause problems. The default values for STP give a maximum network diameter of about seven. This means that two switches in the network cannot be more than seven hops apart. Part of this diameter restriction is the BPDU age field. As BPDUs are propagated from the root bridge to the leaves of the spanning tree, each bridge increments the age field. When this field is beyond the maximum age, the packet is discarded. For large diameter networks, STP convergence can be very slow.

Identifying a data loop

Broadcast storms have a very similar effect on the network to data loops, but broadcast storm controls in modern switches have (along with subnetting and other network practices) have been very effective in controlling broadcast storms. The best way to determine if a data loop exists is to capture traffic on a saturated link and check if similar packets are seen multiple times.

Generally, if all the users of a given domain are unable to connect to the network at the same time, a data loop is the cause. In this case, the port-utilization data in the switch Telnet windows will give unusually high values.

The priority for most cases is to restore connectivity as soon as possible. The simplest remedy is to manually disable all of the ports that provide redundant links. Disabling the ports one at a time, and then checking for the restoration of a user's connectivity will identify the link that is causing the problem, if sufficient time is available. Connectivity will be restored immediately after disabling a data loop.

Avoiding network problems

To help your network operate more efficiently, you can avoid or minimize network problems, as described in this section.

- Know where the root is located.

  Although the STP can elect a root bridge, a well-designed network has an identifiable root for each VLAN. Careful setup of the STP parameters results in the selection of this best switch as the root for each VLAN. Redundant links can then be built into the network. STP is well-suited to maintaining connectivity in the event of a device failure or removal, but is poorly suited to designing networks.

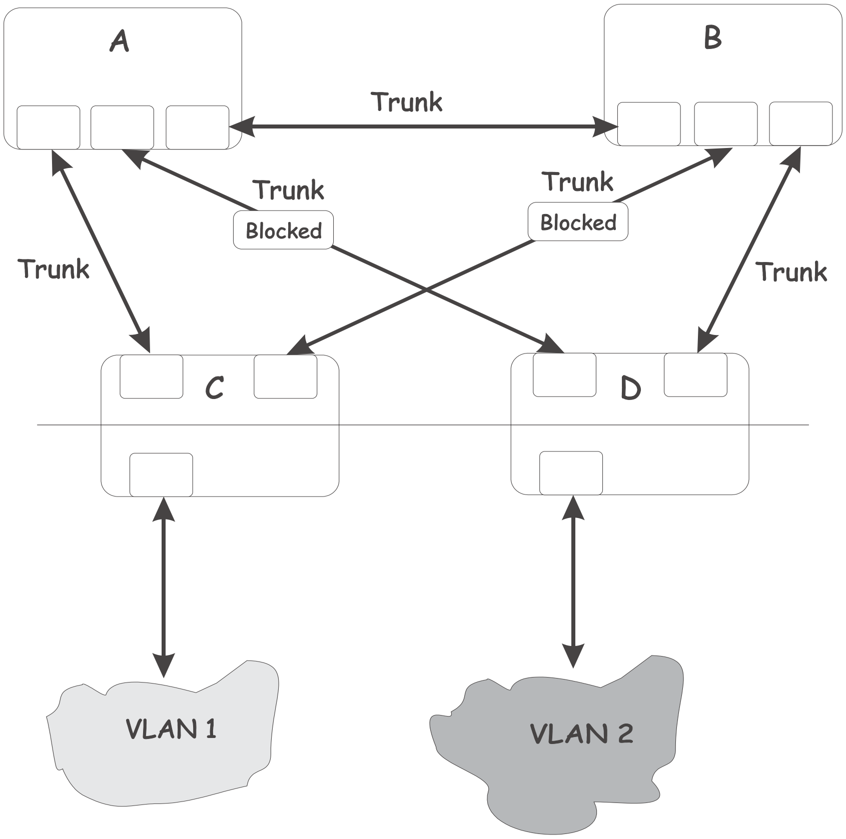
- Know which links are redundant.

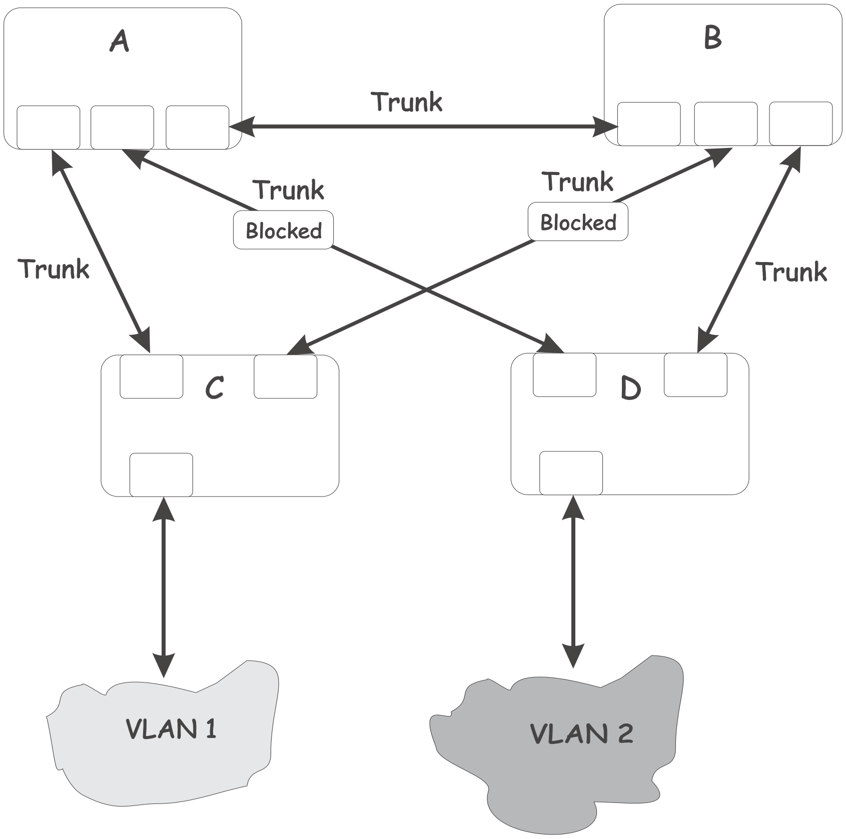
  Organize the redundant links and tune the port cost parameter of STP to force those ports into the blocking state.

  For each VLAN, know which ports should be blocking in a stable network. A network illustration that shows each physical loop in the network and which ports break which loops is extremely helpful.

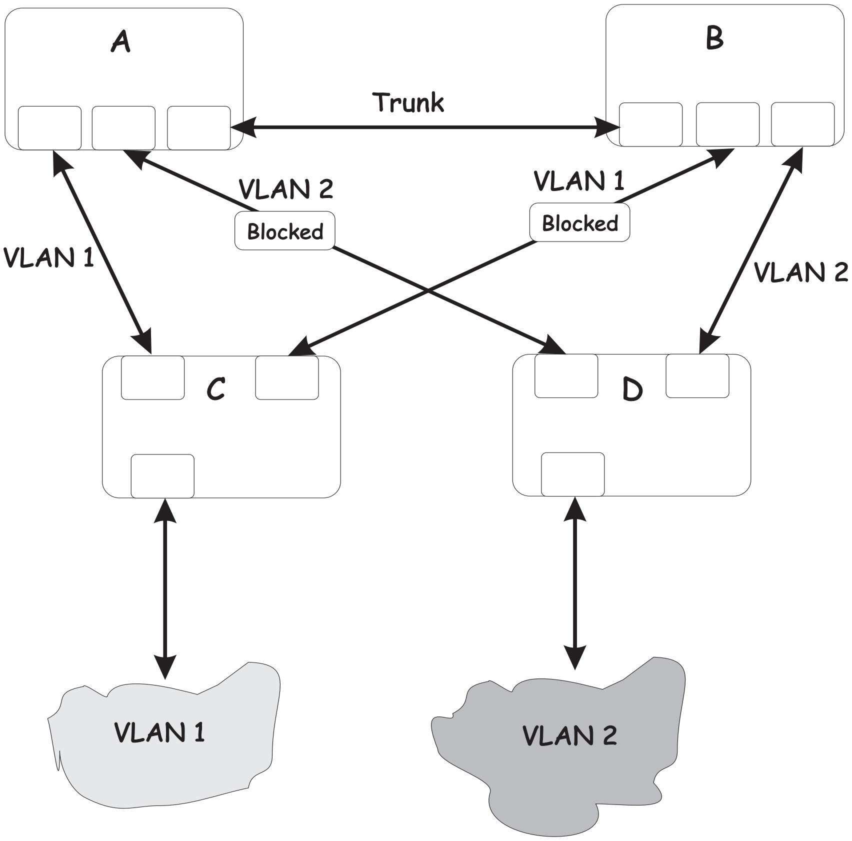
- Minimize the number of ports in the blocking state.

  A single blocking port changing to the forwarding state at an inappropriate time can cause a large part of a network to fail. Limiting the number of blocked ports helps to limit the risk of an inappropriate change.





This is a common network design. Through trunks, switches C and D have redundant links to backbone switches A and B. Trunks, by default, carry all the VLAN traffic from VLAN 1 and VLAN 2. Therefore, switch C is not only receiving traffic for VLAN 1, but switch C is also receiving unnecessary broadcast and multicast traffic for VLAN 2. Switch C is also blocking one port for VLAN 2. Thus, there are three redundant paths between switches A and B and two blocked ports per VLAN. This increases the chance of a data loop.



In this example, the VLAN definitions are extended to switches A and B. This gives only a single blocked port per VLAN and enables the removal of all redundant links by removing switch A or B from the network.

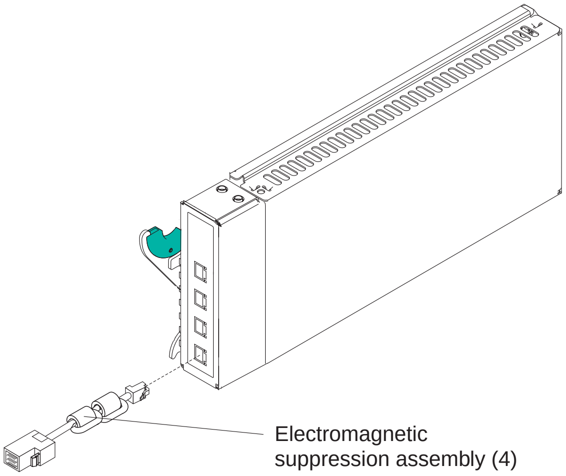
Appendix E. Technical Update

This appendix provides important information regarding Technical Updates.

Electromagnetic suppression assemply

This technical update provides information about the electromagnetic suppression assembly. Use these cables with your Ethernet switch module as shown in the following illustration. You must use one cable for each port on the Ethernet swtich module.

This assembly must be used for compliance to the Electronic Emissions regulations.



Appendix F. Important Safety and Regulatory Information

Only a technically qualified person shall access, integrate, configure and service this product.

Intended Application Uses

This product was evaluated as Information Technology Equipment (ITE), which may be installed in offices, schools, computer rooms, and similar commercial type locations. The suitability of this product for other Product Categories and Environments (such as medical, industrial, alarm systems, and test equipment), other than an ITE application, may require further evaluation.

Safety Instructions and Information

To avoid personal injury or property damage, before you begin installing the product, read, observe, and adhere to all of the following safety instructions and information. The following safety symbols may be used throughout this product guide, and may be marked on the product and or its packaging.

Table 1.Safety Symbols

CAUTION	Indicates the presence of a hazard that may cause minor personal injury or property damage if the CAUTION is ignored.
WARNING	Indicates the presence of a hazard that may result in serious injury or death if the WARNING is ignored.
⚠	Indicates potential hazard if hazard symbol is ignored.
⚡	Indicates shock hazards that result in serious injury or death if safety instructions are not followed.

CAUTION

To avoid electrical shock, check the power cord as follows:

- Do not attempt to modify or use the supplied AC power cord, if they are not the exact type required.
- If a power cord supplied is not compatible with the AC wall outlet in your region, get one that meets the following criteria:
- ¾The power cord must be properly rated for the AC voltage in your region.
- ¾The power cord plug cap must have an electrical current rating that is at least 125% of the electrical current rating of the product.
- ¾The power cord plug cap that plugs into the wall socket-outlet must have a grounding type male plug designed for use in your region.
- ¾The power cord must have safety certifications for your region, and shall be marked with the certification markings.
- ¾The power cord plug cap that plugs into the AC receptacle on the power supply must be an IEC 320, sheet C13, type female connector.

- ¾In Europe, the power cord must be less than 4.5 meters (14.76 feet) long, and it must be flexible <HAR> (harmonized) or VDE certified cordage to comply with the chassis' safety certifications.
- ·The power supply cord(s) is the main disconnect device to AC power. The socket outlet(s) shall be near the equipment and shall be readily accessible for disconnection.

Earth Grounded Socket-Outlets

CAUTION To avoid electrical shock, the system power cord(s) must be plugged into socket-outlet(s) that is provided with a suitable earth ground. The system will be provided with the following marking:

- Connect only to properly earthed socket outlet.
- Apparaten skall anslutas till jordat uttag när den ansluts till ett nätverk.
- Before You Remove the Access Cover

CAUTION To avoid personal injury or property damage, the following safety instructions apply whenever accessing inside the product:

- Turn off all peripheral devices connected to this product.
- Turn off the system by pressing the power button on the front of the product.
- Disconnect the AC power by unplugging all AC power cords from the system or wall outlet.
- Disconnect all cables and telecommunication lines that are connected to the system.
- Retain all screws or other fasteners when removing access cover(s). Upon completion of accessing inside the product, refasten access cover with original screws or fasteners.
- Do not access inside power supply. There are no serviceable parts in the power supply.
- Return to manufacturer for servicing.

Electrostatic Discharge (ESD)

CAUTION Perform the procedures in this product guide only at an electrostatic discharge (ESD) workstation, because the server components can be extremely sensitive to ESD. If no such station is available, you can reduce the risk of electrostatic discharge ESD damage by doing the following:

- Wear an antistatic wrist strap and attach it to a metal part of the server.
- Touch the metal on the server chassis before touching the server components.
- Keep part of your body in contact with the metal server chassis to dissipate the static charge while handling the components.
- Avoid moving around unnecessarily.
- Hold the server components (especially boards) only by the edges.
- Place the server components on a grounded, static-free surface. Use a conductive foam pad if available but not the component wrapper.
- Do not slide the components over any surface.

Equipment Rack Precautions

Follow the rack manufacturer's safety and installation instructions for proper rack installation. The following additional rack safety installation measures shall be considered:

ANCHOR THE EQUIPMENT RACK

The equipment rack must be anchored to an unmovable suitable support to prevent the rack from falling over when one or more systems are fully extended out of the rack assembly. You must also consider the weight of any other devices installed in the rack assembly. The equipment rack must be installed according to the manufacturer's instructions.

MAIN AC POWER DISCONNECT

You are responsible for installing an AC power disconnects for the entire rack unit. This main disconnect must be readily accessible, and it must be labeled as controlling power to the entire unit, not just to the system(s).

GROUNDING THE RACK INSTALLATION

To avoid the potential for an electrical shock hazard, the rack assembly itself must be suitably earth grounded, according to your local regional electrical codes. This typically will require the rack to have its own separate earth ground. We recommend you consult your local approved electrician.

TEMPERATURE LIMITS

The operating temperature of the system, when installed in the rack, must not go below 5 °C (41 °F) or rise above 35 °C (95 °F). Extreme fluctuations in temperature may cause a variety of problems in system, and safety limits may be broken.

VENTILATION CONSIDERATIONS

The equipment rack must provide sufficient airflow to the front of the system to maintain proper cooling. The rack selected and the ventilation provided must be suitable to the environment in which the system will be used.

Product Regulation Compliance Information

This product has been verified to comply with the following safety standards / requirements

Product Safety

Argentina	Resolution S.I.C.M No. 92/98
Australia / New Zealand	AS/NZS 3562

Canada / USA	UL60 950 - CSA60 950
China	GB4943-1995
European	UnionEN60 950 & 73/23/EEC
Germany	EN60 950
International	IEC 60 950, 3rd Edition
Nordics	EMKO-TSE (74-SEC) 207/94
Russia	GOST-R 50377-92

Electromagnetic Compatibility (EMC) - Emissions

Australia / New Zealand	AS/NZS 3548 (Class A)
Canada	ICES-003 (Class A)
China	GB9254-1998
European	UnionEN55022: 1994 (Class A) & 89/336/EEC
International	CISPR 22, 3rd Edition (Class A)
Japan	VCCI (Class A)
Korea	MIC Notice 1997-42 (Class A)
Russia	GOST-R 29216-91 (Class A)
Taiwan	BSMI CNS13438
USA	Title 47 CFR, Part 15 (Class A)

Electromagnetic Compatibility - Immunity

China	GB9254-1998
European	UnionEN55024: 1998
International	CISPR 24: 1st Edition
Korea	MIC Notice 1997-41
Russia	GOST-R 50628-95

Power Line Harmonics / Voltage Flicker

European	UnionEN61000-3-2 / EN61000-3-3
International	IEC61000-3-2
Japan	JEIDA

Product Regulatory Compliance Markings

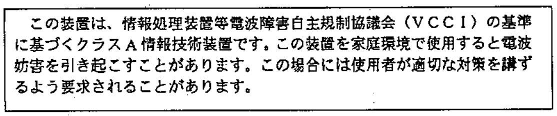
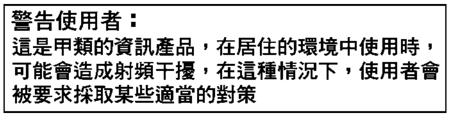
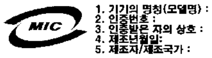
Country	Marking	Marking Description
Australia / New Zealand	N232	EMC Compliance Mark.
Canada	C UL US	System Compliance Safety Mark (sam USA)
	CANADA ICES-003 CLASS A	EMC Compliance Mark
China	CCC	CCC EMC & Safety Compliance Marki
	声明 此为 A 级产品，在生活环境中，该产品可能会造成无线电干擾。 在这種情况下，可能需要用戶对其干擾采取可行的措施。	EMC Class A Warning
European Union / Nordics	CE	Declaration of Conformity Mark
Germany	GS	System Safety Compliance Mark
Japan	この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。VCCI-A	EMC Compliance Mark – Class A
Korea	MIC	EMC Compliance Mark
Russia	PCT	Safety & EMC Compliance Mark
Taiwan	R33025	BSMI Certification Number
	警告使用者： 這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策	BSMI EMC Warning for Class A Devic
USA	C UL US	System Compliance Safety Mark (sam Canada)
	This device complies with Part 15 of the FCC Rules. Operation of this device is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation. Manufactured by Intel Corporation	EMC Compliance Marking Statement - Class A Products

Regional EMC Compliance Information

Table 2.Regional EMC Compliance Information

Country	Compliance Information
USA	**FCC Verification Notice (Class A)** This device complies with Part 15 of the FCC Rules. Operation is subject to t following two conditions: (1) this device may not cause harmful interference, (2) this device must accept any interference received, including interference t may cause undesired operation. For questions related to the EMC performance of this product, contact: Intel Corporation 5200 N.E. Elam Young Parkway Hillsboro, OR 97124 1-800-628-8686 This equipment has been tested and found to comply with the limits for a Clas digital device, pursuant to Part 15 of the FCC Rules. These limits are NOT designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radi frequency energy and, if not installed and used in accordance with the instruc may cause harmful interference to radio communications. However, there is guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, w can be determined by turning the equipment off and on, the user is encourag try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna. Increase the separation between the equipment and the receiver. Connect the equipment to an outlet on a circuit other than the one to which th receiver is connected. Consult the dealer or an experienced radio/TV technician for help.
CANADA	**INDUSTRY CANADA (Class A)** This Class A digital apparatus complies with Canadian ICES-003. Cet appereil numérique de la classe A est conforme à la norme NMB-003 du Canada.
EUROPE	**CE Declaration of Conformity** This product has been tested in accordance to, and complies with the Europe Low Voltage Directive (73/23/EEC) and European EMC Directive (89/336/EE The product has been marked with the CE Mark to illustrate its compliance.

Table 3.Regional EMC Compliance Information (continued)

Country	Compliance Information
JAPAN	**VCCI (Class A)**  この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 English translation of the notice above is as follow: This is a Class A product based on the standard of the Voluntary Control Cou For Interference (VCCI) from Information Technology Equipment. If this is us near a radio or television receiver in a domestic environment, it may cause ra interference. Install and use the equipment according to the instruction manu
TAIWAN	**BSMI Certification Information** The following BSMI Certification Number is marked on the product: R33025 The following BSMI EMC Warning is marked on the product: BSMI Cert No a EMC Warning are required for Class A products.  警告使用者： 這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策
KOREA	**RRL Certification Information**  1. 기기의 명칭(모델명) : 2. 인증번호 : 3. 인증받은 자의 상호 : 4. 제조년월일: 5. 제조자/제조국가 : The English translation for the above is as follows: 1. Type of Equipment (Model Name): Refer to Model Name on Product. 2. Certification No.: Contact Intel representative. 3. Name of Certification Recipient: Intel Corporation. 4. Date of Manufacturer: Refer to date code on product. 5. Manufacturer / Nation: Intel / Refer to manufacturing label on product.

Backup Battery

⚠ WARNING!

Danger of explosion if battery is incorrectly replaced. Replace with only the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer’s instructions.

⚠ ADVARSEL!

Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

⚠ ADVARSEL!

Lithiumbatteri - Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

⚠ VARNING!

Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

⚠ VAROITUS!

Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

Replacing Backup Battery

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Open the chassis.
3. Insert the tip of a small flat bladed screwdriver, or equivalent, under the tab in the plastic retainer. Gently push down on the screwdriver to lift the battery.
4. Remove the battery from its socket.

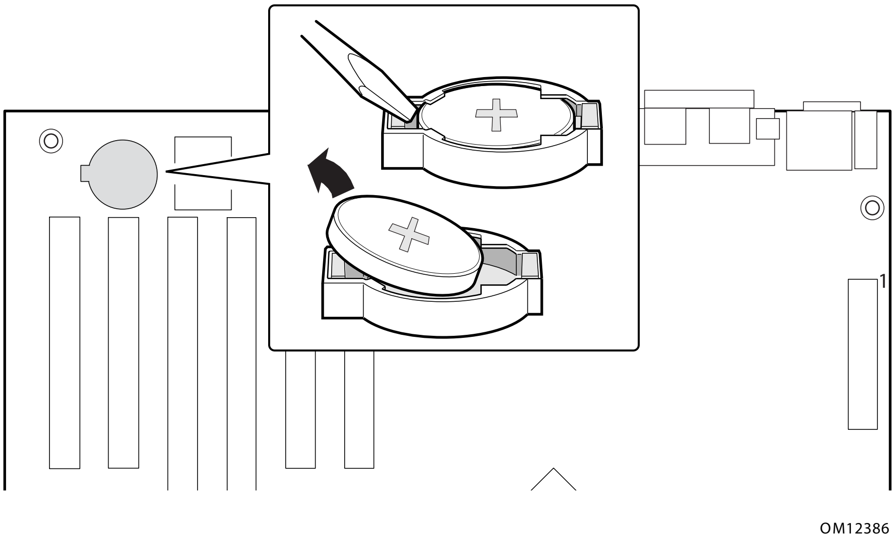


Figure 1. Replacing the Backup Battery

5. Dispose of the battery according to local ordinance.
6. Remove the new lithium battery from its package, and, being careful to observe the correct polarity, insert it in the battery socket.
7. Close the chassis.
8. Run Setup to restore the configuration settings to the RTC.