



# **X** S T A C K USER MANUAL

PRODUCT MODEL: **xStack**<sup>™</sup> **DGS-3400 SERIES**

LAYER 2 GIGABIT MANAGED SWITCH

RELEASE 1

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## Intended Readers

The *xStack DGS-3400 series Manual* contains information for setup and management of the Switch. This manual is intended for network managers familiar with network management concepts and terminology.

## Typographical Conventions

Convention	Description
[ ]	In a command line, square brackets indicate an optional entry. For example: [copy filename] means that optionally you can type copy followed by the name of the file. Do not type the brackets.
<b>Bold font</b>	Indicates a button, a toolbar icon, menu, or menu item. For example: Open the <b>File</b> menu and choose <b>Cancel</b> . Used for emphasis. May also indicate system messages or prompts appearing on screen. For example: <b>You have mail</b> . <b>Bold font</b> is also used to represent filenames, program names and commands. For example: <b>use the copy command</b> .
<b>Boldface Typewriter Font</b>	Indicates commands and responses to prompts that must be typed exactly as printed in the manual.
Initial capital letter	Indicates a window name. Names of keys on the keyboard have initial capitals. For example: Click Enter.
<i>Italics</i>	Indicates a window name or a field. Also can indicate a variables or parameter that is replaced with an appropriate word or string. For example: type <i>filename</i> means that the actual filename should be typed instead of the word shown in italic.
<b>Menu Name &gt; Menu Option</b>	<b>Menu Name &gt; Menu Option</b> Indicates the menu structure. <b>Device &gt; Port &gt; Port Properties</b> means the Port Properties menu option under the Port menu option that is located under the Device menu.

## Notes, Notices, and Cautions



A **NOTE** indicates important information that helps make better use of the device.




A **NOTICE** indicates either potential damage to hardware or loss of data and tells how to avoid the problem.



A **CAUTION** indicates a potential for property damage, personal injury, or death.

## Safety Instructions

Use the following safety guidelines to ensure your own personal safety and to help protect your system from potential damage. Throughout this safety section, the caution icon (  ) is used to indicate cautions and precautions that need to be reviewed and followed.



### Safety Cautions

To reduce the risk of bodily injury, electrical shock, fire, and damage to the equipment, observe the following precautions.

- Observe and follow service markings.
  - Do not service any product except as explained in the system documentation.
  - Opening or removing covers that are marked with the triangular symbol with a lightning bolt may expose the user to electrical shock.
  - Only a trained service technician should service components inside these compartments.
- If any of the following conditions occur, unplug the product from the electrical outlet and replace the part or contact your trained service provider:
  - Damage to the power cable, extension cable, or plug.
  - An object has fallen into the product.
  - The product has been exposed to water.
  - The product has been dropped or damaged.
  - The product does not operate correctly when the operating instructions are correctly followed.
- Keep your system away from radiators and heat sources. Also, do not block cooling vents.
- Do not spill food or liquids on system components, and never operate the product in a wet environment. If the system gets wet, see the appropriate section in the troubleshooting guide or contact your trained service provider.
- Do not push any objects into the openings of the system. Doing so can cause fire or electric shock by shorting out interior components.
- Use the product only with approved equipment.
- Allow the product to cool before removing covers or touching internal components.
- Operate the product only from the type of external power source indicated on the electrical ratings label. If unsure of the type of power source required, consult your service provider or local power company.
- To help avoid damaging the system, be sure the voltage selection switch (if provided) on the power supply is set to match the power available at the Switch's location:
  - 115 volts (V)/60 hertz (Hz) in most of North and South America and some Far Eastern countries such as South Korea and Taiwan
  - 100 V/50 Hz in eastern Japan and 100 V/60 Hz in western Japan
  - 230 V/50 Hz in most of Europe, the Middle East, and the Far East
- Also, be sure that attached devices are electrically rated to operate with the power available in your location.
- Use only approved power cable(s). If you have not been provided with a power cable for your system or for any AC-powered option intended for your system, purchase a power cable that is approved for use in your country. The power cable must be rated for the product and for the voltage and current marked on the product's electrical ratings label. The voltage and current rating of the cable should be greater than the ratings marked on the product.

- To help prevent electric shock, plug the system and peripheral power cables into properly grounded electrical outlets. These cables are equipped with three-prong plugs to help ensure proper grounding. Do not use adapter plugs or remove the grounding prong from a cable. If using an extension cable is necessary, use a 3-wire cable with properly grounded plugs.
- Observe extension cable and power strip ratings. Make sure that the total ampere rating of all products plugged into the extension cable or power strip does not exceed 80 percent of the ampere ratings limit for the extension cable or power strip.
- To help protect the system from sudden, transient increases and decreases in electrical power, use a surge suppressor, line conditioner, or uninterruptible power supply (UPS).
- Position system cables and power cables carefully; route cables so that they cannot be stepped on or tripped over. Be sure that nothing rests on any cables.
- Do not modify power cables or plugs. Consult a licensed electrician or your power company for site modifications. Always follow your local/national wiring rules.
- When connecting or disconnecting power to hot-pluggable power supplies, if offered with your system, observe the following guidelines:
  - Install the power supply before connecting the power cable to the power supply.
  - Unplug the power cable before removing the power supply.
  - If the system has multiple sources of power, disconnect power from the system by unplugging all power cables from the power supplies.
- Move products with care; ensure that all casters and/or stabilizers are firmly connected to the system. Avoid sudden stops and uneven surfaces.



## General Precautions for Rack-Mountable Products

Observe the following precautions for rack stability and safety. Also, refer to the rack installation documentation accompanying the system and the rack for specific caution statements and procedures.

- Systems are considered to be components in a rack. Thus, "component" refers to any system as well as to various peripherals or supporting hardware.



**CAUTION:** Installing systems in a rack without the front and side stabilizers installed could cause the rack to tip over, potentially resulting in bodily injury under certain circumstances. Therefore, always install the stabilizers before installing components in the rack. After installing system/components in a rack, never pull more than one component out of the rack on its slide assemblies at one time. The weight of more than one extended component could cause the rack to tip over and may result in serious injury.

- Before working on the rack, make sure that the stabilizers are secured to the rack, extended to the floor, and that the full weight of the rack rests on the floor. Install front and side stabilizers on a single rack or front stabilizers for joined multiple racks before working on the rack.
- Always load the rack from the bottom up, and load the heaviest item in the rack first.
- Make sure that the rack is level and stable before extending a component from the rack.
- Use caution when pressing the component rail release latches and sliding a component into or out of a rack; the slide rails can pinch your fingers.
- After a component is inserted into the rack, carefully extend the rail into a locking position, and then slide the component into the rack.

- Do not overload the AC supply branch circuit that provides power to the rack. The total rack load should not exceed 80 percent of the branch circuit rating.
- Ensure that proper airflow is provided to components in the rack.
- Do not step on or stand on any component when servicing other components in a rack.



**NOTE:** A qualified electrician must perform all connections to DC power and to safety grounds. All electrical wiring must comply with applicable local or national codes and practices.



**CAUTION:** Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if uncertain that suitable grounding is available.



**CAUTION:** The system chassis must be positively grounded to the rack cabinet frame. Do not attempt to connect power to the system until grounding cables are connected. Completed power and safety ground wiring must be inspected by a qualified electrical inspector. An energy hazard will exist if the safety ground cable is omitted or disconnected.

## Protecting Against Electrostatic Discharge

Static electricity can harm delicate components inside the system. To prevent static damage, discharge static electricity from your body before touching any of the electronic components, such as the microprocessor. This can be done by periodically touching an unpainted metal surface on the chassis.

The following steps can also be taken prevent damage from electrostatic discharge (ESD):

1. When unpacking a static-sensitive component from its shipping carton, do not remove the component from the antistatic packing material until ready to install the component in the system. Just before unwrapping the antistatic packaging, be sure to discharge static electricity from your body.
2. When transporting a sensitive component, first place it in an antistatic container or packaging.
3. Handle all sensitive components in a static-safe area. If possible, use antistatic floor pads, workbench pads and an antistatic grounding strap.

# Introduction

*Ethernet Technology*

*Switch Description*

*Features*

*Ports*

*Front-Panel Components*

*Side Panel Description*

*Rear Panel Description*

*Gigabit Combo Ports*

*Ethernet Technology*

*Fast Ethernet Technology*

The DGS-3400 Gigabit Ethernet switches are members of the D-Link xStack family. Ranging from 10/100Mbps edge switches to core gigabit switches, the xStack switch family has been future-proof designed to deliver a system with fault tolerance, flexibility, port density, robust security and maximum throughput with a user-friendly management interface for the networking professional.

This manual describes the installation, maintenance and configurations concerning members of the xStack DGS-3400 Switch Series. These switches include: the DGS-3426, DGS-3427 and the DGS-3450. The DGS-3400 Series switches are similar in configurations and basic hardware and consequentially, most of the information in this manual will be universal to the whole xStack DGS-3400 Series. Corresponding screen pictures of the web manager may be taken from any one of these switches but the configuration will be identical, except for varying port counts.

## Switch Description

D-Link's next-generation xStack DGS-3400 series switches are high port-density stackable switches that combine the ultimate performance with fault tolerance, security, management functions with flexibility and ease-of-use. All these features, typically found in the more expensive chassis-based solutions, are available from the xStack DGS-3400 switch series at the price of a stackable switch!

All xStack DGS-3400 Series switches have some combination of 1000BASE-T ports, SFP ports and 10-Gigabit ports that may be used in uplinking various network devices to the Switch, including PCs, hubs and other switches to provide a gigabit Ethernet uplink in full-duplex mode. The SFP (Small Form Factor Portable) combo ports are used with fiber-optical transceiver cabling in order to uplink various other networking devices for a gigabit link that may span great distances. These SFP ports support full-duplex transmissions, have auto-negotiation and can be used with DEM-310GT (1000BASE-LX), DEM-311GT (1000BASE-SX), DEM-314GT (1000BASE-LH) and DEM-315GT (1000BASE-ZX) transceivers. The rear panel of the DGS-3400 Series Switches include spaces for optional single-port module inserts for single port 10GE XFP or 10GBASE-CX4 modules used for backbone uplink or STACKING connection to another xStack DGS-3400 Series Switch.



## Features

The list of features below highlights the significant features of the xStack DGS-3400 Series.

- IEEE 802.3z compliant
- IEEE 802.3x Flow Control in full-duplex compliant
- IEEE 802.3u compliant
- IEEE 802.3ab compliant
- IEEE 802.3ae compliant (for optional XFP module)
- IEEE 802.1p Priority Queues
- IEEE 802.3ad Link Aggregation Control Protocol support.
- IEEE 802.1x Port-based and MAC-based Access Control
- IEEE 802.1Q VLAN
- IEEE 802.1D Spanning Tree, IEEE 802.1W Rapid Spanning Tree and IEEE 802.1s Multiple Spanning Tree support
- STACKING support in either Ring or Star topology
- Access Control List (ACL) support
- IP Multinetting support
- Protocol VLAN support
- Single IP Management support
- Access Authentication Control utilizing TACACS, XTACACS, TACACS+ and RADIUS protocols
- Dual Image Firmware
- Simple Network Time Protocol support
- MAC Notification support
- System and Port Utilization support
- System Log Support
- High performance switching engine performs forwarding and filtering at full wire speed up to 128Gbps.
- Full- and half-duplex for all gigabit ports. Full duplex allows the switch port to simultaneously transmit and receive data. It only works with connections to full-duplex-capable end stations and switches. Connections to a hub must take place at half-duplex.
- Support broadcast storm filtering
- Non-blocking store and forward switching scheme capability to support rate adaptation and protocol conversion
- Supports by-port Egress/Ingress rate control
- Efficient self-learning and address recognition mechanism enables forwarding rate at wire speed
- Support port-based enable and disable
- Address table: Supports up to 8K MAC addresses per device
- Supports a packet buffer of up to 3 Mbits
- Supports Port-based VLAN Groups
- Port Trunking with flexible load distribution and fail-over function
- IGMP Snooping support
- IGMP version 3

- SNMP support
- Secure Sockets Layer (SSL) and Secure Shell (SSH) support
- System Severity control
- Port Mirroring support
- MIB support for:
  - RFC1213 MIB II
  - RFC1493 Bridge
  - RFC1757 RMON
  - RFC1643 Ether-like MIB
  - RFC2233 Interface MIB
  - IF MIB
  - Private MIB
  - RFC2674 for 802.1p
  - IEEE 802.1x MIB
- RS-232 DCE console port for Switch management
- Provides parallel LED display for port status such as link/act, speed, etc.

## Ports

The DGS-3400 Series Switches have port options as listed by device.

DGS-3426	DGS-3427	DGS-3450
<ul style="list-style-type: none"> <li>• 10/100/1000BASE-T Gigabit ports</li> <li>•</li> <li>• 10GE XFP or 10GBASE-CX4 modules</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Twenty-four 10/100/1000BASE-T Gigabit ports</li> <li>• Four Combo SFP Ports</li> <li>• Three slots open for single port 10GE XFP or 10GBASE-CX4 modules</li> <li>• One RS-232 DB-9 console port</li> </ul>	<ul style="list-style-type: none"> <li>• Forty-eight 10/100/1000BASE-T Gigabit ports</li> <li>•</li> <li>• 10GE XFP or 10GBASE-CX4 modules</li> <li>•</li> </ul>



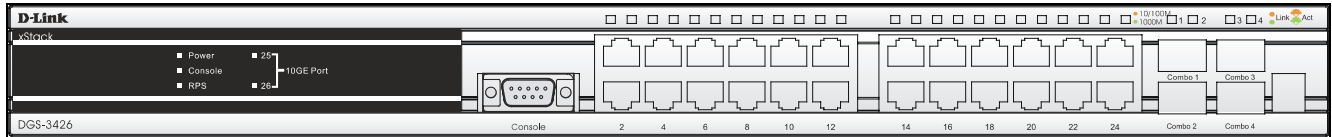
**NOTE:** For customers interested in D-View, D-Link Corporation's proprietary SNMP management software, go to the D-Link Website and download the software and manual.

## Front-Panel Components

The front panel of the Switch consists of LED indicators for Power, Master, Console, RPS, and for Link/Act for each port on the Switch including 10GE Ports for optional modules and SFP port LEDs. The front panel includes a seven-segment LED indicating the Stack ID number\*. A separate table below describes LED indicators in more detail.

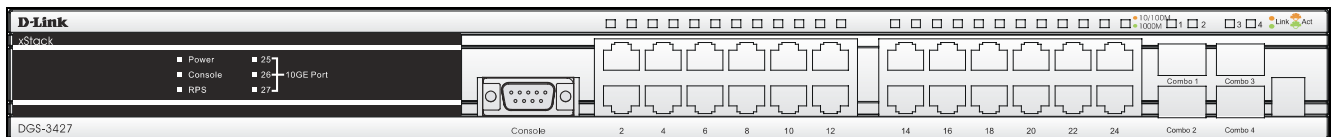
\* Note that Stacking in the DGS-3400 Series is not yet supported in this firmware release.

### DGS-3426



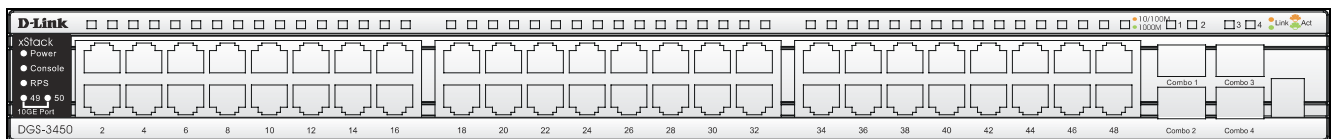
**Figure 2- 1. Front Panel View of the DGS-3426 as shipped**

### DGS-3427



**Figure 2- 2. Front Panel View of the DGS-3427 as shipped**

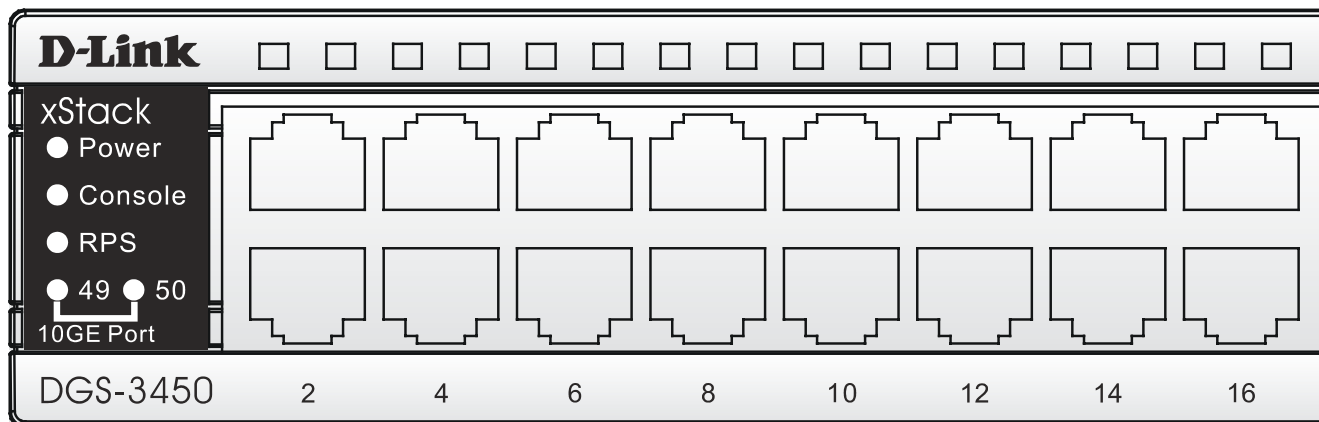
### DGS-3450



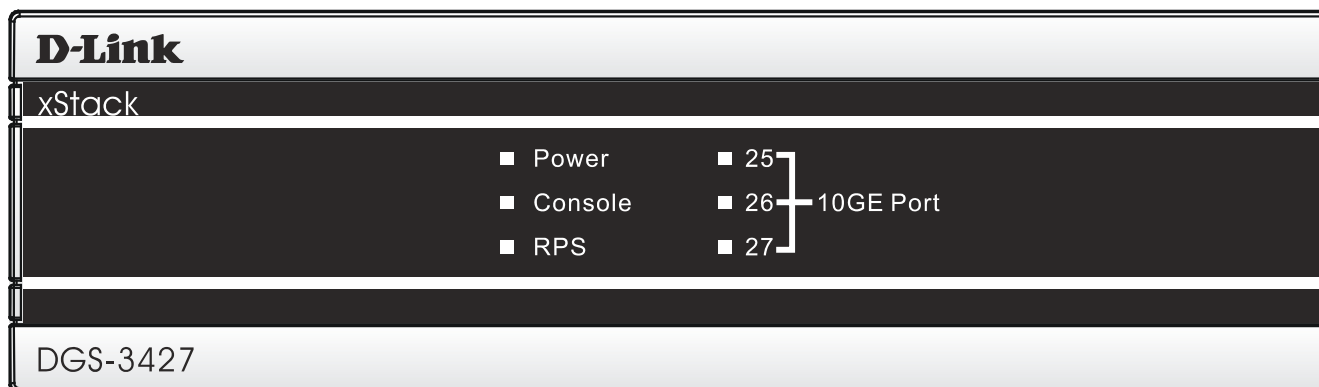
**Figure 2- 3. Front Panel View of the DGS-3450 as shipped**

## LED Indicators

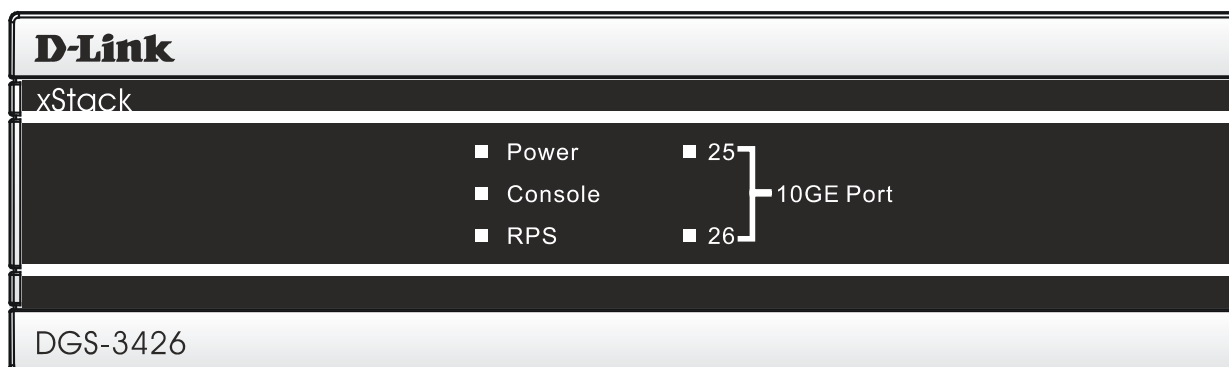
The Switch supports LED indicators for Power, Console, RPS and Port LEDs including 10GE port LEDs for optional module inserts..



**Figure 2- 4. LED Indicators on DGS-3450**



**Figure 2- 5. LED Indicators on DGS-3427**



**Figure 2- 6. LED Indicators on DGS-3426**

<b>LED</b>	<b>Description</b>
<b>Power</b>	This LED will light green after powering the Switch on to indicate the ready state of the device. The indicator is dark when the Switch is no longer receiving power (i.e powered off).
<b>Console</b>	This LED will blink green during the Power-On Self Test (POST). When the POST is finished, the LED goes dark. The indicator will light steady green when an active console link is in session via RS-232 console port.
<b>RPS</b>	This LED will light when the internal power has failed and the RPS has taken over the power supply to the Switch. Otherwise, it will remain dark.
<b>Port LEDs</b>	One row of LEDs for each port is located above the ports on the front panel. The indicator above the left side of a port corresponds to the port below the indicator in the upper row of ports. The indicator above the right side of a port corresponds to the port below the indicator in the lower row of ports. A steady green light denotes a valid 1000Mbps link on the port while a blinking green light indicates activity on the port (at 1000Mbps). A steady orange light denotes a valid 10 or 100Mbps link on the port while a blinking orange light indicates activity on the port (at 100Mbps). These LEDs will remain dark if there is no link/activity on the port.
<b>10GE Ports</b>	A steady green light denotes a valid link on the port while a blinking green light indicates activity on the port. These LEDs will remain dark if there is no link/activity on the port.
<b>Combo SFP Ports</b>	LED indicators for the Combo ports are located above the ports and numbered 1 – 4 for Comb 1, Combo 2, etc. ports. A steady green light denotes a valid link on the port while a blinking green light indicates activity on the port. These LEDs will remain dark if there is no link/activity on the port.
<b>Stack ID*</b>	These two seven segment LEDs display the current switch stack order of the Switch while in use.

\* Note that Stacking in the DGS-3400 Series is not yet supported in this firmware release.

## Rear Panel Description

### DGS-3426

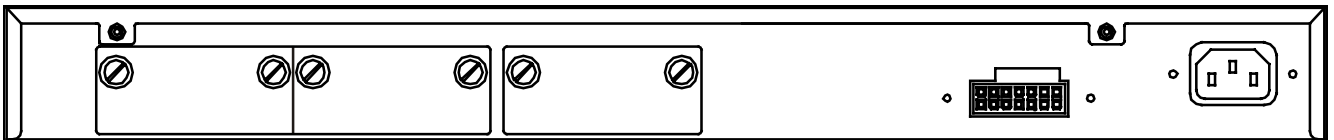
The rear panel of the DGS-3426 contains an AC power connector, a redundant power supply connector and two empty slots for optional module inserts.



**Figure 2- 7. Rear panel view of DGS-3426**

### DGS-3427

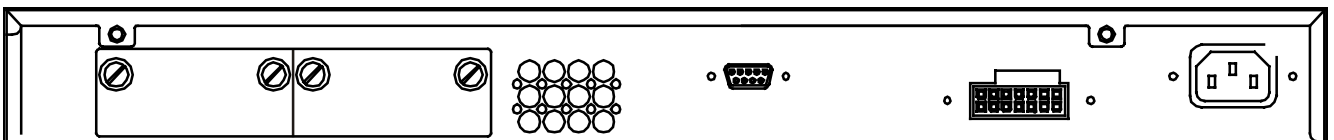
The rear panel of the DGS-3427 contains an AC power connector, a redundant power supply connector and three empty slots for optional module inserts.



**Figure 2- 8. Rear panel view of DGS-3427**

### DGS-3450

The rear panel of the DGS-3450 contains an AC power connector, two empty slots for optional module inserts, a redundant power supply connector, a RS-232 DCE console port for Switch management and a system fan vent.



**Figure 2- 9. Rear panel view of DGS-3450**

The AC power connector is a standard three-pronged connector that supports the power cord. Plug-in the female connector of the provided power cord into this socket, and the male side of the cord into a power outlet. The Switch automatically adjusts its power setting to any supply voltage in the range from 100 ~ 240 VAC at 50 ~ 60 Hz.

The rear panel also includes an outlet for an optional external power supply. When a power failure occurs, the optional external RPS will immediately and automatically assume the power supply for the Switch.

## Side Panel Description

DGS-3426 & DGS-3450

The system fans and heat vents located on each side dissipate heat. Do not block these openings. Leave at least 6 inches of space at the rear and sides of the Switch for proper ventilation. Be reminded that without proper heat dissipation and air circulation, system components might overheat, which could lead to system failure and severely damage components.

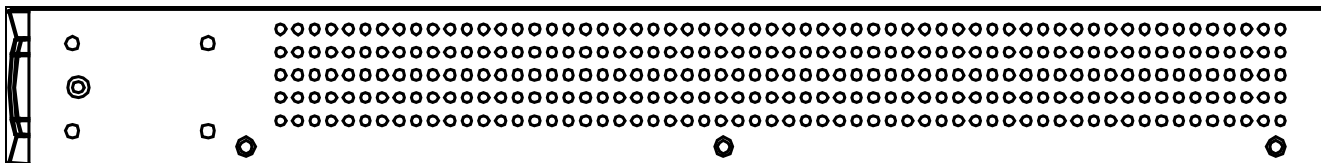
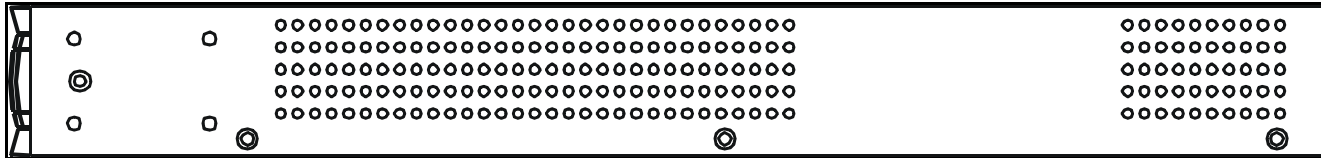


Figure 2- 10. Side Panels (DGS-3450)

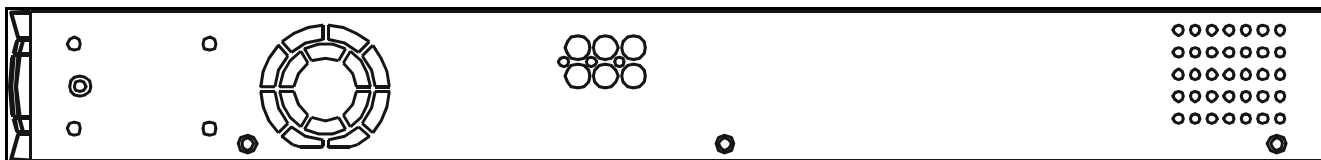
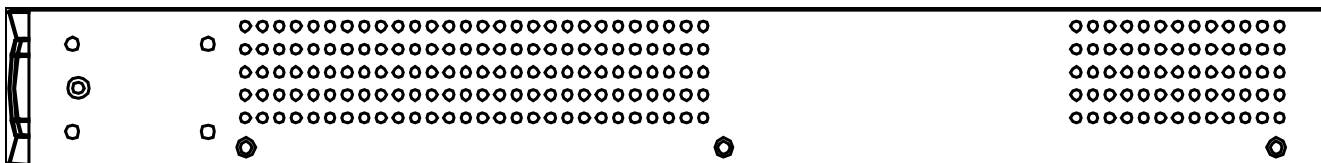


Figure 2- 11. Side Panels (DGS-3426 and DGS-3427)

# Installation

***Package Contents***

***Installation Guidelines***

***Installing the Switch without the Rack***

***Rack Installation***

***Power On***

***The Optional Module***

***Redundant Power System***

## Package Contents

Open the shipping carton of the Switch and carefully unpack its contents. The carton should contain the following items:

1. One xStack Stackable Switch
2. One AC power cord
3. Mounting kit (two brackets and screws)
4. Four rubber feet with adhesive backing
5. RS-232 console cable
6. One CD Kit for User's Guide/CLI/D-View module
7. One CD Kit for D-View 5.1 Standard version(for Europe only)
8. Registration card & China Warranty Card (for China only)

If any item is missing or damaged, please contact your local D-Link Reseller for replacement.

## Installation Guidelines

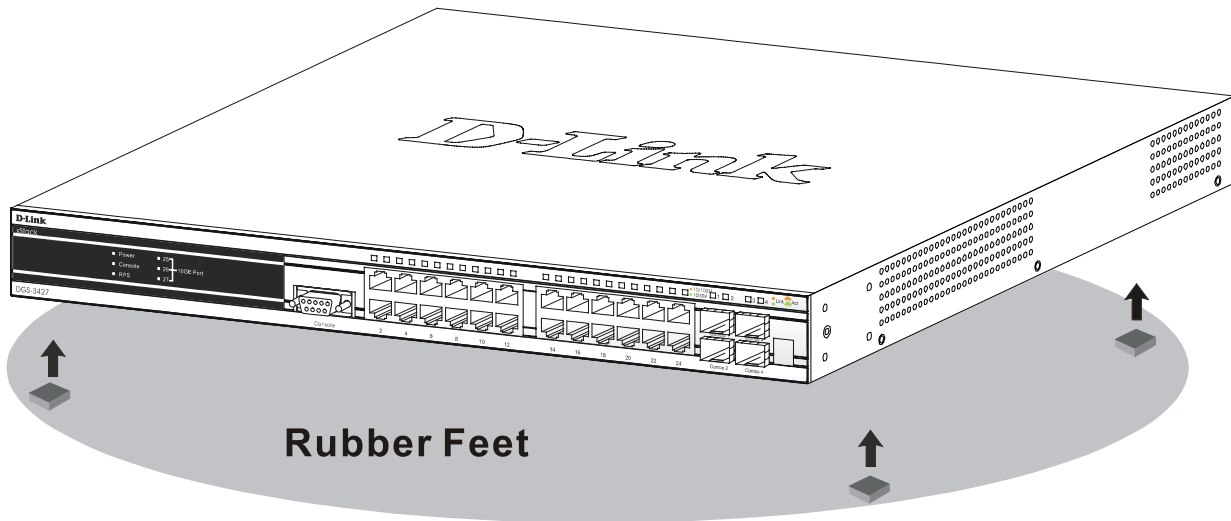
Please follow these guidelines for setting up the Switch:

- Install the Switch on a sturdy, level surface that can support at least 6.6 lb. (3 kg) of weight. Do not place heavy objects on the Switch.
- The power outlet should be within 1.82 meters (6 feet) of the Switch.
- Visually inspect the power cord and see that it is fully secured to the AC power port.
- Make sure that there is proper heat dissipation from and adequate ventilation around the Switch. Leave at least 10 cm (4 inches) of space at the front and rear of the Switch for ventilation.
- Install the Switch in a fairly cool and dry place for the acceptable temperature and humidity operating ranges.
- Install the Switch in a site free from strong electromagnetic field generators (such as motors), vibration, dust, and direct exposure to sunlight.
- When installing the Switch on a level surface, attach the rubber feet to the bottom of the device. The rubber feet cushion the Switch, protect the casing from scratches and prevent it from scratching other surfaces.



## Installing the Switch without the Rack

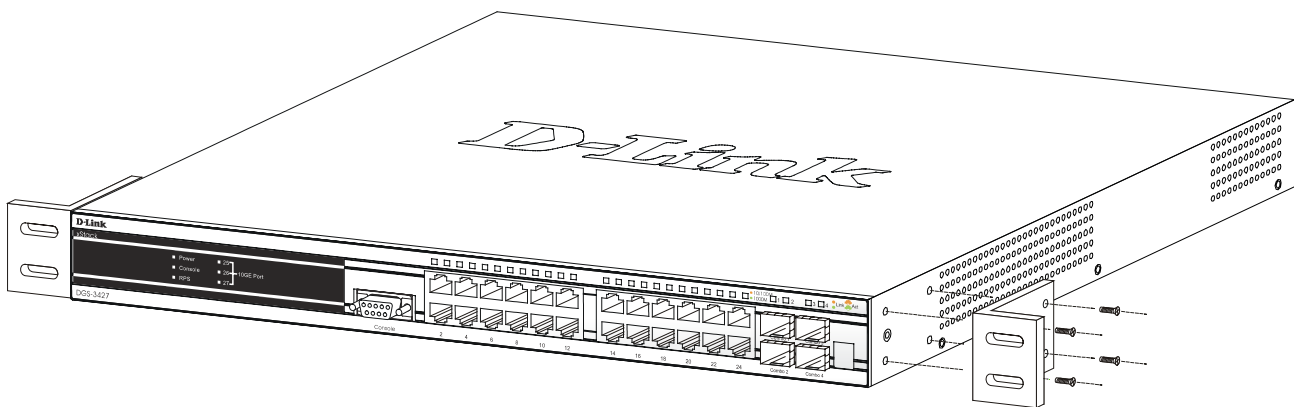
First, attach the rubber feet included with the Switch if installing on a desktop or shelf. Attach these cushioning feet on the bottom at each corner of the device. Allow enough ventilation space between the Switch and any other objects in the vicinity.



**Figure 2- 12. Prepare Switch for installation on a desktop or shelf**

## Installing the Switch in a Rack

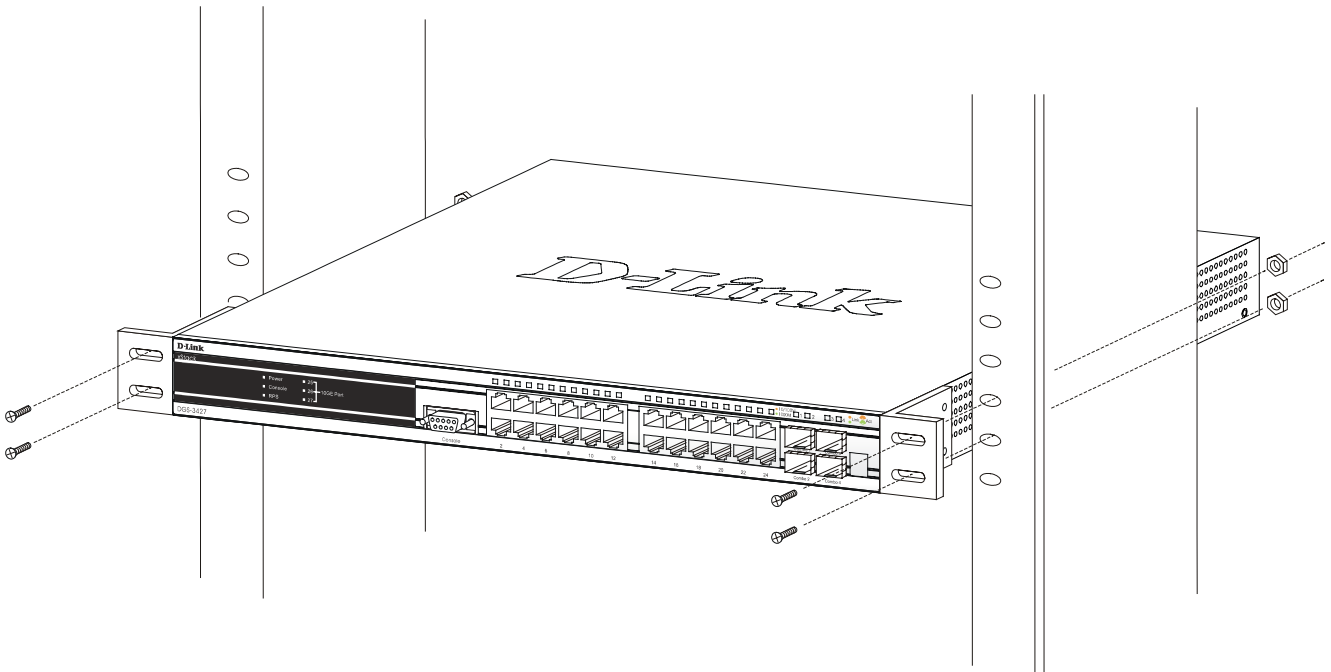
The Switch can be mounted in a standard 19" rack. Use the following diagrams as a guide.



**Figure 2- 13. Fasten mounting brackets to Switch**

Fasten the mounting brackets to the Switch using the screws provided. With the brackets attached securely, the Switch can be mounted in a standard rack as shown below.

## Mounting the Switch in a Standard 19" Rack



**Figure 2- 14. Installing Switch in a rack**

## Power On

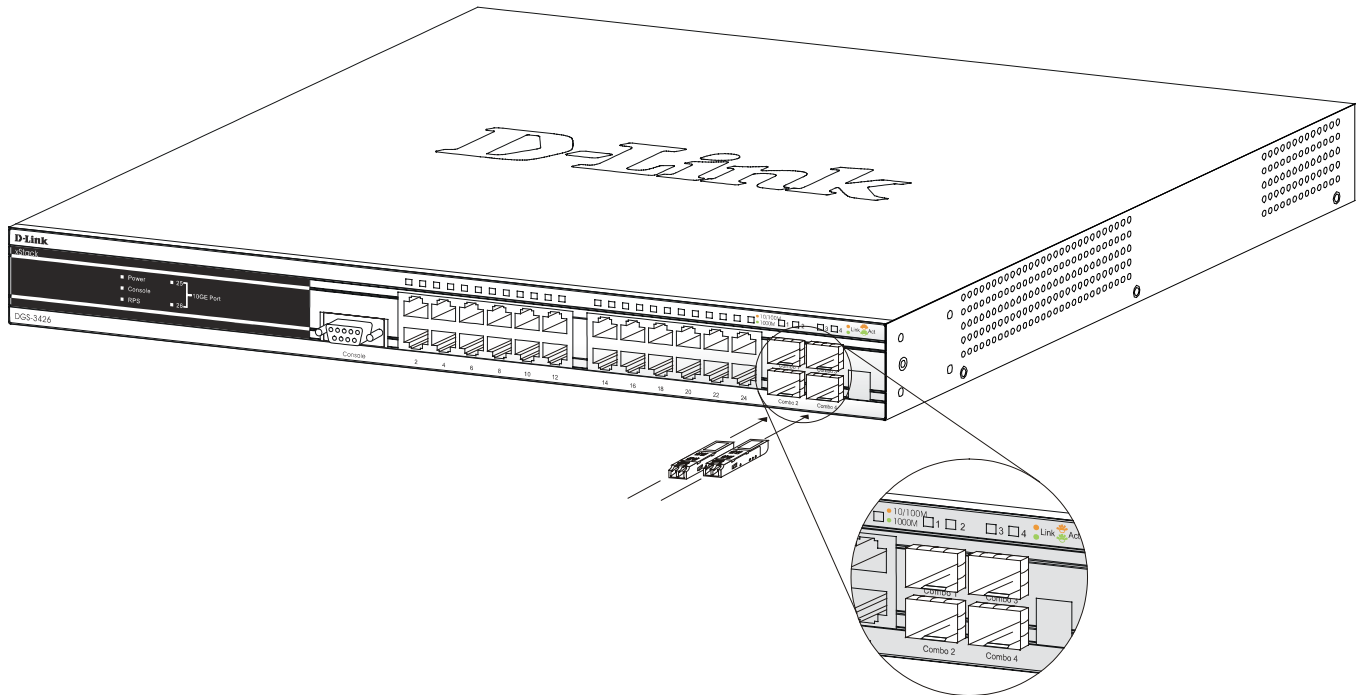
1. Plug one end of the AC power cord into the power connector of the Switch and the other end into the local power source outlet.
2. After powering on the Switch, the LED indicators will momentarily blink. This blinking of the LED indicators represents a reset of the system.

## Power Failure

As a precaution, in the event of a power failure, unplug the Switch. When power is resumed, plug the Switch back in.

## Installing the SFP ports

The xStack DGS-3400 series switches are equipped with SFP (Small Form Factor Portable) ports, which are to be used with fiber-optical transceiver cabling in order to uplink various other networking devices for a gigabit link that may span great distances. These SFP ports support full-duplex transmissions, have auto-negotiation and can be used with DEM-310GT (1000BASE-LX), DEM-311GT (1000BASE-SX), DEM-314GT (1000BASE-LH) and DEM-315GT (1000BASE-ZX) transceivers. See the figure below for installing the SFP ports in the Switch.



**Figure 2- 15. Inserting the fiber-optic transceivers into the DGS-3426**

## The Optional Module

The rear panel of the DGS-3426, DGS-3427 and DGS-3450 include open slots that may be equipped with the DEM-410X 1-port 10GE XFP uplink module, or a DEM-410CX 1-port 10GBASE-CX4 uplink module, both sold separately.

Adding the DEM-410X optional module will allow the administrator to transmit data at a rate of ten gigabits a second. The module port(s) are compliant with standard IEEE 802.3ae, support full-duplex transmissions only and must be used with XFP MSA compliant transceivers.

The DEM-410CX uses copper wire medium, not optic fiber and therefore has a transmit length limit up to 1 meters. Compliant with the IEEE802.3ak standard, this module uses a 4-laned copper connector for data transfer in full-duplex mode.

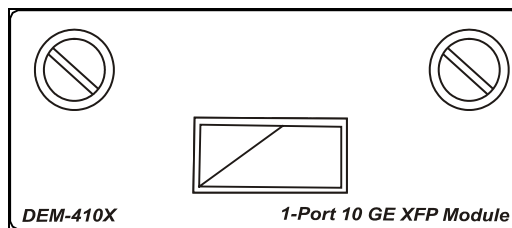
To install these modules in the DGS-3400 Series Switch, follow the simple steps listed below.



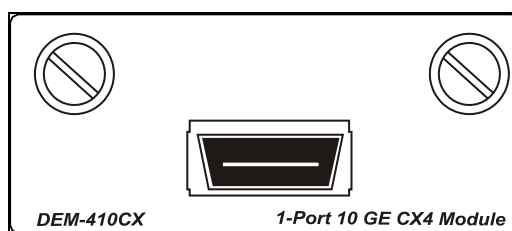
**CAUTION:** Before adding the optional module, make sure to disconnect all power sources connected to the Switch. Failure to do so may result in an electrical shock, which may cause damage, not only to the individual but to the Switch as well.

At the back of the Switch to the left is the slot for the optional module. This slot must be covered with the faceplate if the slot is not being used. If a module will be installed in an available slot, the faceplate is easily removed by loosening the screws and pulling off the plate.

The front panels of the available modules are shown here:



**Figure 2- 16. Front Panel of the DEM-410X**



**Figure 2- 17. Front Panel of the DEM-410CX**

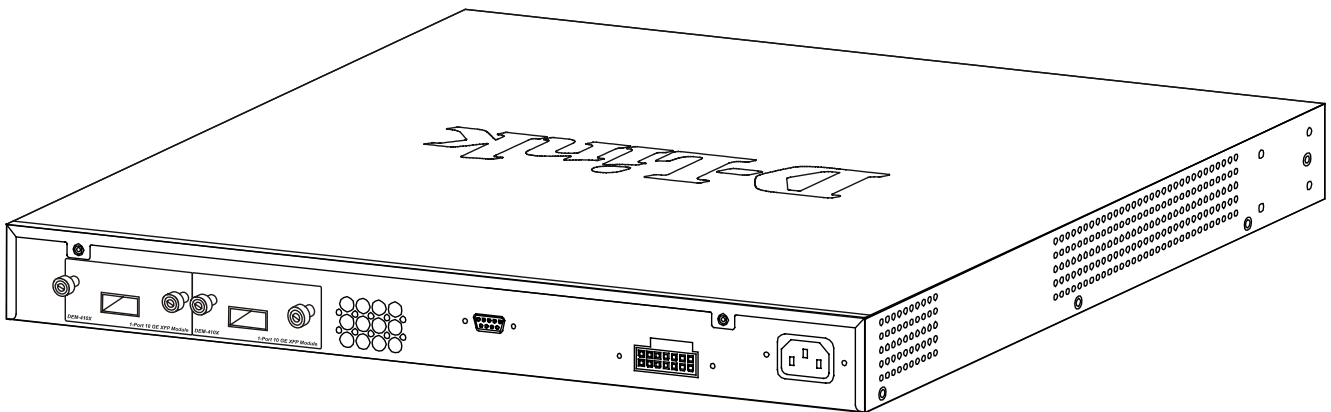
## Install the Module

Unplug the Switch before removing the faceplate covering the empty slot. To install the module, slide it in to the available slot at the rear of the Switch until it reaches the back, as shown in the following figure. Gently, but firmly push in on the module to secure it to the Switch. The module should fit snugly into the corresponding receptors.



**Figure 2- 18. Inserting the optional module into the Switch (DGS-3450)**

Now tighten the two screws at adjacent ends of the module into the available screw holes on the Switch. The upgraded Switch is now ready for use.



**Figure 2- 19. DGS-3450 with optional DEM-410X module installed**



DGS-3450

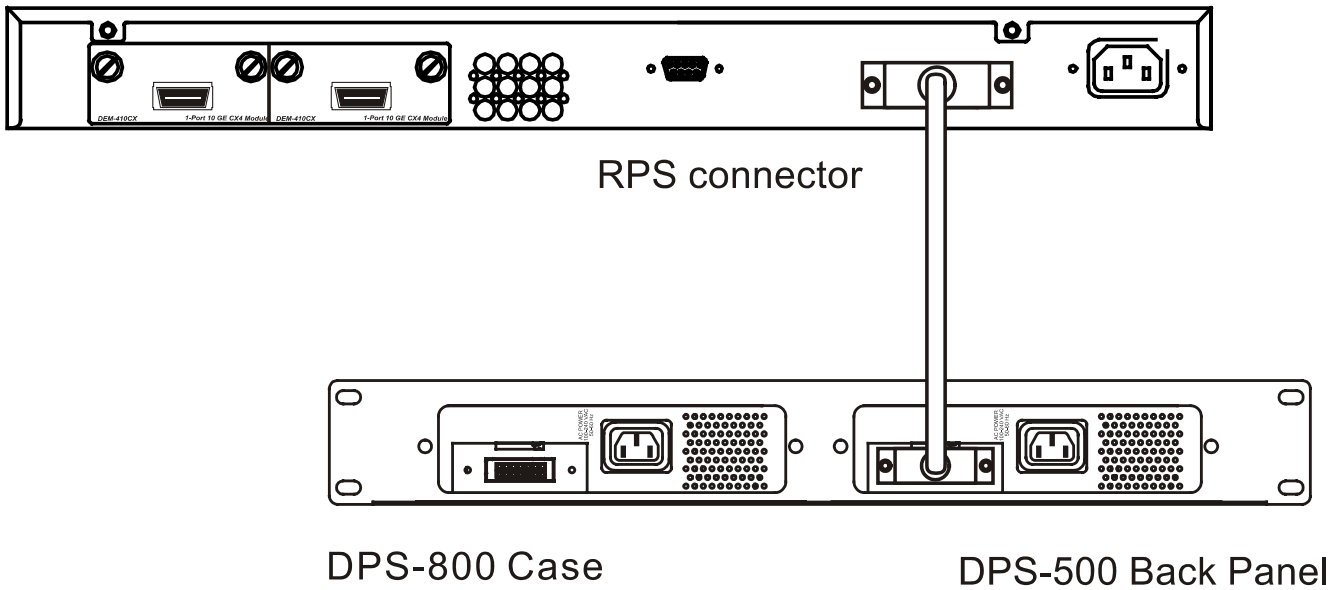


Figure 2- 21. The DGS-3450 with the DPS-500 Redundant External Power Supply



**NOTE:** See the DPS-500 documentation for more information.



**CAUTION:** Do not use the Switch with any redundant power system other than the DPS-500.

**Section 3**

# Connecting the Switch

**Switch To End Node**

**Switch to Switch**

**Connecting To Network Backbone or Server**



**NOTE:** All high-performance N-Way Ethernet ports can support both MDI-II and MDI-X connections.

## Switch to End Node

End nodes include PCs outfitted with a 10, 100 or 1000 Mbps RJ-45 Ethernet Network Interface Card (NIC) and routers.

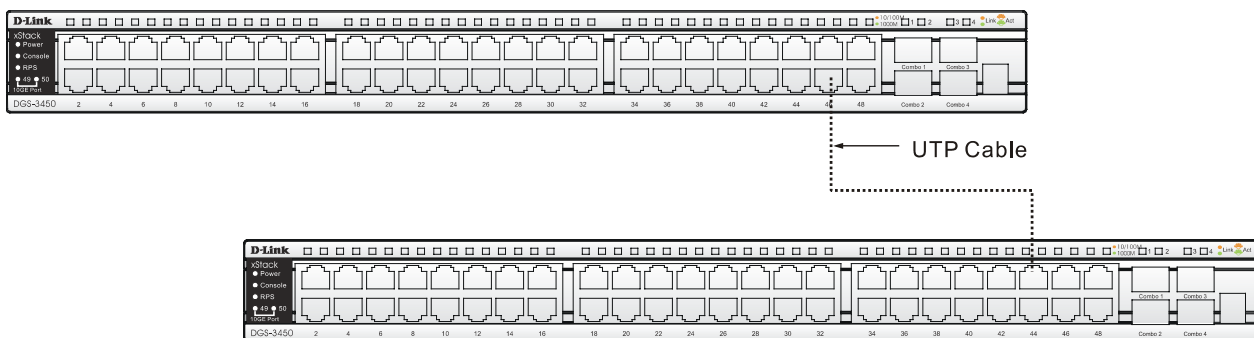
An end node connects to the Switch via a twisted-pair UTP/STP cable. Connect the end node to any of the 1000BASE-T ports of the Switch.

The Link/Act LEDs for each UTP port will light green or amber when the link is valid. A blinking LED indicates packet activity on that port.

## Switch to Switch

There is a great deal of flexibility on how connections are made using the appropriate cabling.

- Connect a 10BASE-T hub or switch to the Switch via a twisted-pair Category 3, 4 or 5 UTP/STP cable.
- Connect a 100BASE-TX hub or switch to the Switch via a twisted-pair Category 5 UTP/STP cable.
- Connect 1000BASE-T switch to the Switch via a twisted pair Category 5e UTP/STP cable.
- Connect switch supporting a fiber-optic uplink to the Switch’s SFP ports via fiber-optic cabling. See cabling guidelines in Appendix B for more information.



**Figure 3- 1. Connect the Switch to a port on a switch with straight or crossover cable**

## Connecting To Network Backbone or Server

The combo SFP ports and the 1000BASE-T ports are ideal for uplinking to a network backbone, server or server farm. The copper ports operate at a speed of 1000, 100 or 10Mbps in full or half duplex mode. The fiber-optic ports can operate at 1000Mbps in full duplex mode only.

Connections to the Gigabit Ethernet ports are made using a fiber-optic cable or Category 5e copper cable, depending on the type of port. A valid connection is indicated when the Link LED is lit.



# Introduction to Switch Management

## *Management Options*

*Connecting the Console Port (RS-232 DCE)*

*First Time Connecting to the Switch*

*Password Protection*

*SNMP Settings*

*IP Address Assignment*

*Connecting Devices to the Switch*

## Management Options

This system may be managed out-of-band through the console port on the front panel or in-band using Telnet. The user may also choose the web-based management, accessible through a web browser.

### **1. Web-based Management Interface**

After successfully installing the Switch, the user can configure the Switch, monitor the LED panel, and display statistics graphically using a web browser, such as Netscape Navigator (version 6.2 and higher) or Microsoft® Internet Explorer (version 5.0).

### **2. SNMP-Based Management**

The Switch can be managed with an SNMP-compatible console program. The Switch supports SNMP version 1.0, version 2.0 and version 3.0. The SNMP agent decodes the incoming SNMP messages and responds to requests with MIB objects stored in the database. The SNMP agent updates the MIB objects to generate statistics and counters.

### **3. Command Line Console Interface through the Serial Port**

The user can also connect a computer or terminal to the serial console port to access the Switch. The command-line-driven interface provides complete access to all Switch management features.

## Connecting the Console Port (RS-232 DCE)

The Switch provides an RS-232 serial port that enables a connection to a computer or terminal for monitoring and configuring the Switch. This port is a female DB-9 connector, implemented as a data terminal equipment (DTE) connection.

To use the console port, the following equipment is needed:

- A terminal or a computer with both a serial port and the ability to emulate a terminal.
- A null modem or crossover RS-232 cable with a female DB-9 connector for the console port on the Switch.

### ***To connect a terminal to the console port:***

Connect the female connector of the RS-232 cable directly to the console port on the Switch, and tighten the captive retaining screws.

Connect the other end of the cable to a terminal or to the serial connector of a computer running terminal emulation software. Set the terminal emulation software as follows:

- Select the appropriate serial port (**COM port 1** or **COM port 2**).
- Set the data rate to **115200 baud**.
- Set the data format to **8 data bits, 1 stop bit, and no parity**.
- Set **flow control** to **none**.
- Under Properties, select **VT100** for Emulation mode.
- Select **Terminal** keys for **Function, Arrow** and **Ctrl** keys. Make sure to use Terminal keys (not Windows keys) are selected.

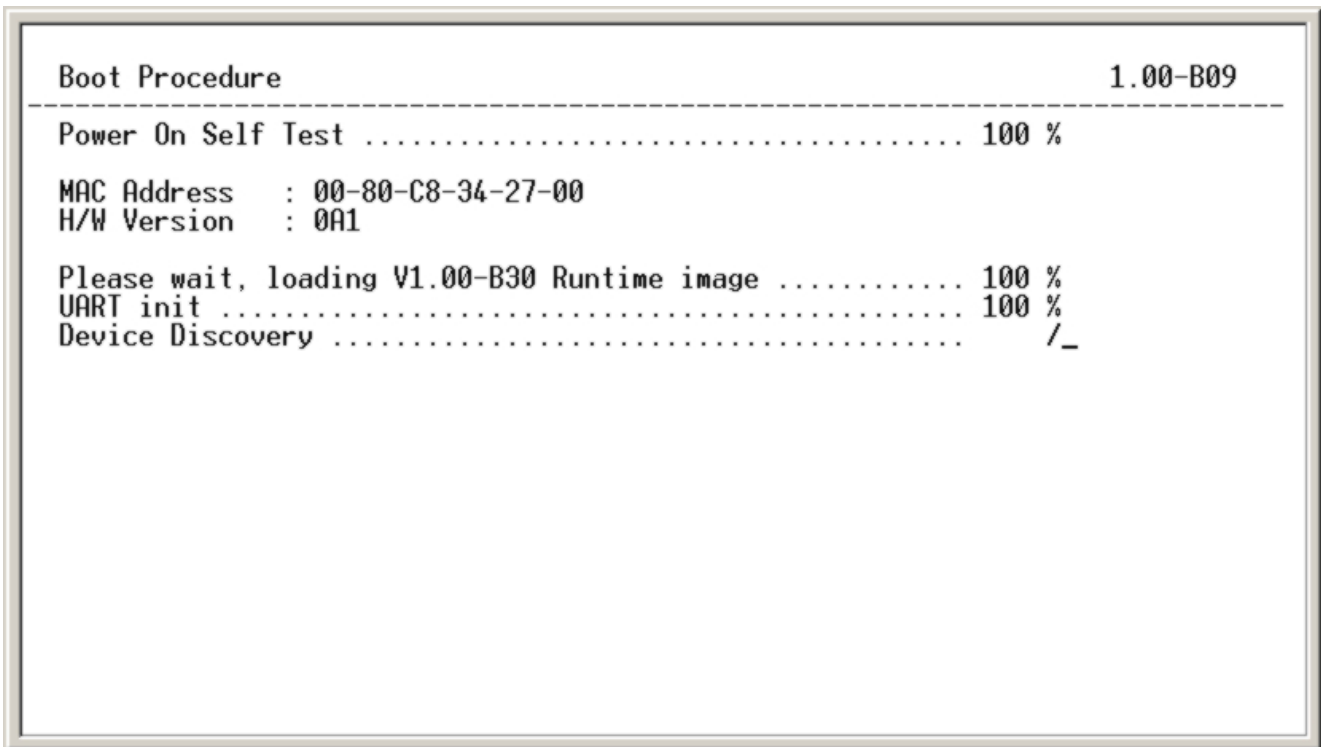


**NOTE:** When using HyperTerminal with the Microsoft® Windows® 2000 operating system, ensure that Windows 2000 Service Pack 2 or later is installed. Windows 2000 Service Pack 2 allows use of arrow keys in HyperTerminal's VT100 emulation. See [www.microsoft.com](http://www.microsoft.com) for information on Windows 2000 service packs.

- After you have correctly set up the terminal, plug the power cable into the power receptacle on the back of the Switch. The boot sequence appears in the terminal.
- After the boot sequence completes, the console login screen displays.
- If the user has not logged into the command line interface (CLI) program, press the Enter key at the User name and password prompts. There is no default user name and password for the Switch. The administrator must first create user names and passwords. If user accounts have been previously set up, log in and continue to configure the Switch.
- Enter the commands to complete desired tasks. Many commands require administrator-level access privileges. Read the next section for more information on setting up user accounts. See the *xStack DGS-3400 series CLI Manual* on the documentation CD for a list of all commands and additional information on using the CLI.
- To end a management session, use the logout command or close the emulator program.

If problems occur in making this connection on a PC, make sure the emulation is set to VT-100. The emulation settings can be configured by clicking on the **File** menu in the HyperTerminal window by clicking on **Properties** in the drop-down menu, and then clicking the **Settings** tab. This is where you will find the **Emulation** options. If you still do not see anything, try rebooting the Switch by disconnecting its power supply.

Once connected to the console, the screen below will appear on the console screen. This is where the user will enter commands to perform all the available management functions. The Switch will prompt the user to enter a user name and a password. Upon the initial connection, there is no user name or password and therefore just press enter twice to access the command line interface.



**Figure 4- 1. Boot up display in console screen (DGS-3427)**

## Managing the Switch for the First Time

The Switch supports user-based security that can allow prevention of unauthorized users from accessing the Switch or changing its settings. This section tells how to log onto the Switch via out-of-band console connection.

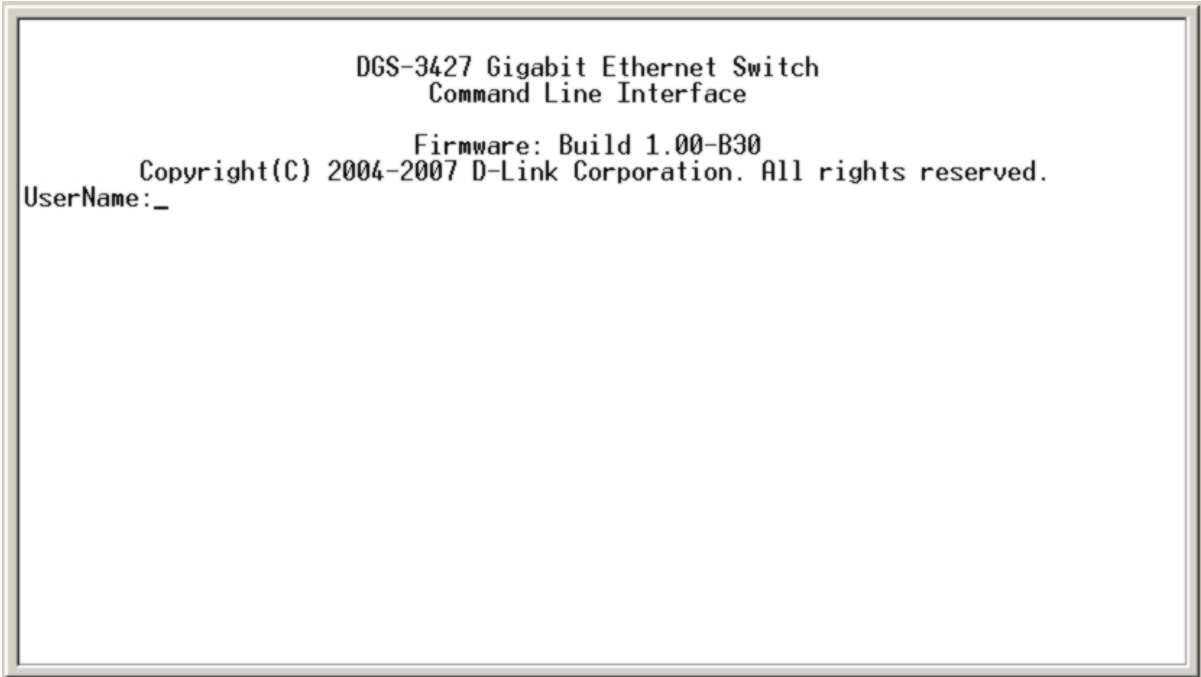


**NOTE:** The passwords used to access the Switch are case-sensitive; for example, "S" is not the same as "s."

Upon initial connection to the Switch, the login screen appears (see example below).



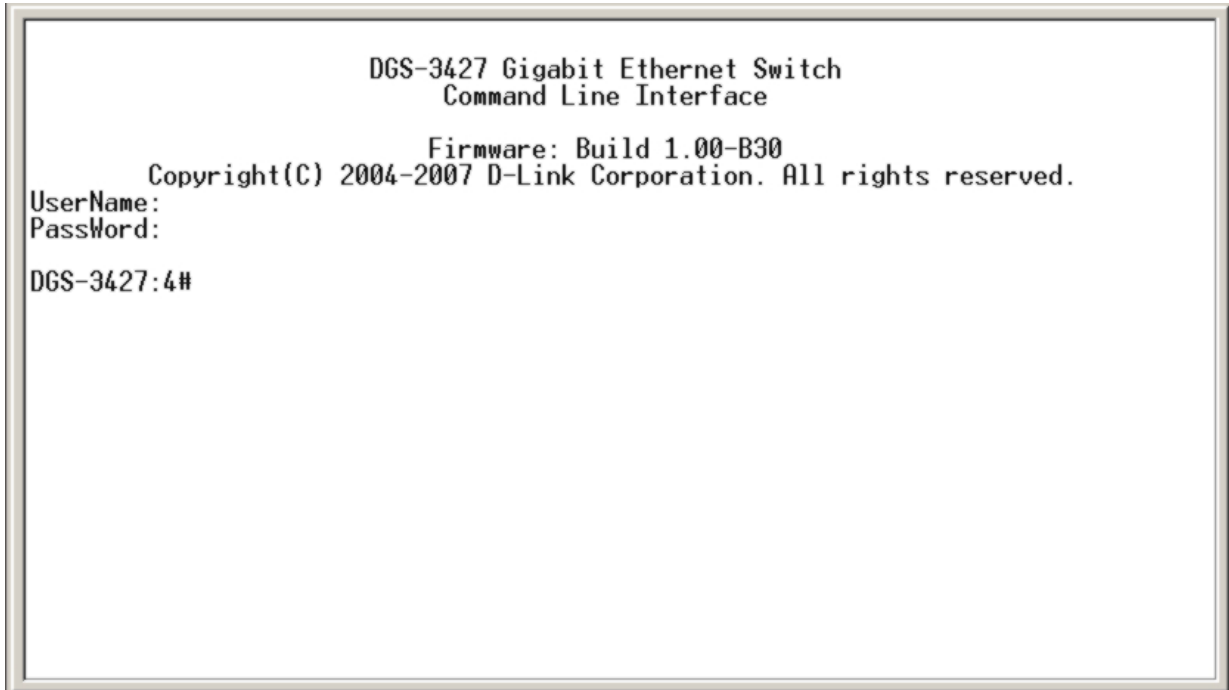
**NOTE:** Press Ctrl+R to refresh the screen. This command can be used at any time to force the console program in the Switch to refresh the console screen.



**Figure 4- 2. Initial screen, first time connecting to the Switch**

Press Enter in both the Username and Password fields. Then access will be given to enter commands after the command prompt **DGS-3426:4#**, **DGS-3427:4#** or **DGS-3450:4#** as shown below:

There is no initial username or password. Leave the **Username** and **Password** fields blank.



**Figure 4- 3. Command Prompt**



**NOTE:** The first user automatically gets Administrator level privileges. At least one Admin-level user account must be created for the Switch.

## Password Protection

The xStack DGS-3400 Series switches do not have a default user name and password. One of the first tasks when settings up the Switch is to create user accounts. Logging in using a predefined administrator-level user name will give the user privileged access to the Switch's management software.

After the initial login, define new passwords for both default user names to prevent unauthorized access to the Switch, and record the passwords for future reference.

To create an administrator-level account for the Switch, do the following:

1. At the CLI login prompt, enter create account admin followed by the *<user name>* and press the Enter key.
2. The Switch will then prompt the user to provide a password. Type the *<password>* used for the administrator account being created and press the Enter key.
3. Once entered, the Switch will again ask the user to enter the same password again to verify it. Type the same password and press the Enter key.
4. A "Success" response by the Switch will verify the creation of the new administrator.



**NOTE:** Passwords are case sensitive. User names and passwords can be up to 15 characters in length.

The sample below illustrates a successful creation of a new administrator-level account with the user name "newmanager".

```
DGS-34xx:4#create account admin newmanager
Command: create account admin newmanager

Enter a case-sensitive new password:*****
Enter the new password again for confirmation:*****

Success.

DGS-34xx:4#
```



**NOTICE:** CLI configuration commands only modify the running configuration file and are not saved when the Switch is rebooted. To save all configuration changes in non-volatile memory, use the **save** command to copy the running configuration file to the startup configuration.

## **SNMP Settings**

Simple Network Management Protocol (SNMP) is an OSI Layer 7 (Application Layer) designed specifically for managing and monitoring network devices. SNMP enables network management stations to read and modify the settings of gateways, routers, switches and other network devices. Use SNMP to configure system features for proper operation, monitor performance and detect potential problems in the Switch, switch group or network.

Managed devices that support SNMP include software (referred to as an agent), which runs locally on the device. A defined set of variables (managed objects) is maintained by the SNMP agent and used to manage the device. These objects are defined in a Management Information Base (MIB), which provides a standard presentation of the information controlled by the on-board SNMP agent. SNMP defines both the format of the MIB specifications and the protocol used to access this information over the network.

The xStack DGS-3400 series switches support SNMP versions 1, 2c, and 3. The administrator may specify which version of SNMP to use to monitor and control the Switch. The three versions of SNMP vary in the level of security provided between the management station and the network device.

In SNMP v.1 and v.2, user authentication is accomplished using 'community strings', which function like passwords. The remote user SNMP application and the Switch SNMP must use the same community string. SNMP packets from any station that has not been authenticated are ignored (dropped).

The default community strings for the Switch used for SNMP v.1 and v.2 management access are:

- public - Allows authorized management stations to retrieve MIB objects.
- private - Allows authorized management stations to retrieve and modify MIB objects.

SNMP v.3 uses a more sophisticated authentication process that is separated into two parts. The first part is to maintain a list of users and their attributes that are allowed to act as SNMP managers. The second part describes what each user on that list can do as an SNMP manager.

The Switch allows groups of users to be listed and configured with a shared set of privileges. The SNMP version may also be set for a listed group of SNMP managers. Thus, a group of SNMP managers can be created to view read-only information or receive traps using SNMP v.1 while assigning a higher level of security to another group, granting read/write privileges using SNMP v.3.

Using SNMP v.3 individual users or groups of SNMP managers can be allowed to perform or be restricted from performing specific SNMP management functions. The functions allowed or restricted are defined using the Object Identifier (OID) associated with a specific MIB. An additional layer of security is available for SNMP v.3 in that SNMP messages may be encrypted. To read more about how to configure SNMP v.3 settings for the Switch read the section entitled Management.

### **Traps**

Traps are messages that alert network personnel of events that occur on the Switch. The events can be as serious as a reboot (someone accidentally turned OFF the Switch), or less serious like a port status change. The Switch generates traps and sends them to the trap recipient (or network manager). Typical traps include trap messages for Authentication Failure, Topology Change and Broadcast/Multicast Storm.

### **MIBs**

The Switch in the Management Information Base (MIB) stores management and counter information. 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, the Switch also supports its own proprietary enterprise MIB as an extended Management Information Base. The proprietary MIB may also be retrieved by specifying the MIB Object Identifier. MIB values can be either read-only or read-write.

## IP Address Assignment

An IP Address must be assigned to each switch, which is used for communication with an SNMP network manager or other TCP/IP application (for example BOOTP, TFTP). The Switch's default IP address is 0.0.00 (i.e. no default IP address). The user may change the default Switch IP address to meet the specification of your networking address scheme.

The Switch is also assigned a unique MAC address by the factory. This MAC address cannot be changed, and can be found by entering the command "**show switch**" into the command line interface, as shown below.

```

Device Type       : DGS-3427 Gigabit Ethernet Switch
MAC Address       : 00-80-C8-34-27-00
IP Address        : 10.34.27.100 (Manual)
VLAN Name         : default
Subnet Mask       : 255.0.0.0
Default Gateway   : 0.0.0.0
Boot PROM Version : Build 1.00-B09
Firmware Version  : Build 1.00-B30
Hardware Version  : 0A1
System Name       : DGS-3427
System Location   : BR5-49
System Contact    : Junior Sample
Spanning Tree     : Disabled
GVRP              : Disabled
IGMP Snooping    : Disabled
TELNET           : Enabled (TCP 23)
WEB               : Enabled (TCP 80)
RMON              : Disabled
SSL status        : Disabled
SSH status        : Disabled
802.1x           : Disabled
Jumbo Frame       : Off
CTRL+C ESC [a] Quit SPACE [n] Next Page ENTER Next Entry [a] All
    
```

**Figure 4- 4. “show switch” command**

The Switch's MAC address also appears in **Switch Information** menu of the web-based management interface.

The IP address for the Switch must be set before using the Web-based manager. The Switch IP address can be automatically set using BOOTP or DHCP protocols, in which case the actual address assigned to the Switch must be known.

The IP address may be set using the Command Line Interface (CLI) over the console serial port as follows:

Starting at the command line prompt, enter the command:

```
config ipif System ipaddress xxx.xxx.xxx.xxx/yyy.yyy.yyy.yyy
```

Where the x's represent the IP address to be assigned to the IP interface named System and the y's represent the corresponding subnet mask.

Alternatively, the user can enter **config ipif System ipaddress xxx.xxx.xxx.xxx/z**. Where the x's represent the IP address to be assigned to the IP interface named System and the z represents the corresponding number of subnets in CIDR notation.

The IP interface named System on the Switch can be assigned an IP address and subnet mask, which can then be used to connect a management station to the Switch's Telnet or Web-based management agent.

```
Default Gateway : 0.0.0.0
Boot PROM Version : Build 1.00-B09
Firmware Version : Build 1.00-B30
Hardware Version : 0A1
System Name : DGS-3427
System Location : BR5-49
System Contact : Junior Sample
Spanning Tree : Disabled
GVRP : Disabled
IGMP Snooping : Disabled
TELNET : Enabled (TCP 23)
WEB : Enabled (TCP 80)
RMON : Disabled
SSL status : Disabled
SSH status : Disabled
802.1x : Disabled
Jumbo Frame : Off

DGS-3427:4#config ipif System ipaddress 10.34.27.100/8
Command: config ipif System ipaddress 10.34.27.100/8

Success.

DGS-3427:4#
```

**Figure 4- 5. Assigning the Switch an IP Address**

In the above example, the Switch was assigned an IP address of 10.34.27.100 with a subnet mask of 255.0.0.0. The system message **Success** indicates that the command was executed successfully. The Switch can now be configured and managed via Telnet and the CLI or via the Web-based management.



# **Web-based Switch Configuration**

*Introduction*

*Logging on to the Web Manager*

*Web-Based User Interface*

*Basic Setup*

*Reboot*

*Basic Switch Setup*

*Network Management*

*Switch Utilities*

*Network Monitoring*

*IGMP Snooping Status*

## **Introduction**

All software functions of the xStack DGS-3400 switch series can be managed, configured and monitored via the embedded web-based (HTML) interface. Manage the Switch from remote stations anywhere on the network through a standard browser. The browser acts as a universal access tool and can communicate directly with the Switch using the HTTP protocol.

The Web-based management module and the Console program (and Telnet) are different ways to access the same internal switching software and configure it. Thus, all settings encountered in web-based management are the same as those found in the console program.

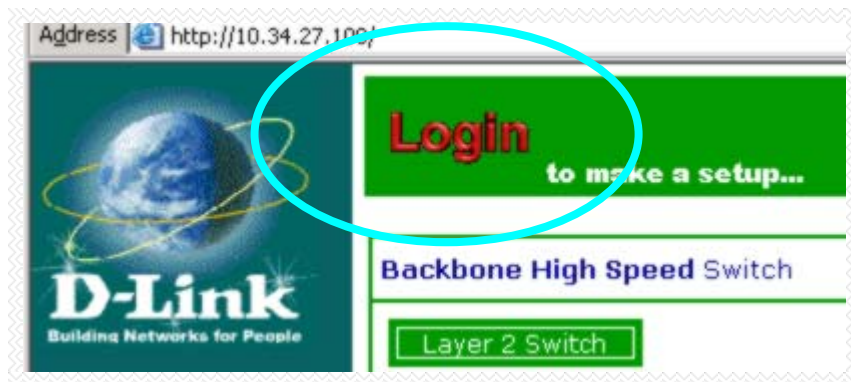
## Logging in to the Web Manager

To begin managing the Switch, simply run the browser installed on your computer and point it to the IP address you have defined for the device. The URL in the address bar should read something like: `http://123.123.123.123`, where the numbers 123 represent the IP address of the Switch.



**NOTE:** There is no factory default IP address.

In the page that opens, click on the **Login** hyperlink:



**Figure 5- 1. Click on Login hyperlink**

This opens the management module's user authentication window, as seen below.



**Figure 5- 2. Enter Network Password window**

Leave both the **User Name** field and the **Password** field blank and click OK. This will open the Web-based user interface. The Switch management features available in the web-based manager are explained below.

## Web-based User Interface

The user interface provides access to various Switch configuration and management screens, allows the user to view performance statistics, and permits graphical monitoring of the system status.

### Areas of the User Interface

The figure below shows the user interface. Three distinct areas divide the user interface, as described in the table.

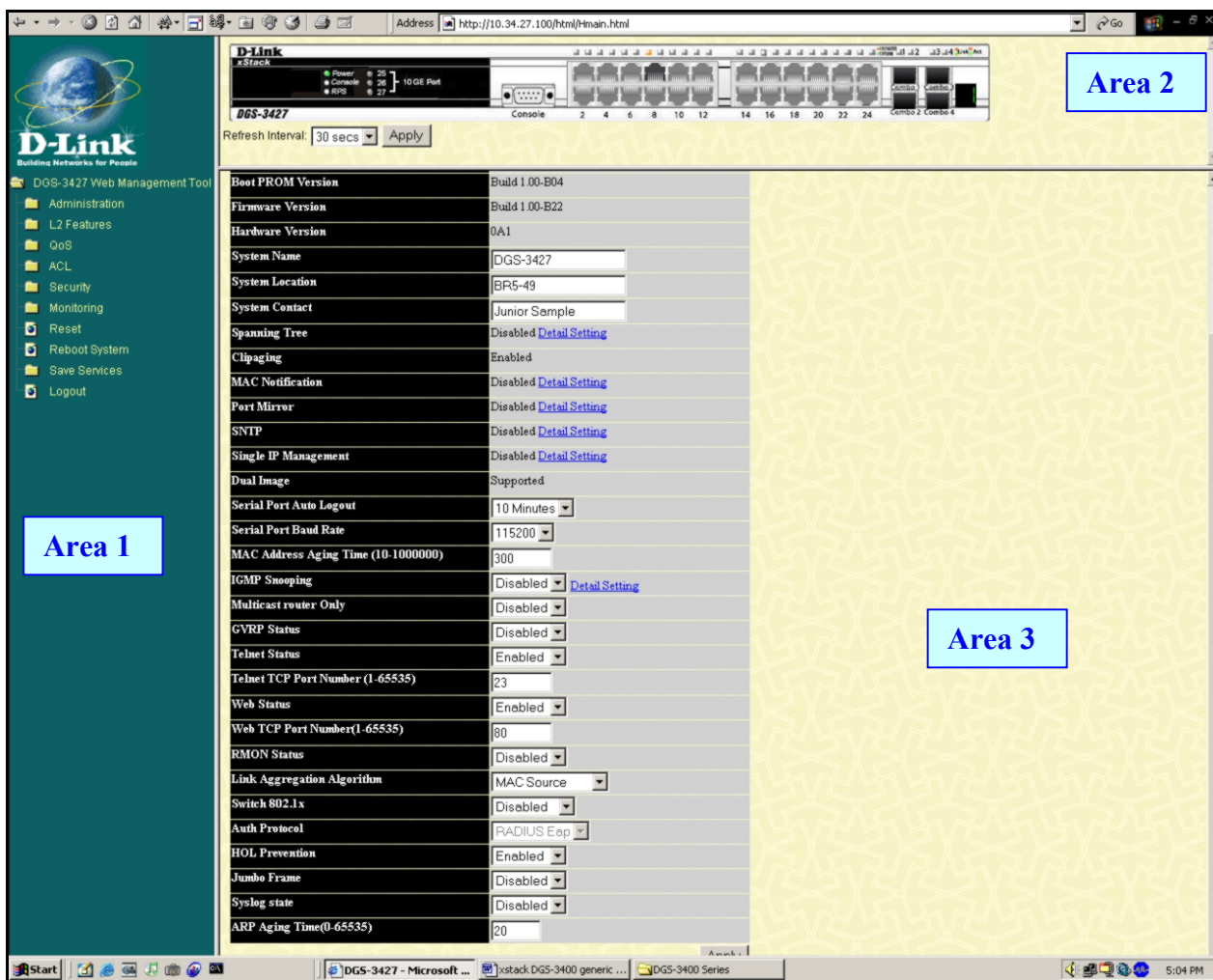


Figure 5- 3. Main Web-Manager Screen

Area	Function
Area 1	Select the menu or window to display. Open folders and click the hyperlinked menu buttons and subfolders contained within them to display menus. Click the D-Link logo to go to the D-Link website.
Area 2	Presents a graphical near real-time image of the front panel of the Switch. This area displays the Switch's ports and expansion modules, showing port activity, duplex mode, or flow control, depending on the specified mode. Some management functions, including port configuration are accessible here.
Area 3	Presents switch information based on user selection and the entry of configuration data.

## Web Pages

When connecting to the management mode of the Switch with a web browser, a login screen is displayed. Enter a user name and password to access the Switch's management mode.

Below is a list of the main folders available in the web interface:

**Administration** – Contains the following menu pages and sub-directories: IP Address, Port Configuration, User Accounts, Port Mirroring, System Log Settings, System Severity Settings, SNMP Settings, MAC Notification Settings, TFTP Services, Multiple Image Services, Ping Test, Safeguard Engine, Static ARP Settings, Routing Table, DHCP Auto Configuration, SNMP Manager, IP-MAC Binding and Single IP Management.

**L2 Features** – Contains the following menu pages and sub-directories: VLAN, Trunking, IGMP Snooping, Spanning Tree and Forwarding & Filtering.

**QoS** – Contains the following menu pages and sub-directories: Bandwidth Control, QoS Output Scheduling, 802.1p Default Priority and 802.1p User Priority.

**ACL** – Contains the following menu pages and sub-directories: Access Profile Table and CPU Interface Filtering.

**Security** – Contains the following menu pages and sub-directories: Traffic Control, Port Security, Port Lock Entries, 802.1x, Trusted Host, Access Authentication Control, Traffic Segmentation, SSL and SSH.

**Monitoring** – Contains the following menu pages and sub-directories: Device Status, Module Information, CPU Utilization, Port Utilization, Packets, Errors, Packet Size, Browse Router Port, VLAN Status, Port Access Control, MAC Address Table, IGMP Snooping Group, Switch Log, Browse ARP Table, Browse IPv6 ARP Table and Session Table.

**Save Services** – Contains the following menu pages and sub-directories: Save Changes, Configure Information and Config Current Setting.

**Reset, Reboot System** and **Logout** menu links are displayed in the main directory.



**NOTE:** Be sure to configure the user name and password in the User Accounts menu before connecting the Switch to the greater network.

# Configuring the Switch

*Device Information*

*IP Address*

*Port Configuration*

*Port Description*

*User Accounts*

*Port Mirroring*

*System Log Host / System Severity Settings*

*SNTP / Time Zone Settings*

*MAC Notification TFTP / Multiple Image Services*

*Safeguard Engine*

*Static ARP*

*DHCP Auto Configuration*

*SNMP Settings*

*Single IP Management Settings*

## Device Information

The **Device Information** window contains the main settings for all major functions for the Switch. It appears automatically when you log on to the Switch. To return to the **Device Information** window after viewing other windows, click the **DGS-3400 Web Management Tool** folder. The Device Information window shows the Switch's **MAC Address** (assigned by the factory and unchangeable), the **Boot PROM**, **Firmware Version**, and **Hardware Version**. This information is helpful to keep track of PROM and firmware updates and to obtain the Switch's MAC address for entry into another network device's address table, if necessary. The user may also enter a **System Name**, **System Location** and **System Contact** to aid in defining the Switch, to the user's preference. In addition, this screen displays the status of functions on the Switch to quickly assess their current global status. Some Functions are hyper-linked for easy access from the Device Information window.

Many miscellaneous functions are enabled and disabled in the Device Information menu.

Device Type	DGS-3427 Gigabit Ethernet Switch
MAC Address	00:80:c8:34:27:00
IP Address	10.34.27.100 (Manual)
VLAN Name	default
Subnet Mask	255.0.0.0
Default Gateway	0.0.0.0
Boot PROM Version	Build 1.00-B09
Firmware Version	Build 1.00-B34
Hardware Version	0A1
System Name	<input type="text" value="DGS-3427"/>
System Location	<input type="text" value="BR5-49"/>
System Contact	<input type="text" value="Junior Sample"/>
Spanning Tree	Disabled <a href="#">Detail Setting</a>
Clipping	Enabled
MAC Notification	Disabled <a href="#">Detail Setting</a>
Port Mirror	Disabled <a href="#">Detail Setting</a>
SNTP	Disabled <a href="#">Detail Setting</a>
Single IP Management	Disabled <a href="#">Detail Setting</a>
Dual Image	Supported
Serial Port Auto Logout	<input type="text" value="10 Minutes"/>
Serial Port Baud Rate	<input type="text" value="115200"/>
MAC Address Aging Time (10-1000000)	<input type="text" value="300"/>
IGMP Snooping	<input type="text" value="Disabled"/> <a href="#">Detail Setting</a>
Multicast router Only	<input type="text" value="Disabled"/>
GVRP Status	<input type="text" value="Disabled"/>
Telnet Status	<input type="text" value="Enabled"/>
Telnet TCP Port Number (1-65535)	<input type="text" value="23"/>
Web Status	<input type="text" value="Enabled"/>
Web TCP Port Number(1-65535)	<input type="text" value="80"/>
RMON Status	<input type="text" value="Disabled"/>
Link Aggregation Algorithm	<input type="text" value="MAC Source"/>
Switch 802.1x	<input type="text" value="Disabled"/>
Auth Protocol	<input type="text" value="RADIUS Eap"/>
HOL Prevention	<input type="text" value="Enabled"/>
Jumbo Frame	<input type="text" value="Disabled"/> Maximum Jumbo frame size: 1536 bytes
Syslog state	<input type="text" value="Disabled"/>
ARP Aging Time(0-65535)	<input type="text" value="20"/>

**Figure 6- 1. Device Information and general settings**

Device Information menu configurable parameters include those described in the table below.

Parameter	Description
<b>Serial Port Auto Logout Time</b>	Select the logout time used for the console interface. This automatically logs the user out after an idle period of time, as defined. Choose from the following options: <i>2 Minutes, 5 Minutes, 10 Minutes, 15 Minutes</i> or <i>Never</i> . The default setting is <i>10 minutes</i> .
<b>Serial Baud Rate</b>	This field specifies the baud rate for the serial port on the Switch. This fields menu is set at 115200 and cannot be changed.
<b>MAC Address Aging Time</b>	This field specifies the length of time a learned MAC Address will remain in the forwarding table without being accessed (that is, how long a learned MAC Address is allowed to remain idle). To change this, type in a different value representing the MAC address age-out time in seconds. The MAC Address Aging Time can be set to any value between <i>10</i> and <i>1,000,000</i> seconds. The default setting is <i>300</i> seconds.
<b>IGMP Snooping</b>	To enable system-wide IGMP Snooping capability select <i>Enabled</i> . IGMP snooping is <i>Disabled</i> by default. Enabling IGMP snooping allows you to specify use of a multicast router only (see below). To configure IGMP Snooping for individual VLANs, use the IGMP Snooping window under the IGMP folder.
<b>Multicast Router Only</b>	This field specifies that the Switch should only forward all multicast traffic to a multicast-enabled router, if enabled. Otherwise, the Switch will forward all multicast traffic to any IP router. The default is <i>Disabled</i> .
<b>GVRP Status</b>	Use this pull-down menu to enable or disable GVRP on the Switch.
<b>Telnet Status</b>	Telnet configuration is <i>Enabled</i> by default. If you do not want to allow configuration of the system through Telnet choose <i>Disabled</i> .
<b>Telnet TCP Port Number (1-65535)</b>	The TCP port number used for Telnet management of the Switch. The "well-known" TCP port for the Telnet protocol is <i>23</i> .
<b>Web Status</b>	Web-based management is <i>Enabled</i> by default. If you choose to disable this by selecting <i>Disabled</i> , you will lose the ability to configure the system through the web interface as soon as these settings are applied.
<b>Web TCP Port Number (1-65535)</b>	The TCP port number used for Web-based management of the Switch. The "well-known" TCP port for the Telnet protocol is <i>80</i> .
<b>RMON Status</b>	Remote monitoring (RMON) of the Switch is <i>Enabled</i> or <i>Disabled</i> here.
<b>Link Aggregation Algorithm</b>	The algorithm that the Switch uses to balance the load across the ports that make up the port trunk group is defined by this definition. Choose <i>MAC Source, MAC Destination, MAC Src &amp; Dest, IP Source, IP Destination</i> or <i>IP Src &amp; Dest</i> (See the Link Aggregation section of this manual).
<b>Switch 802.1x</b>	MAC Address may enable by port or the Switch's 802.1x function; the default is <i>Disabled</i> . This field must be enabled to view and configure certain windows for 802.1x. More information regarding 802.1x, its functions and implementation can be found later in this section, under the Port Access Entity folder. Port-Based 802.1x specifies that ports configured for 802.1x are initialized based on the port number only and are subject to any authorization parameters configured. MAC-based Authorization specifies that ports configured for 802.1x are initialized based on the port number and the MAC address of the computer being authorized and are then subject to any authorization parameters configured.
<b>Authentication Protocol</b>	The user may use the pull-down menu to choose between <i>radius eap</i> and <i>radius pap</i> for the 802.1x authentication protocol on the Switch. The default setting is <i>radius eap</i> .
<b>HOL Prevention</b>	If this option is enabled it prevents the forwarding of data to a port that is blocked. Traffic that would normally be sent to the buffer memory of the Switch's TX queue is dropped so that memory usage is conserved and performance across all ports remains high.
<b>Jumbo Frame</b>	This field will enable or disable the Jumbo Frame function on the Switch. The default is <i>Disabled</i> . Max. Jumbo frame size = 9216 bytes if this is enabled.

## IP Address

The IP Address may initially be set using the console interface prior to connecting to it through the Ethernet. If the Switch IP address has not yet been changed, read the introduction of the *xStack DGS-3400 Series CLI Manual* or return to Section 4 of this manual for more information. To change IP settings using the web manager you must access the IP Address menu located in the Administration folder.

*To configure the Switch's IP address:*

Open the **Administration** folder and click the **IP Address** menu link. The web manager will display the Switch's current IP settings in the IP configuration menu, as seen below.

IP Address	
Get IP From	Manual
IP Address	10.34.27.100
Subnet Mask	255.0.0.0
Default Gateway	0.0.0.0
VLAN Name	default

Apply

**Figure 6- 2. IP Address Settings window**

To manually assign the Switch's IP address, subnet mask, and default gateway address:

1. Select *Manual* from the **Get IP From** drop-down menu.
2. Enter the appropriate **IP Address** and **Subnet Mask**.
3. If accessing the Switch from a different subnet from the one it is installed on, enter the IP address of the **Default Gateway**. If managing the Switch from the subnet on which it is installed, the user may leave the default address (0.0.0.0) in this field.
4. If the Switch has no previously configured VLANs, the user can use the *default VLAN Name*. The *default VLAN* contains all of the Switch ports as members. If the Switch has previously configured VLANs, the user will need to enter the *VLAN ID* of the VLAN that contains the port connected to the management station that will access the Switch. The Switch will allow management access from stations with the same VID listed here.



**NOTE:** The Switch's factory default IP address is 0.0.0.0 with a subnet mask of 255.0.0.0 and a default gateway of 0.0.0.0.

To use the BOOTP or DHCP protocols to assign the Switch an IP address, subnet mask, and default gateway address:

Use the **Get IP From:** pull-down menu to choose from *BOOTP* or *DHCP*. This selects the method the Switch assigns an IP address on the next reboot.



The IP Address Settings options are:

Parameter	Parameter
<b>BOOTP</b>	The Switch will send out a BOOTP broadcast request when it is powered up. The BOOTP protocol allows IP addresses, network masks, and default gateways to be assigned by a central BOOTP server. If this option is set, the Switch will first look for a BOOTP server to provide it with this information before using the default or previously entered settings.
<b>DHCP</b>	The Switch will send out a DHCP broadcast request when it is powered up. The DHCP protocol allows IP addresses, network masks, and default gateways to be assigned by a DHCP server. If this option is set, the Switch will first look for a DHCP server to provide it with this information before using the default or previously entered settings.
<b>Manual</b>	Allows the entry of an IP address, 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.
<b>Subnet Mask</b>	A Bitmask that determines the extent of the subnet that the Switch 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 custom subnet masks are allowed.
<b>Default Gateway</b>	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 you do not want the Switch to be accessible outside your local network, you can leave this field unchanged.
<b>VLAN Name</b>	This allows the entry of a VLAN Name from which a management station will be allowed to manage the Switch using TCP/IP (in-band via web manager or Telnet). Management stations that are on VLANs other than the one entered here will not be able to manage the Switch in-band unless their IP addresses are entered in the Security IP Management menu. If VLANs have not yet been configured for the Switch, the default VLAN contains all of the Switch's ports. There are no entries in the Security IP Management table, by default, so any management station that can connect to the Switch can access the Switch until a management VLAN is specified or Management Station IP Addresses are assigned.

Click **Apply** to implement changes made.

## Setting the Switch's IP Address using the Console Interface

Each Switch must be assigned its own IP Address, which is used for communication with an SNMP network manager or other TCP/IP application (for example BOOTP, TFTP). The Switch's default IP address is 0.0.0.0. The default Switch IP address can be changed to meet the specification of your networking address scheme.

The IP address for the Switch must be set before the Web-based manager can manage the switch. The Switch IP address can be automatically set using BOOTP or DHCP protocols, in which case the actual address assigned to the Switch must be known. The IP address may be set using the Command Line Interface (CLI) over the console serial port as follows:

- Starting at the command line prompt, enter the commands **config ipif System ipaddress xxx.xxx.xxx.xxx/yyy.yyy.yyy.yyy**. Where the x's represent the IP address to be assigned to the IP interface named System and the y's represent the corresponding subnet mask.
- Alternatively, the user can enter **config ipif System ipaddress xxx.xxx.xxx.xxx/z**. Where the x's represent the IP address to be assigned to the IP interface named System and the z represents the corresponding number of subnets in CIDR notation.

The IP interface named System on the Switch can be assigned an IP address and subnet mask, which can then be used to connect a management station to the Switch's Telnet or Web-based management agent.

Successful entry of the command will produce a “**Success**” message, indicating that the command execution was correctly. The user may now utilize this address to configure or manage the Switch through Telnet, the Command Line Interface (CLI) or the Web-based management (GUI).

## Port Configuration

Click **Administration > Port Configuration > Port Configuration** to display the following window:

*To configure switch ports:*

1. Choose the port or sequential range of ports using the From... To... port pull-down menus.
2. Use the remaining pull-down menus to configure the parameters described below:

The screenshot shows the 'Port Configuration' window. At the top, there are several dropdown menus for configuration: 'From' (Port 1), 'To' (Port 1), 'State' (Enabled), 'Speed/Duplex' (Auto), 'Flow Control' (Disabled), 'Learning' (Enabled), and 'Medium Type' (Copper). An 'Apply' button is located to the right of these menus. Below the configuration options is a table titled 'The Port Information Table'.

Port	State	Speed/Duplex	Flow Control	Connection	Learning
1	Enabled	Auto	Disabled	Link Down	Enabled
2	Enabled	Auto	Disabled	Link Down	Enabled
3	Enabled	Auto	Disabled	Link Down	Enabled
4	Enabled	Auto	Disabled	Link Down	Enabled
5	Enabled	Auto	Disabled	Link Down	Enabled
6	Enabled	Auto	Disabled	Link Down	Enabled
7	Enabled	Auto	Disabled	100M/Full/None	Enabled
8	Enabled	Auto	Disabled	Link Down	Enabled
9	Enabled	Auto	Disabled	Link Down	Enabled
10	Enabled	Auto	Disabled	Link Down	Enabled
11	Enabled	Auto	Disabled	Link Down	Enabled
12	Enabled	Auto	Disabled	Link Down	Enabled

**Figure 6- 3. Port Configuration window**

The following parameters can be configured:

Parameter	Description
<b>State</b> <Enabled>	Toggle the State field to either enable or disable a given port or group of ports.
<b>Speed/Duplex</b> <Auto>	Toggle the Speed/Duplex field to either select the speed and duplex/half-duplex state of the port. Auto denotes auto-negotiation between 10 and 100 Mbps devices, in full- or half-duplex. The Auto setting allows the port to automatically determine the fastest settings the device the port is connected to can handle, and then to use those settings. The other options are Auto, 10M/Half, 10M/Full, 100M/Half, 100M/Full and 1000/full. There is no automatic adjustment of port settings with any option other than Auto.
<b>Flow Control</b>	Displays the flow control scheme used for the various port configurations. Ports configured for full-duplex use 802.3x flow control, half-duplex ports use backpressure flow control, and Auto ports use an automatic selection of the two. The default is Disabled.
<b>Learn</b>	Enable or disable MAC address learning for the selected ports. When Enabled, destination and source MAC addresses are automatically listed in the forwarding table. When learning is Disabled, MAC addresses must be manually entered into the forwarding table. This is sometimes done for reasons of security or efficiency. See the section on Forwarding/Filtering for information on entering MAC addresses into the forwarding table. The default setting is Disabled.
<b>Media Type</b>	For the Combo ports, if configuring the Combo ports this defines the type of transport medium used.

Click **Apply** to implement the new settings on the Switch.

## Port Description

The Switch supports a port description feature where the user may name various ports on the Switch. To assign names to various ports, click **Administration > Port Configuration > Port Description** to view the following window:

Port Description				
From	To	Medium Type	Description	Apply
Port 1	Port 1	Copper		Apply

Port Description Table	
Port	Description
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

**Figure 6- 4. Port Description Setting window**

Use the **From** and **To** pull down menu to choose a port or range of ports to describe, and then enter a description of the port(s). Click **Apply** to set the descriptions in the Port Description Table.

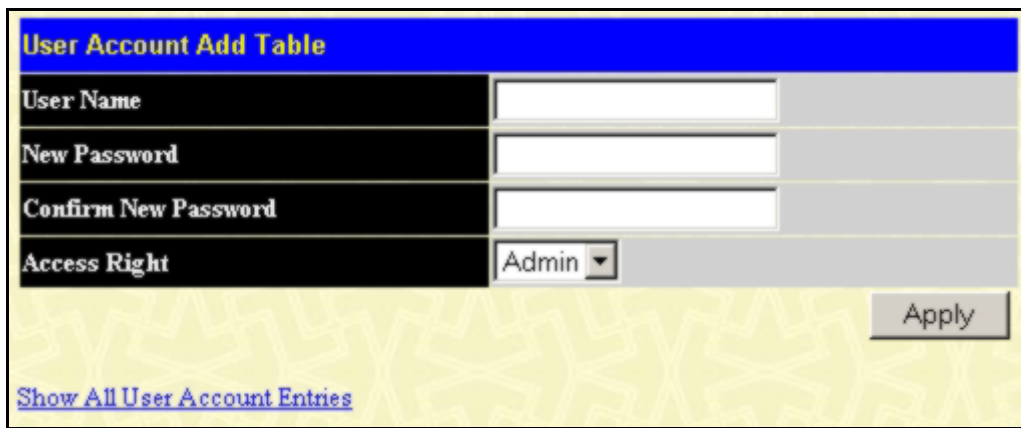
## User Accounts

Use the **User Account Management** window to control user privileges. To view existing User Accounts, open the **Administration** folder and click on the **User Accounts** link. This will open the **User Account Management** window, as shown below.



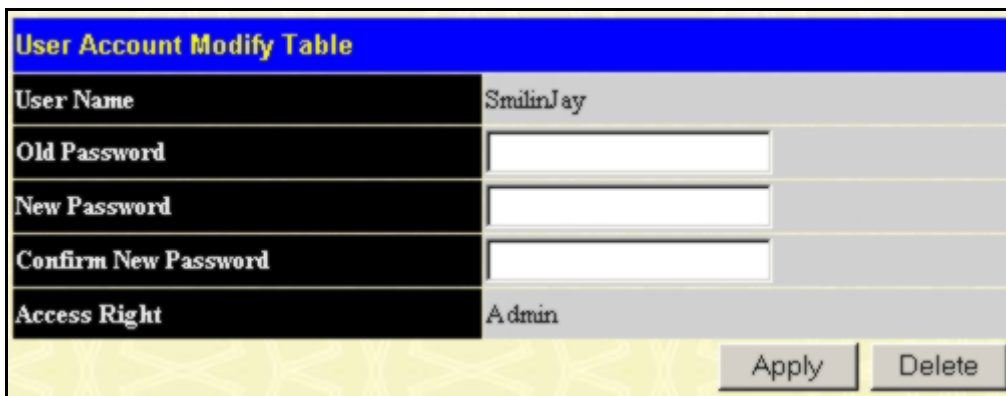
**Figure 6- 5. User Accounts Management window**

To add a new user, click on the **Add** button. To modify or delete an existing user, click on the **Modify** button for that user.



**Figure 6- 6. User Accounts - Add**

Add a new user by typing in a User Name, and New Password and retype the same password in the Confirm New Password. Choose the level of privilege (*Admin* or *User*) from the Access Right drop-down menu.



**Figure 6- 7. User Accounts Modify Table window - Modify**

Modify or delete an existing user account in the User Account Modify Table. To delete the user account, click on the **Delete** button. To change the password, type in the New Password and retype it in the Confirm New Password entry field. The level of privilege (*Admin* or *User*) can be viewed in the Access Right field.

## Port Mirroring

The Switch allows you to copy frames transmitted and received on a port and redirect the copies to another port. You can attach a monitoring device to the mirrored port, such as a sniffer or an RMON probe, to view details about the packets passing through the first port. This is useful for network monitoring and troubleshooting purposes. To view the **Port Mirroring** window, click **Port Mirroring** in the **Administration** folder.

Port Mirroring	
Target	Port 10
Status	Enabled
Port	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
None	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
Ingress	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
Egress	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
Both	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
Port	26 27 -
None	<input checked="" type="radio"/> <input checked="" type="radio"/> -
Ingress	<input type="radio"/> <input type="radio"/> -
Egress	<input type="radio"/> <input type="radio"/> -
Both	<input type="radio"/> <input type="radio"/> -
Apply	
Note(1): The "Source Port" and "Target Port" should be different, or the setup will be invalid.	
Note(2): The target port should be a non-trunked port.	

Figure 6- 8. Setup Port Mirroring window

*To configure a mirror port:*

1. Select the Source Port from where you want to copy frames and the Target Port, which receives the copies from the source port.
2. Select the Source Direction, Ingress, Egress, or Both and change the Status drop-down menu to *Enabled*.
3. Click **Apply** to let the changes take effect.



**NOTE:** You cannot mirror a fast port 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 you are copying frames from should always support an equal or lower speed than the port to which you are sending the copies. Also, the target port for the mirroring cannot be a member of a trunk group. Please note a target port and a source port cannot be the same port.

## System Log Host

The Switch can send Syslog messages to up to four designated servers using the **System Log Server**. In the **Administration** folder, click **System Log Setting**, to view the window shown below.

System Log Host							
Index	Server IP	Severity	Facility	UDP port	Status	Modify	Delete
1	10.1.100.28	ALL	Local0	514	Enabled	Modify	X

Figure 6- 9. System Log Host list

The parameters configured for adding and editing System Log Server settings are the same. See the table below for a description.

Configure System Log Server-Edit	
Index(1-4)	1
Server IP	10.1.100.28
Severity	ALL
Facility	Local0
UDP Port(514 or 6000-65535)	514
Status	Enabled
Apply	

Figure 6- 10. System Log Server menu – Edit

Configure System Log Server-Add	
Index(1-4)	1
Server IP	0.0.0.0
Severity	ALL
Facility	Local0
UDP Port(514 or 6000-65535)	514
Status	Disabled
Apply	

Figure 6- 11. System Log Server menu– Add

Configure the parameters listed below:

Parameter	Description																																																
<b>Index</b>	Syslog server settings index (1-4).																																																
<b>Server IP</b>	The IP address of the Syslog server.																																																
<b>Severity</b>	This drop-down menu allows you to select the level of messages that will be sent. The options are <i>Warning</i> , <i>Informational</i> , and <i>All</i> .																																																
<b>Facility</b>	<p>Some of the operating system daemons and processes have been assigned Facility values. Processes and daemons that have not been explicitly assigned a Facility may use any of the "local use" facilities or they may use the "user-level" Facility. Those Facilities that have been designated are shown in the following: Bold font means the facility values that the Switch currently now.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Numerical Code</th> <th style="text-align: left;">Facility</th> </tr> </thead> <tbody> <tr><td>0</td><td>kernel messages</td></tr> <tr><td>1</td><td>user-level messages</td></tr> <tr><td>2</td><td>mail system</td></tr> <tr><td>3</td><td>system daemons</td></tr> <tr><td>4</td><td>security/authorization messages</td></tr> <tr><td>5</td><td>messages generated internally by syslog line printer subsystem</td></tr> <tr><td>7</td><td>network news subsystem</td></tr> <tr><td>8</td><td>UUCP subsystem</td></tr> <tr><td>9</td><td>clock daemon</td></tr> <tr><td>10</td><td>security/authorization messages</td></tr> <tr><td>11</td><td>FTP daemon</td></tr> <tr><td>12</td><td>NTP subsystem</td></tr> <tr><td>13</td><td>log audit</td></tr> <tr><td>14</td><td>log alert</td></tr> <tr><td>15</td><td>clock daemon</td></tr> <tr><td><b>16</b></td><td><b>local use 0 (local0)</b></td></tr> <tr><td><b>17</b></td><td><b>local use 1 (local1)</b></td></tr> <tr><td><b>18</b></td><td><b>local use 2 (local2)</b></td></tr> <tr><td><b>19</b></td><td><b>local use 3 (local3)</b></td></tr> <tr><td><b>20</b></td><td><b>local use 4 (local4)</b></td></tr> <tr><td><b>21</b></td><td><b>local use 5 (local5)</b></td></tr> <tr><td><b>22</b></td><td><b>local use 6 (local6)</b></td></tr> <tr><td><b>23</b></td><td><b>local use 7 (local7)</b></td></tr> </tbody> </table>	Numerical Code	Facility	0	kernel messages	1	user-level messages	2	mail system	3	system daemons	4	security/authorization messages	5	messages generated internally by syslog line printer subsystem	7	network news subsystem	8	UUCP subsystem	9	clock daemon	10	security/authorization messages	11	FTP daemon	12	NTP subsystem	13	log audit	14	log alert	15	clock daemon	<b>16</b>	<b>local use 0 (local0)</b>	<b>17</b>	<b>local use 1 (local1)</b>	<b>18</b>	<b>local use 2 (local2)</b>	<b>19</b>	<b>local use 3 (local3)</b>	<b>20</b>	<b>local use 4 (local4)</b>	<b>21</b>	<b>local use 5 (local5)</b>	<b>22</b>	<b>local use 6 (local6)</b>	<b>23</b>	<b>local use 7 (local7)</b>
Numerical Code	Facility																																																
0	kernel messages																																																
1	user-level messages																																																
2	mail system																																																
3	system daemons																																																
4	security/authorization messages																																																
5	messages generated internally by syslog line printer subsystem																																																
7	network news subsystem																																																
8	UUCP subsystem																																																
9	clock daemon																																																
10	security/authorization messages																																																
11	FTP daemon																																																
12	NTP subsystem																																																
13	log audit																																																
14	log alert																																																
15	clock daemon																																																
<b>16</b>	<b>local use 0 (local0)</b>																																																
<b>17</b>	<b>local use 1 (local1)</b>																																																
<b>18</b>	<b>local use 2 (local2)</b>																																																
<b>19</b>	<b>local use 3 (local3)</b>																																																
<b>20</b>	<b>local use 4 (local4)</b>																																																
<b>21</b>	<b>local use 5 (local5)</b>																																																
<b>22</b>	<b>local use 6 (local6)</b>																																																
<b>23</b>	<b>local use 7 (local7)</b>																																																
<b>UDP Port (514 or 6000-65535)</b>	Type the UDP port number used for sending Syslog messages. The default is 514.																																																
<b>Status</b>	Choose <i>Enabled</i> or <i>Disabled</i> to activate or deactivate.																																																

To set the System Log Server configuration, click **Apply**. To delete an entry from the **System Log Server** window, click the corresponding **X** under the Delete heading of the entry you wish to delete. To return to the **Current System Log Servers** window, click the [Show All System Log Servers link](#).

## System Severity Settings

The Switch can be configured to allow alerts be logged or sent as a trap to an SNMP agent or both. The level at which the alert triggers either a log entry or a trap message can be set as well. Use the System Severity Settings menu to set the criteria for alerts. The current settings are displayed below the Settings menu. In the **Administration** folder, click **System Severity Settings**, to view the window shown below.

**Figure 6- 12. System Severity Settings**

Use the drop-down menus to configure the parameters described below.

Click **Apply** to implement the new System Severity Settings.

Parameter	Description
<b>System Severity</b>	Choose how the alerts are used from the drop-down menu. Select <i>log</i> to send the alert of the Severity Type configured to the Switch's log for analysis. Choose <i>trap</i> to send it to an SNMP agent for analysis. Or select <i>all</i> to send the chosen alert type to an SNMP agent and the Switch's log for analysis.
<b>Severity Level</b>	Choose what level of alert will trigger sending the log entry or trap message as defined by the Severity Name. Select <i>critical</i> to send only critical events to the Switch's log or SNMP agent. Choose <i>warning</i> to send critical and warning events to the Switch's log or SNMP agent. Select <i>information</i> send informational, warning and critical events to the Switch's log or SNMP agent.



## SNTP Settings

### Time Settings

To configure the time settings for the Switch, open the **Administration** folder. Then the **SNTP Settings** folder and click on the **Time Settings** link, revealing the following window for the user to configure.

Figure 6- 13. Current Time: Status window

The following parameters can be set or are displayed:

Parameter	Description
<b>Current Time: Status</b>	
<b>System Boot Time</b>	Displays the time when the Switch was initially started for this session.
<b>Current Time</b>	Displays the Current Time.
<b>Time Source</b>	Displays the time source for the system.
<b>Current Time: SNTP Settings</b>	
<b>SNTP State</b>	Use this pull-down menu to <i>Enabled</i> or <i>Disabled</i> SNTP.
<b>SNTP Primary Server</b>	This is the IP address of the primary server the SNTP information will be taken from.
<b>SNTP Secondary Server</b>	This is the IP address of the secondary server the SNTP information will be taken from.
<b>SNTP Poll Interval in Seconds (30-99999)</b>	This is the interval, in seconds, between requests for updated SNTP information.
<b>Current Time: Set Current Time</b>	
<b>Year</b>	Enter the current year, if you want to update the system clock.
<b>Month</b>	Enter the current month, if you would like to update the system clock.
<b>Day</b>	Enter the current day, if you would like to update the system clock.
<b>Time in HH MM SS</b>	Enter the current time in hours, minutes, and seconds.

Click **Apply** to implement your changes.

## Time Zone and DST

The following are windows used to configure time zones and Daylight Savings time settings for SNTP. Open the **Administration** folder, then the **SNTP Settings** folder and click on the **Time Zone and DST** link, revealing the following window.

Time Zone and DST	
Daylight Saving Time State	Disabled ▾
Daylight Saving Time Offset in Minutes	60 ▾
Time Zone Offset:from GMT in +/-HH:MM	- ▾ 06 ▾ 00 ▾
DST Repeating Settings	
From: Which Day	First ▾
From: Day of Week	Sunday ▾
From: Month	April ▾
From: time in HH MM	00 ▾ 00 ▾
To: Which Day	Last ▾
To: Day of Week	Sunday ▾
To: Month	October ▾
To: time in HH MM	00 ▾ 00 ▾
DST Annual Settings	
From: Month	April ▾
From: Day	29 ▾
From: time in HH MM	00 ▾ 00 ▾
To: Month	October ▾
To: Day	12 ▾
To: Time in HH MM	00 ▾ 00 ▾
Apply	

Figure 6- 14. Time Zone and DST Settings window

The following parameters can be set:

Parameter	Description
Time Zone and DST Settings	
Daylight Saving Time State	Use this pull-down menu to enable or disable the DST Settings.
Daylight Saving Time Offset in Minutes	Use this pull-down menu to specify the amount of time that will constitute your local DST offset - 30, 60, 90, or 120 minutes.
Time Zone Offset from GMT in +/- HH:MM	Use these pull-down menus to specify your local time zone's offset from Greenwich Mean Time (GMT.)
DST Repeating Settings - Using repeating mode will enable DST seasonal time adjustment. Repeating mode requires that the DST beginning and ending date be specified using a formula. For example, specify to begin DST on Saturday during the second week of April and end DST on Sunday during the last week of October.	
From: Which Day	Enter the week of the month that DST will start.
From: Day of Week	Enter the day of the week that DST will start on.
From: Month	Enter the month DST will start on.
From: time in HH:MM	Enter the time of day that DST will start on.
To: Which Day	Enter the week of the month the DST will end.
To: Day of Week	Enter the day of the week that DST will end.
To: Month	Enter the month that DST will end.
To: time in HH:MM	Enter the time DST will end.
DST Annual Settings - Using annual mode will enable DST seasonal time adjustment. Annual mode requires that the DST beginning and ending date be specified concisely. For example, specify to begin DST on April 3 and end DST on October 14.	
From: Month	Enter the month DST will start on, each year.
From: Day	Enter the day of the week DST will start on, each year.
From: Time in HH:MM	Enter the time of day DST will start on, each year.
To: Month	Enter the month DST will end on, each year.
To: Day	Enter the day of the week DST will end on, each year.
To: Time in HH:MM	Enter the time of day that DST will end on, each year.

Click **Apply** to implement changes made to the **Time Zone and DST** window.

## MAC Notification Settings

MAC Notification is used to monitor MAC addresses learned and entered into the forwarding database. To globally set MAC notification on the Switch, open the following window by opening the **MAC Notification Settings** in the Administration folder.

Figure 6- 15. MAC Notification Settings

### Global Settings

The following parameters may be viewed and modified:

Parameter	Description
State	Enable or disable MAC notification globally on the Switch
Interval (sec)	The time in seconds between notifications.
History size	The maximum number of entries listed in the history log used for notification. Up to 500 entries can be specified.

### Port Settings

To change MAC notification settings for a port or group of ports on the Switch, configure the following parameters.

Parameter	Description
From...To	Select a port or group of ports to enable for MAC notification using the pull-down menus.
State	Enable MAC Notification for the ports selected using the pull-down menu.

Click **Apply** to implement changes made.

## TFTP Services

Trivial File Transfer Protocol (TFTP) services allow the Switch's firmware to be upgraded by transferring a new firmware file from a TFTP server to the Switch. A configuration file can also be loaded into the Switch from a TFTP server. Switch configuration settings can be saved to the TFTP server, and a history log can be uploaded from the Switch to the TFTP server. The Switch supports dual image storage for configuration and firmware. The firmware and configuration images are indexed by ID number 1 or 2. To change the boot firmware image, use the **Config Firmware Image** menu **Multiple Image Services** sub-directory. The default Switch settings will use Image ID 1 as the boot configuration or firmware. To update the Switch's firmware or configuration file, open the **TFTP Services** hyperlink, located in the **Administration** folder.

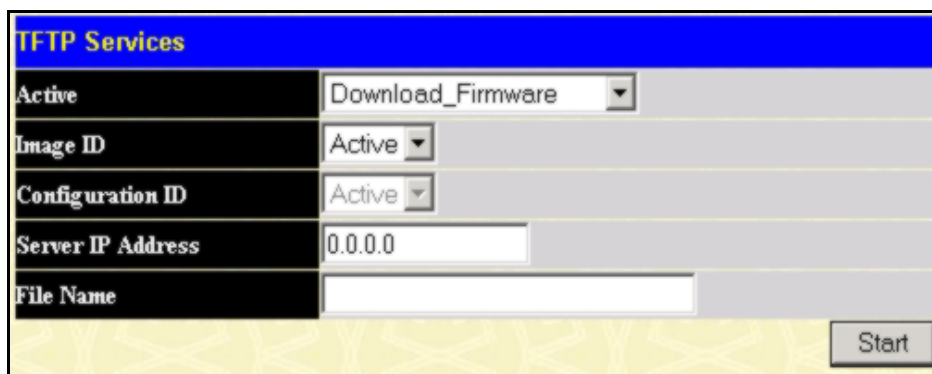


Figure 6- 16. TFTP Services menu

Configure the following parameters:

Parameter	Description
<b>Active</b>	Select a service for the TFTP server to perform from the drop down window: Download Firmware - Enter the IP address of the TFTP server and specify the location of the new firmware on the TFTP server. Click Start to record the IP address of the TFTP server and to initiate the file transfer. Download Configuration - Enter the IP address of the TFTP server, and the path and filename for the Configuration file on the TFTP server. Click Start to record the IP address of the TFTP server and to initiate the file transfer. Upload Configuration - Enter the IP address of the TFTP server and the path and filename for the switch settings on the TFTP server. Click Start to record the IP address of the TFTP server and to initiate the file transfer. Upload Log - Enter the IP address of the TFTP server and the path and filename for the history log on the TFTP server. Click Start to record the IP address of the TFTP server and to initiate the file transfer.
<b>Image ID</b>	For firmware downloads, select the Image ID of the firmware. The Switch can hold two firmware images in its memory. Image ID 1 will always be the boot up firmware for the Switch unless specified by the user. Choosing Active will download the firmware to the Boot Up Image ID, depending on the user's configuration. Information on configuring Image IDs can be found in this section, under the heading Multiple Image Services.
<b>Configuration ID</b>	For configuration downloads, select the Image ID of the configuration. The Switch can hold two configuration images in its memory. Image ID 1 will always be the boot up configuration for the Switch unless specified by the user. Choosing Active will download the configuration to the Boot Up Image ID, depending on the user's configuration. Information on configuring Image IDs can be found in this section, under the heading Multiple Image Services.
<b>Server IP Address</b>	Enter the IP address of the server from which you wish to download firmware.
<b>File Name</b>	Enter the path and filename of the firmware or configuration file that you wish to upload or download.

## Multiple Image Services

The **Multiple Image Services** folder allows users of the Switch to configure and view information regarding firmware located on the Switch. The Switch allows two firmware images to be stored in its memory and either can be configured to be the boot up firmware for the Switch. For information regarding firmware images located on the Switch, open the **Firmware Information** link. The default setting for the Switch’s firmware will have the boot up firmware stored in Image 1, but the user may set either firmware stored to be the boot up firmware by using the **Config Firmware Image** menu.

### Firmware Information

The following screen allows the user to view information about current firmware images stored on the Switch. To access the following screen, click **Administration > Multiple Image Services**.

Firmware Information					
ID	Version	Size	Update Time	From	User
1	1.00-B27	2013171	0 days 00:00:00	Serial Port(Prom)	Unknown
2	*1.00-B30	2013334	2005/12/12 11:50:15	10.41.44.44(W)	

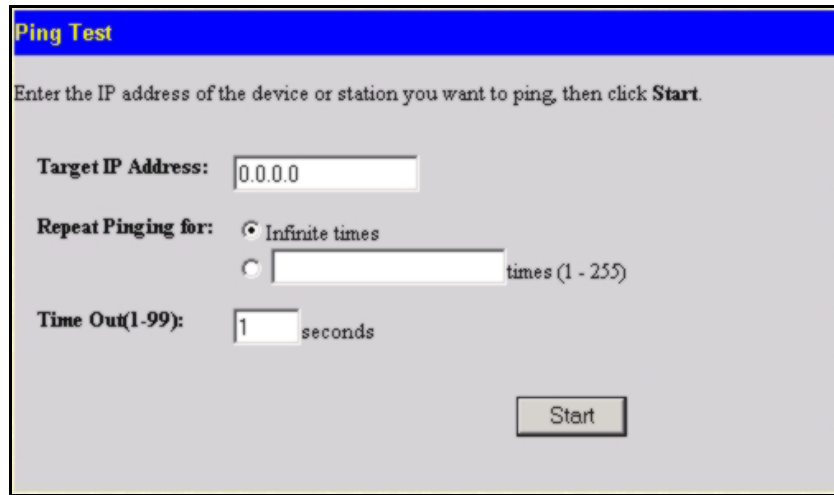
**Figure 6- 17. Firmware Information window**

This window holds the following information:

Parameter	Description
<b>ID</b>	States the image ID number of the firmware in the Switch’s memory. The Switch can store 2 firmware images for use. Image ID 1 will be the default boot up firmware for the Switch unless otherwise configured by the user.
<b>Version</b>	States the firmware version.
<b>Size</b>	States the size of the corresponding firmware, in bytes.
<b>Update Time</b>	States the specific time the firmware version was downloaded to the Switch.
<b>From</b>	States the IP address of the origin of the firmware. There are five ways firmware may be downloaded to the Switch. R – If the IP address has this letter attached to it, it denotes a firmware upgrade through the Console Serial Port (RS-232). T - If the IP address has this letter attached to it, it denotes a firmware upgrade through Telnet. S - If the IP address has this letter attached to it, it denotes a firmware upgrade through the Simple Network Management Protocol (SNMP). W - If the IP address has this letter attached to it, it denotes a firmware upgrade through the web-based management interface. SIM – If the IP address has this letter attached to it, it denotes a firmware upgrade through the Single IP Management feature.
<b>User</b>	States the user who downloaded the firmware. This field may read “Anonymous” or “Unknown” for users that are not identified.

## Ping Test

Ping is a small program that sends ICMP Echo packets to the IP address you specify. The destination node then responds to or "echoes" the packets sent from the Switch. This is very useful to verify connectivity between the Switch and other nodes on the network.



**Figure 6- 18. Ping Test window**

The user may use Infinite times radio button, in the Repeat Pinging for field, which will tell the ping program to keep sending ICMP Echo packets to the specified IP address until the program is stopped. The user may opt to choose a specific number of times to ping the Target IP Address by clicking its radio button and entering a number between 1 and 255. Click **Start** to initiate the Ping program.

## Safeguard Engine

Periodically, malicious hosts on the network will attack the Switch by utilizing packet flooding (ARP Storm) or other methods. These attacks may increase the CPU utilization beyond its capability. To alleviate this problem, the Safeguard Engine function was added to the Switch's software.

Safeguard Engine can help the overall operability of the Switch by minimizing the workload of the Switch while the attack is ongoing, thus making it capable to forward essential packets over its network in a limited bandwidth. When the Switch either (a) receives too many packets to process or (b) exerts too much memory, it will enter an **Exhausted** mode. When in this mode, the Switch will perform the following tasks to minimize the CPU usage:

1. It will limit bandwidth of receiving ARP packets. The user may implement this in two ways, by using the Mode pull down menu in the screen below:
  - a. When **Strict** is chosen, the Switch will stop receiving ARP packets not destined for the Switch. This will eliminate all unnecessary ARP packets while allowing the essential ARP packets to pass through to the Switch's CPU.
  - b. When **Fuzzy** is chosen, the Switch will minimize the ARP packet bandwidth received by the switch by adjusting the bandwidth for all ARP packets, whether destined for the Switch or not. The Switch uses an internal algorithm to filter ARP packets through, with a higher percentage set aside for ARP packets destined for the Switch.
2. It will limit the bandwidth of IP packets received by the Switch. The user may implement this in two ways, by using the Mode pull down menu in the screen below:
  - a. When **Strict** is chosen, the Switch will stop receiving all unnecessary broadcast IP packets, even if the high CPU utilization is not caused by the high reception rate of broadcast IP packets.
  - b. When **Fuzzy** is chosen, the Switch will minimize the IP packet bandwidth received by the Switch by adjusting the bandwidth for all IP packets, by setting an acceptable bandwidth for both unicast and broadcast IP packets. The Switch uses an internal algorithm to filter IP packets through while adjusting the bandwidth dynamically.



IP packets may also be limited by the Switch by configuring only certain IP addresses to be accepted. This method can be accomplished through the CPU Interface Filtering mechanism explained in the previous section. Once the user configures these acceptable IP addresses, other packets containing different IP addresses will be dropped by the Switch, thus limiting the bandwidth of IP packets. To keep the process moving fast, be sure not to add many conditions on which to accept these acceptable IP addresses and their packets, this limiting the CPU utilization.

Once in Exhausted mode, the packet flow will decrease by half of the level that caused the Switch to enter Exhausted mode. After the packet flow has stabilized, the rate will initially increase by 25% and then return to a normal packet flow.



**NOTICE:** When Safeguard Engine is enabled, the Switch will allot bandwidth to various traffic flows (ARP, IP) using the FFP (Fast Filter Processor) metering table to control the CPU utilization and limit traffic. This may limit the speed of routing traffic over the network.

## Safeguard Engine Status

To view the current **Safeguard Engine Status** for the Switch, click **Administration > Safeguard Engine > Safeguard Engine Status**

Safeguard Engine Status	
State	Disabled
Current Mode	fuzzy
CPU Utilization Information	
Rising(20-100)	30%
Falling(20-100)	20%
Trap / Log State	Disabled

**Figure 6- 19. Safeguard Engine Status display**

The Safeguard Engine Status window is a read-only field that will state the current Safeguard Engine mode of the Switch. This field may read “normal mode” or “exhausted mode”.

## Enable/Disable Safeguard Engine

To enable Safeguard Engine or configure advanced Safeguard Engine settings for the Switch, click **Configuration > Safeguard Engine > Safeguard Engine Settings**, which will open the following window.

**Safeguard Engine**

State

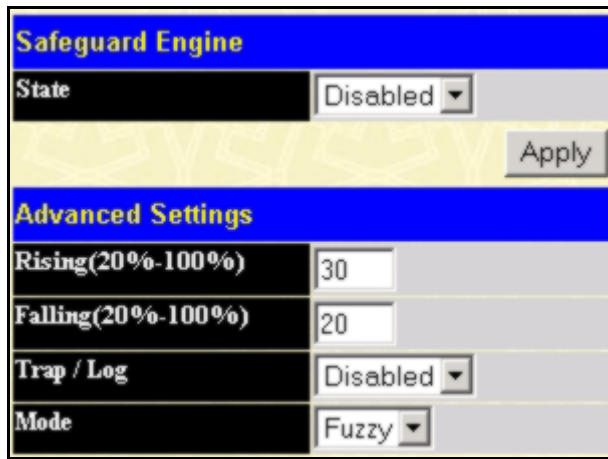
D-Link [Safeguard Engine](#) is a robust and innovative technology developed by D-Link, which will automatically throttle the impact of packet flooding into the switch's CPU. It will keep D-Link Switches better protected from being too frequently interrupted by malicious viruses or worm attacks.

**Figure 6- 20. Safeguard Engine State menu**

To enable the Safeguard Engine option, select *Enabled* with the drop-down **State** menu and click the **Apply** button.



To configure the advanced settings for Safeguard Engine, click the **Advanced Settings** button to view the following menu.



**Figure 6- 21. Safeguard Engine (Advanced) Settings menu**

To configure, set the following parameters and click **Apply**.

Parameter	Description
<b>State</b>	Use the pull-down menu to globally enable or disable Safeguard Engine settings for the Switch.
<b>Rising</b>	Used to configure the acceptable level of CPU utilization before the Safeguard Engine mechanism is enabled. Once the CPU utilization reaches this percentage level, the Switch will move into Safeguard Engine state, based on the parameters provided in this window.
<b>Falling</b>	Used to configure the acceptable level of CPU utilization as a percentage, where the Switch leaves the Safeguard Engine state and returns to normal mode.
<b>Trap / Log</b>	Use the pull-down menu to enable or disable the sending of messages to the device's SNMP agent and switch log once the Safeguard Engine has been activated by a high CPU utilization rate.
<b>Mode</b>	Used to select the type of Safeguard Engine to be activated by the Switch when the CPU utilization reaches a high rate. The user may select: Fuzzy – If selected, this function will instruct the Switch to minimize the IP and ARP traffic flow to the CPU by dynamically allotting an even bandwidth to all traffic flows. Strict – If selected, this function will stop accepting all ARP packets not intended for the Switch, and will stop receiving all unnecessary broadcast IP packets, until the storm has subsided. The default setting is Fuzzy mode.

## Static ARP Settings

The *Address Resolution Protocol (ARP)* is a TCP/IP protocol that converts IP addresses into physical addresses. This table allows network managers to view, define, modify and delete ARP information for specific devices.

Static entries can be defined in the **ARP Table**. When static entries are defined, a permanent entry is entered and is used to translate IP address to MAC addresses.

To open the **Static ARP Table** open the **Administration** folder, and then open the **Static ARP** folder and click on the **Static ARP Settings** link.

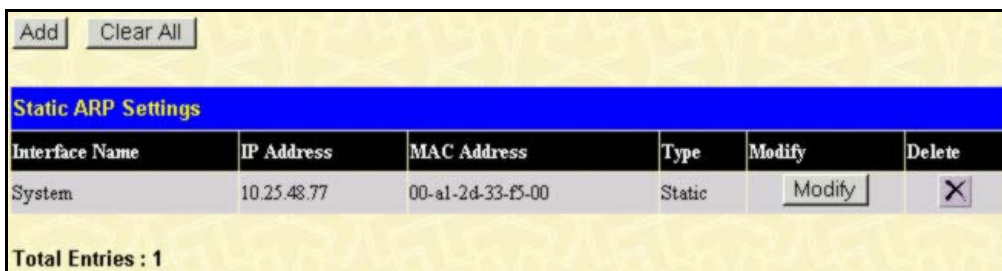


Figure 6- 22. Static ARP Settings window

To add a new entry, click the **Add** button, revealing the following screen to configure:

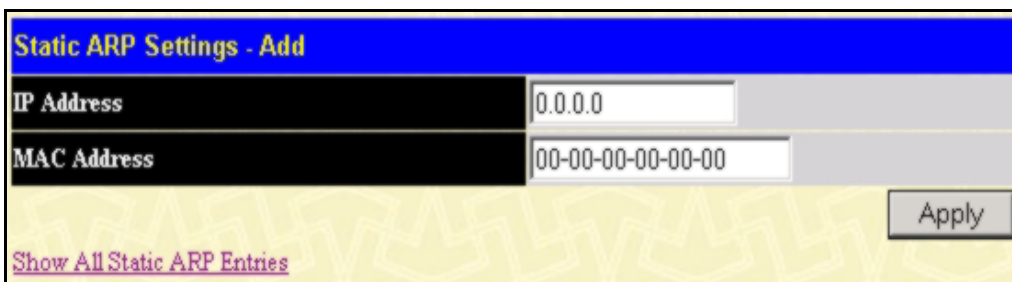


Figure 6- 23. Static ARP Settings – Add window

To modify a current entry, click the corresponding **Modify** button of the entry to be modified, revealing the following screen to configure:

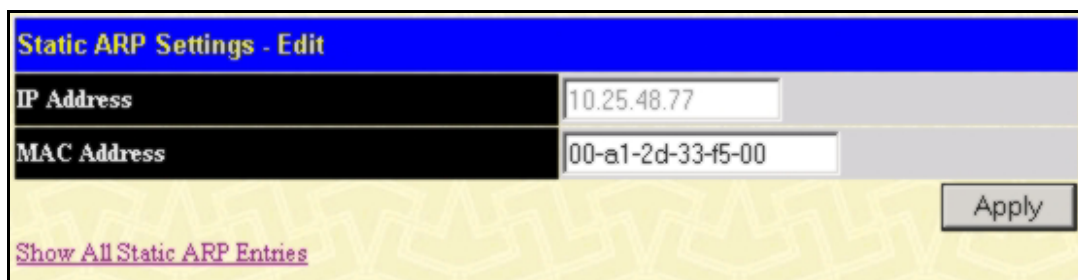


Figure 6- 24. Static ARP Settings – Edit window

The following fields can be set or viewed:

Parameter	Description
<b>IP Address</b>	The IP address of the ARP entry. This field cannot be edited in the Static ARP Settings – Edit window.
<b>MAC Address</b>	The MAC address of the ARP entry.

After entering the IP Address and MAC Address of the **Static ARP** entry, click **Apply** to implement the new entry. To completely clear the **Static ARP Settings**, click the **Clear All** button.

## Static IPv6 ARP Settings

Static ARP entries can be defined for IPv6 addresses. This will create a permanent entry is entered and is used to translate IPv6 address to MAC addresses.

To open the **Static IPv6 ARP Table** open the **Administration** folder, and then open the **Static ARP** folder and click on the **Static IPv6 ARP Settings** link.

Static IPv6 ARP Settings				
Interface Name	IPv6 Address	MAC Address	Type	Delete
System	2D30::AC21	00-01-01-01-01-01	Static	<input type="button" value="X"/>

Total Entries : 1

Figure 6- 25. Static IPv6 ARP Settings table

To remove an entry, click the Delete button for the entry being removed. To completely clear the **Static IPv6 ARP Settings**, click the **Clear All** button. To add a new entry, click the **Add** button, revealing the following screen to configure:

Static IPv6 ARP Settings - Add	
IPv6 Address	<input type="text" value="0000:0000:0000:0000:00"/>
MAC Address	<input type="text" value="00-00-00-00-00-00"/>
<input type="button" value="Apply"/>	

Figure 6- 26. Static IPv6 ARP Settings – Add menu

The following fields can be set or viewed:

Parameter	Description
<b>IPv6 Address</b>	The IPv6 address of the ARP entry. Specify the address using the format as ipv6address (ipv6address is hexadecimal number, for example 1234::5D7F/32).
<b>MAC Address</b>	The MAC address of the IPv6 ARP entry.

After entering the IPv6 Address and MAC Address of the **Static IPv6 ARP** entry, click **Apply** to implement the new entry.

## Routing Table

The Switch supports static routing for IP and IPv6 formatted addressing. Access both menus in the Routing Table folder.

### Static/Default IP Route Settings

Entries into the Switch’s forwarding table can be made using both MAC addresses and IP addresses. Static IP forwarding is accomplished by the entry of an IP address into the Switch’s **Static IP Routing Table**. To view the following window, click **Administration > Routing Table > Static/Default Route**.

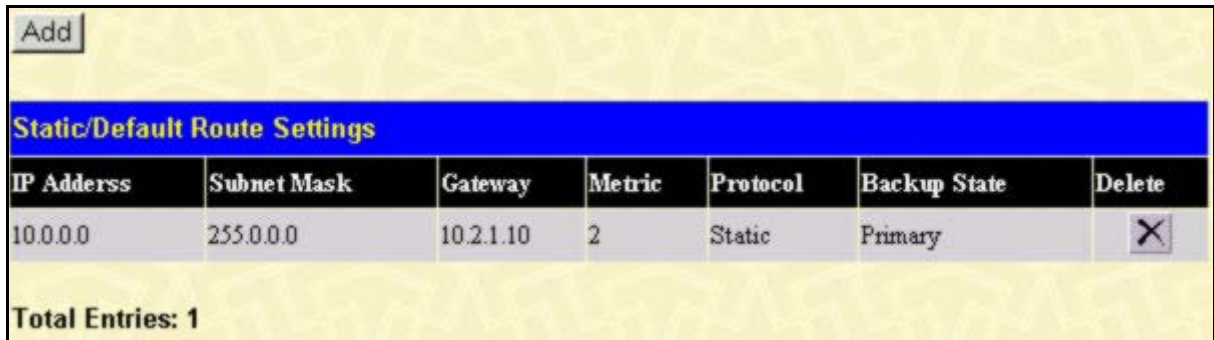


Figure 6- 27. Static/Default Route Settings window

This window shows the following values:

Parameter	Description
<b>IP Address</b>	The IP address of the Static/Default Route.
<b>Subnet Mask</b>	The corresponding Subnet Mask of the IP address entered into the table.
<b>Gateway</b>	The corresponding Gateway of the IP address entered into the table.
<b>Metric</b>	Represents the metric value of the IP interface entered into the table. This field may read a number between 1-65535.
<b>Protocol</b>	Represents the protocol used for the Routing Table entry of the IP interface.
<b>Backup State</b>	Represents the Backup state that this IP interface is configured for. This field may read Primary or Backup.
<b>Delete</b>	Click the  button if you would like to delete this entry from the Static/Default Route Settings table.

To enter an IP Interface into the Switch's **Static/Default Route Settings** window, click the **Add** button, revealing the following window to configure.

Static/Default Route Settings - Add	
IP Address	<input type="text" value="0.0.0.0"/>
Subnet Mask	<input type="text" value="0.0.0.0"/>
Gateway	<input type="text" value="0.0.0.0"/>
Metric (1-65535)	<input type="text" value="1"/>
Backup State	<input type="text" value="Primary"/>
<input type="button" value="Apply"/>	
<a href="#">Show All Static/Default Route Entries</a>	

**Figure 6- 28. Static/Default Route Settings – Add window**

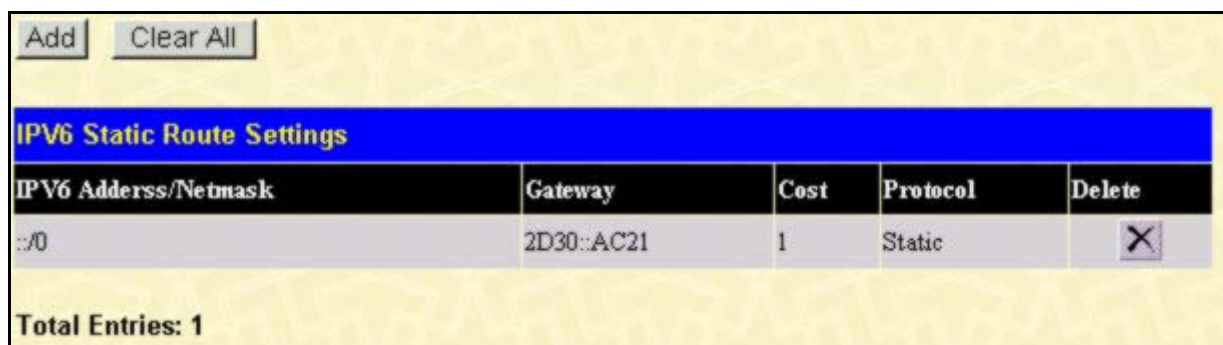
The following fields can be set:

Parameter	Description
<b>IP Address</b>	Allows the entry of an IP address that will be a static entry into the Switch's Routing Table.
<b>Subnet Mask</b>	Allows the entry of a subnet mask corresponding to the IP address above.
<b>Gateway</b>	Allows the entry of an IP address of a gateway for the IP address above.
<b>Metric (1-65535)</b>	Allows the entry of a routing protocol metric representing the number of routers between the Switch and the IP address above.
<b>Backup State</b>	The user may choose between <i>Primary</i> and <i>Backup</i> . If the Primary Static/Default Route fails, the Backup Route will support the entry. Please take note that the Primary and Backup entries cannot have the same Gateway.

Click **Apply** to implement changes made.

## Static IPv6 Route Settings

A static entry of an IPv6 address can be entered into the Switch's routing table for IPv6 formatted addresses. To view the following window, click **Administration > Routing Table > IPv6 Static Route**.



**Figure 6- 29. IPv6 Static Route Settings list**

This window shows the following values:

Parameter	Description
<b>IPv6 Address/Netmask</b>	The IPv6 address and corresponding Subnet Mask of the IPv6 static route entry.
<b>Gateway</b>	The corresponding IPv6 address for the next hop Gateway address in IPv6 format.
<b>Metric (1-65535)</b>	The metric of the IPv6 interface entered into the table representing the number of routers between the Switch and the IPv6 address above. Metric values allowed are between 1-65535.
<b>Protocol</b>	Represents the status (default or static) for the IPv6 routing table entry.
<b>Delete</b>	Click the  button if you would like to delete this entry from the list.

To enter an IPv6 Interface into the **IPv6 Static Route** list, click the **Add** button, revealing the following window to configure.

**Figure 6- 30. Static/Default Route Settings – Add menu**

Click to select the **default** option if this will be the default IPv6 route. Choosing this option will allow the user to configure the default gateway for the next hop router only.

The following fields can be set:

Parameter	Description
<b>IPv6 Address/Netmask</b>	Specify the address and mask information using the format as ipv6address / prefix length (ipv6address is hexadecimal number, prefix length is decimal number, for example 1234::5D7F/32).
<b>Next Hop Address</b>	Enter the IPv6 address for the next hop Gateway address in IPv6 format.
<b>Metric (1-65535)</b>	The metric representing the number of routers between the Switch and the IPv6 address above.
<b>default</b>	Select the default option to define the entry as a 1 hop IPv6 default route.

Click **Apply** to implement changes made.

## DHCP Auto Configuration Settings

This window is used to enable the DHCP Autoconfiguration feature on the Switch. When enabled, the Switch is instructed to receive a configuration file from a TFTP server, which will set the Switch to become a DHCP client automatically on boot up. To employ this method, the DHCP server must be set up to deliver the TFTP server Ip address and configuration file name information in the DHCP reply packet. The TFTP server must be up and running and hold the necessary configuration file stored in its base directory when the request is received from the Switch. For more information about loading a configuration file for use by a client, see the DHCP server and/or TFTP server software instructions. The user may also consult the Upload screen description located in the Maintenance section of this manual.

If the Switch is unable to complete the DHCP auto configuration, the previously saved configuration file present in the Switch’s memory will be used.

**Figure 6- 31. DHCP Auto Configuration Settings window**

To enable the DHCP Auto Configuration State, use the pull-down menu to choose Enable and click the Apply button.

## SNMP Settings

Simple Network Management Protocol (SNMP) is an OSI Layer 7 (Application Layer) designed specifically for managing and monitoring network devices. SNMP enables network management stations to read and modify the settings of gateways, routers, switches, and other network devices. Use SNMP to configure system features for proper operation, monitor performance and detect potential problems in the Switch, switch group or network.

Managed devices that support SNMP include software (referred to as an agent), which runs locally on the device. A defined set of variables (managed objects) is maintained by the SNMP agent and used to manage the device. These objects are defined in a Management Information Base (MIB), which provides a standard presentation of the information controlled by the on-board SNMP agent. SNMP defines both the format of the MIB specifications and the protocol used to access this information over the network.

The DGS-3400 Series supports the SNMP versions 1, 2c, and 3. The three versions of SNMP vary in the level of security provided between the management station and the network device.

In SNMP v.1 and v.2, user authentication is accomplished using 'community strings', which function like passwords. The remote user SNMP application and the Switch SNMP must use the same community string. SNMP packets from any station that has not been authenticated are ignored (dropped).

The default community strings for the Switch used for SNMP v.1 and v.2 management access are:

- **public** - Allows authorized management stations to retrieve MIB objects.
- **private** - Allows authorized management stations to retrieve and modify MIB objects.

SNMPv3 uses a more sophisticated authentication process that is separated into two parts. The first part is to maintain a list of users and their attributes that are allowed to act as SNMP managers. The second part describes what each user on that list can do as an SNMP manager.

The Switch allows groups of users to be listed and configured with a shared set of privileges. The SNMP version may also be set for a listed group of SNMP managers. Thus, you may create a group of SNMP managers that are allowed to view read-only information or receive traps using SNMPv1 while assigning a higher level of security to another group, granting read/write privileges using SNMPv3.

Using SNMPv3 individual users or groups of SNMP managers can be allowed to perform or be restricted from performing specific SNMP management functions. The functions allowed or restricted are defined using the Object Identifier (OID) associated with a specific MIB. An additional layer of security is available for SNMPv3 in that SNMP messages may be encrypted. To read more about how to configure SNMPv3 settings for the Switch read the next section.

## Traps

Traps are messages that alert network personnel of events that occur on the Switch. The events can be as serious as a reboot (someone accidentally turned OFF the Switch), or less serious like a port status change. The Switch generates traps and sends them to the trap recipient (or network manager). Typical traps include trap messages for Authentication Failure, Topology Change and Broadcast/Multicast Storm.

## MIBs

The Switch in the Management Information Base (MIB) stores management and counter information. 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, the Switch also supports its own proprietary enterprise MIB as an extended Management Information Base. Specifying the MIB Object Identifier may also retrieve the proprietary MIB. MIB values can be either read-only or read-write.

The DGS-3400 Series incorporates a flexible SNMP management for the switching environment. SNMP management can be customized to suit the needs of the networks and the preferences of the network administrator. Use the SNMP V3 menus to select the SNMP version used for specific tasks.

The DGS-3400 Series supports the Simple Network Management Protocol (SNMP) versions 1, 2c, and 3. The administrator can specify the SNMP version used to monitor and control the Switch. The three versions of SNMP vary in the level of security provided between the management station and the network device.

SNMP settings are configured using the menus located on the SNMP V3 folder of the web manager. Workstations on the network that are allowed SNMP privileged access to the Switch can be restricted with the Management Station IP Address menu.



## SNMP User Table

The **SNMP User Table** displays all of the SNMP User's currently configured on the Switch.

In the **SNMP Manager** folder, located in the **Administration** folder, click on the **SNMP User Table** link. This will open the **SNMP User Table** window, as shown below.

SNMP User Table				
User Name	Group Name	SNMP Version	Display	Delete
u1	g1	V3	View	X
initial	initial	V3	View	X

**Figure 6- 32. SNMP User Table window**

To delete an existing SNMP User Table entry, click the **X** below the **Delete** heading corresponding to the entry you wish to delete.

To display the detailed entry for a given user, click on the **View** button. This will open the **SNMP User Table Display** window, as shown below.

SNMP User Table Display	
User Name	u1
Group Name	g1
SNMP Version	V3
Auth-Protocol	MD5
Priv-Protocol	DES

**Figure 6- 33. SNMP User Table Display**

The following parameters are displayed:

Parameter	Description
<b>User Name</b>	An alphanumeric string of up to 32 characters. This is used to identify the SNMP users.
<b>Group Name</b>	This name is used to specify the SNMP group created can request SNMP messages.
<b>SNMP Version</b>	V1 - Indicates that SNMP version 1 is in use. V2 - Indicates that SNMP version 2 is in use. V3 - Indicates that SNMP version 3 is in use.
<b>Auth-Protocol</b>	<i>None</i> - Indicates that no authorization protocol is in use. <i>MD5</i> - Indicates that the HMAC-MD5-96 authentication level will be used. <i>SHA</i> - Indicates that the HMAC-SHA authentication protocol will be used.
<b>Priv-Protocol</b>	<i>None</i> - Indicates that no authorization protocol is in use. <i>DES</i> - Indicates that DES 56-bit encryption is in use based on the CBC-DES (DES-56) standard.

To return to the SNMP User Table, click the [Show All SNMP User Table Entries](#) link. To add a new entry to the **SNMP User Table Configuration** window, click on the **Add** button on the **SNMP User Table** window. This will open the **SNMP User Table Configuration** window, as shown below.

The image shows a configuration window titled "SNMP User Table Configuration". It contains several input fields and a button:

- User Name:** A text input field.
- Group Name:** A text input field.
- SNMP Version:** A dropdown menu set to "V1" and a checkbox labeled "encrypted".
- Auth-Protocol:** A dropdown menu set to "MD5" and a "Password" text input field.
- Priv-Protocol:** A dropdown menu set to "DES" and a "Password" text input field.
- Apply:** A button in the bottom right corner.

**Figure 6- 34. SNMP User Table Configuration window**

To implement changes made, click **Apply**. To return to the SNMP User Table, click the [Show All SNMP User Table Entries](#) link.

## SNMP View Table

The SNMP View Table is used to assign views to community strings that define which MIB objects can be accessed by a remote SNMP manager. To view the **SNMP View Table** window, open the **SNMP Manager** folder under **Administration** and click the **SNMP View Table** entry. The following window should appear:

The image shows a window titled "SNMP View Table" with a table of entries. Above the table, there is an "Add" button and a note: "Total Entries:9 (Note:Maximum of 30 entries.)".

View Name	Subtree	View Type	Delete
v1	1	Included	X
restricted	1.3.6.1.2.1.1	Included	X
restricted	1.3.6.1.2.1.11	Included	X
restricted	1.3.6.1.6.3.10.2.1	Included	X
restricted	1.3.6.1.6.3.11.2.1	Included	X
restricted	1.3.6.1.6.3.15.1.1	Included	X
CommunityView	1	Included	X
CommunityView	1.3.6.1.6.3	Excluded	X
CommunityView	1.3.6.1.6.3.1	Included	X

**Figure 6- 35. SNMP View Table window**

To delete an existing SNMP View Table entry, click the **X** in the **Delete** column corresponding to the entry you wish to delete. To create a new entry, click the **Add** button and a separate window will appear.

The image shows a web-based configuration window titled "SNMP View Table Configuration". It has a blue header bar with the title in yellow. Below the header, there are three rows of configuration fields: "View Name" with a text input box, "Subtree OID" with a text input box, and "View Type" with a dropdown menu currently set to "Included". At the bottom right of the form is an "Apply" button.

Figure 6- 36. SNMP View Table Configuration window

The SNMP Group created with this table maps SNMP users (identified in the SNMP User Table) to the views created in the previous window.

The following parameters can set:

Parameter	Description
<b>View Name</b>	Type an alphanumeric string of up to 32 characters. This is used to identify the new SNMP view being created.
<b>Subtree OID</b>	Type the Object Identifier (OID) Subtree for the view. The OID identifies an object tree (MIB tree) that will be included or excluded from access by an SNMP manager.
<b>View Type</b>	Select Included to include this object in the list of objects that an SNMP manager can access. Select Excluded to exclude this object from the list of objects that an SNMP manager can access.

To implement your new settings, click **Apply**. To return to the SNMP View Table, click the [Show All SNMP View Table Entries](#) link.

## SNMP Group Table

An SNMP Group created with this table maps SNMP users (identified in the SNMP User Table) to the views created in the previous menu. To view the **SNMP Group Table** window, open the **SNMP Manager** folder in the **Administration** folder and click the **SNMP Group Table** entry. The following window should appear:

The image shows a web-based window titled "SNMP Group Table". At the top left is an "Add" button. Below it, a status bar says "Total Entries: 10 (Note: Maximum of 30 entries.)". The main content is a table with a blue header bar containing the title "SNMP Group Table". The table has five columns: "Group Name", "Security Model", "Security Level", "Display", and "Delete". Each row represents an SNMP group with its name, security model, security level, a "View" button, and a delete "X" button.

Group Name	Security Model	Security Level	Display	Delete
g1	SNMPv3	AuthPriv	View	X
public	SNMPv1	NoAuthNoPriv	View	X
public	SNMPv2	NoAuthNoPriv	View	X
initial	SNMPv3	NoAuthNoPriv	View	X
private	SNMPv1	NoAuthNoPriv	View	X
private	SNMPv2	NoAuthNoPriv	View	X
ReadGroup	SNMPv1	NoAuthNoPriv	View	X
ReadGroup	SNMPv2	NoAuthNoPriv	View	X
WriteGroup	SNMPv1	NoAuthNoPriv	View	X
WriteGroup	SNMPv2	NoAuthNoPriv	View	X

Figure 6- 37. SNMP Group Table window

To delete an existing SNMP Group Table entry, click the corresponding X under the Delete heading.

To display the current settings for an existing SNMP Group Table entry, click the hyperlink for the entry under the Group Name.

SNMP Group Table Display	
Group Name	public
Read View Name	CommunityView
Write View Name	
Notify View Name	CommunityView
Security Model	SNMPv1
Security Level	NoAuthNoPriv

[Show All SNMP Group Table Entries](#)

**Figure 6- 38. SNMP Group Table Configuration window**

To add a new entry to the Switch's SNMP Group Table, click the **Add** button in the upper left-hand corner of the **SNMP Group Table** window. This will open the **SNMP Group Table Configuration** window, as shown below.

SNMP Group Table Configuration	
Group Name	<input type="text"/>
Read View Name	<input type="text"/>
Write View Name	<input type="text"/>
Notify View Name	<input type="text"/>
Security Model	SNMPv1 ▾
Security Level	NoAuthNoPriv ▾

[Show All SNMP Group Table Entries](#)

**Figure 6- 39. SNMP Group Table Configuration window**

The following parameters can set:

Parameter	Description
Group Name	Type an alphanumeric string of up to 32 characters. This is used to identify the new SNMP group of SNMP users.
Read View Name	This name is used to specify the SNMP group created can request SNMP messages.
Write View Name	Specify a SNMP group name for users that are allowed SNMP write privileges to the Switch's SNMP agent.
Notify View Name	Specify a SNMP group name for users that can receive SNMP trap messages generated by the Switch's SNMP agent.
Security Model	<p><i>SNMPv1</i> - Specifies that SNMP version 1 will be used.</p> <p><i>SNMPv2</i> - Specifies that SNMP version 2c will be used. The SNMPv2 supports both centralized and distributed network management strategies. It includes improvements in the Structure of Management Information (SMI) and adds some security features.</p> <p><i>SNMPv3</i> - Specifies that the SNMP version 3 will be used. SNMPv3 provides secure access to devices through a combination of authentication and encrypting packets over the network.</p>
Security Level	<p>The Security Level settings only apply to SNMPv3.</p> <p><i>NoAuthNoPriv</i> - Specifies that there will be no authorization and no encryption of packets sent between the Switch and a remote SNMP manager.</p> <p><i>AuthNoPriv</i> - Specifies that authorization will be required, but there will be no encryption of packets sent between the Switch and a remote SNMP manager.</p> <p><i>AuthPriv</i> - Specifies that authorization will be required, and that packets sent between the Switch and a remote SNMP manger will be encrypted.</p>

To implement your new settings, click **Apply**. To return to the SNMP Group Table, click the [Show All SNMP Group Table Entries](#) link.

## SNMP Community Table Configuration

Use this table to create an SNMP community string to define the relationship between the SNMP manager and an agent. The community string acts like a password to permit access to the agent on the Switch. One or more of the following characteristics can be associated with the community string:

An Access List of IP addresses of SNMP managers that are permitted to use the community string to gain access to the Switch's SNMP agent.

Any MIB view that defines the subset of all MIB objects will be accessible to the SNMP community.

Read/write or read-only level permission for the MIB objects accessible to the SNMP community.


To configure SNMP Community entries, open the **SNMP Manager** folder, (located in the **Administration** folder) and click the **SNMP Community Table** link, which will open the following window:

The image shows the 'SNMP Community Table' configuration window. At the top, there is a blue header with the text 'SNMP Community Table'. Below this, there are three input fields: 'Community Name', 'View Name', and 'Access Right'. The 'Access Right' field is a dropdown menu currently set to 'Read\_Only'. To the right of these fields is an 'Apply' button. Below the input fields, it says 'Total Entries:2 (Note:Maximum of 10 entries.)'. Below this is another blue header with the text 'SNMP Community Table'. Underneath is a table with four columns: 'Community Name', 'View Name', 'Access Right', and 'Delete'. The table contains two entries: 'private' with 'CommunityView' and 'Read\_Write' access, and 'public' with 'CommunityView' and 'Read\_Only' access. Each entry has a delete icon (an 'X' in a square) in the 'Delete' column.

Figure 6- 40. SNMP Community Table Configuration window

The following parameters can set:

Parameter	Description
<b>Community Name</b>	Type an alphanumeric string of up to 32 characters that is used to identify members of an SNMP community. This string is used like a password to give remote SNMP managers access to MIB objects in the Switch's SNMP agent.
<b>View Name</b>	Type an alphanumeric string of up to 32 characters that is used to identify the group of MIB objects that a remote SNMP manager is allowed to access on the Switch. The view name must exist in the SNMP View Table.
<b>Access Right</b>	<p><i>Read Only</i> - Specifies that SNMP community members using the community string created can only read the contents of the MIBs on the Switch.</p> <p><i>Read Write</i> - Specifies that SNMP community members using the community string created can read from, and write to the contents of the MIBs on the Switch.</p>

To implement the new settings, click **Apply**. To delete an entry from the SNMP Community Table, click the  under the Delete heading, corresponding to the entry you wish to delete.



## SNMP Host Table

Use the **SNMP Host Table** window to set up SNMP trap recipients. Open the **SNMP Manager** folder, (located in the **Adminstation** folder) and click on the **SNMP Host Table** link. This will open the **SNMP Host Table** window, as shown below. To delete an existing SNMP Host Table entry, click the corresponding **X** under the Delete heading. To display the current settings for an existing **SNMP Group Table** entry, click the blue link for the entry under the Host IP Address heading.

Figure 6- 41. SNMP Host Table window

To add a new entry to the Switch's SNMP Host Table, click the **Add** button in the upper left-hand corner of the window. This will open the **SNMP Host Table Configuration** window, as shown below.

Figure 6- 42. SNMP Host Table Configuration window

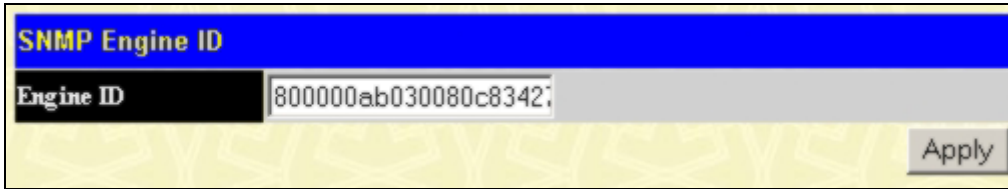
The following parameters can set:

Parameter	Description
<b>Host IP Address</b>	Type the IP address of the remote management station that will serve as the SNMP host for the Switch.
<b>SNMP Version</b>	<p>V1 - To specifies that SNMP version 1 will be used.</p> <p>V2 - To specify that SNMP version 2 will be used.</p> <p>V3-NoAuth-NoPriv - To specify that the SNMP version 3 will be used, with a NoAuth-NoPriv security level.</p> <p>V3-Auth-NoPriv - To specify that the SNMP version 3 will be used, with an Auth-NoPriv security level.</p> <p>V3-Auth-Priv - To specify that the SNMP version 3 will be used, with an Auth-Priv security level.</p>
<b>Community String or SNMP V3 User Name</b>	Type in the community string or SNMP V3 user name as appropriate.

To implement your new settings, click **Apply**. To return to the SNMP Host Table, click the [Show All SNMP Host Table Entries](#) link.

## SNMP Engine ID

The Engine ID is a unique identifier used for SNMP V3 implementations. This is an alphanumeric string used to identify the SNMP engine on the Switch. To display the Switch's SNMP Engine ID, open the **SNMP Manger** folder, (located in the **Administration**) folder and click on the **SNMP Engine ID** link. This will open the **SNMP Engine ID Configuration** window, as shown below.



**Figure 6- 43. SNMP Engine ID Configuration window**

To change the Engine ID, type the new Engine ID in the space provided and click the **Apply** button.



## IP-MAC Binding

The IP-MAC binding feature is a security measure that restricts access to a Switch to authorized users. Only the authorized client can access a Switch’s port by comparing a pre-configured IP/MAC matching database to the IP/MAC match extracted from ARP request or acknowledgement packets. If the comparison test fails, the user is not authorized, the packet is dropped and the user is effectively blocked from access. IP-MAC binding may be enabled on a per port basis. IP-MAC binding is useful for preventing IP spoofing and other abuses.

### IP-MAC Binding per Port

The IP-MAC Ports Settings menu is used to enable IP-MAC binding on a per port basis. Ports that are enabled will apply the IP-MAC check to ingress packets for the port. The IP-MAC database used for the check must be set up with the **IP-MAC Binding Table** (see below).

To enable or disable IP-MAC binding on specific ports, click **IP-MAC Binding Port** in the **IP-MAC Binding** folder on the **Administration Menu** to open the **IP-MAC Binding Ports Setting** window. Select a port or a range of ports with the **From** and **To** fields. Enable or disable the port with the **State** field. Click **Apply** to save changes.

IP-MAC Binding Ports Setting			
From	To	State	Apply
Port 1	Port 1	Disabled	Apply
IP-MAC Binding Port State Table			
Port	State		
1	Disabled		
2	Disabled		
3	Disabled		
4	Disabled		
5	Disabled		
6	Disabled		
7	Disabled		
8	Disabled		
9	Disabled		
10	Disabled		
11	Disabled		
12	Disabled		
13	Disabled		

Figure 6- 44. IP-MAC Binding Ports

## IP-MAC Binding Table

The window shown below can be used to create IP-MAC binding entries. Click the **IP-MAC Binding Table** on the **IP-MAC Binding** folder on the **Configuration** menu to view the **IP-MAC Binding Setting** window. Enter the IP and MAC addresses of the authorized users in the appropriate fields and click **Add**. To modify either the IP address or the MAC address of the binding entry, make the desired changes in the appropriate field and Click **Modify**. To find an IP-MAC binding entry, enter the IP and MAC addresses and click **Find**. To delete an entry click **Delete**. To clear all the entries from the table click **Delete All**.

IP-MAC Binding Setting			
IP Address	MAC Address	Port	
0.0.0.0	00-00-00-00-00-00	All	<input type="checkbox"/>
<input type="button" value="Add"/> <input type="button" value="Modify"/> <input type="button" value="Find"/> <input type="button" value="Delete All"/>			
Total Entries: 1			
IP-MAC Binding Table			
IP Address	MAC Address	Ports	Delete
10.47.8.59	00-01-20-22-30-33	1-27	<input type="button" value="X"/>

Figure 6- 45. IP-MAC Binding Table and Setting menu

IP-MAC Binding Blocked			
VLAN Name	MAC Address		
	00-00-00-00-00-00		
<input type="button" value="Find"/> <input type="button" value="Delete All"/>			
Total Entries: 0			
IP-MAC Binding Blocked Table			
VID	VLAN NAME	MAC Address	Port Type

Figure 6- 46. IP-MAC Blocked Table and configuration menu

## IP-MAC Binding Blocked

To view unauthorized devices that have been blocked by IP-MAC binding restrictions open the **IP-MAC Binding Blocked** window show below. Click **IP-MAC Binding Blocked** in the **IP-MAC Blocked** folder in the **Administration** menu to open the **IP-MAC Binding Blocked** window.

## Single IP Management (SIM) Overview

Simply put, D-Link Single IP Management is a concept that will stack switches together over Ethernet instead of using stacking ports or modules. There are some advantages in implementing the "Single IP Management" feature:

1. SIM can simplify management of small workgroups or wiring closets while scaling the network to handle increased bandwidth demand.
2. SIM can reduce the number of IP address needed in your network.
3. SIM can eliminate any specialized cables for stacking connectivity and remove the distance barriers that typically limit your topology options when using other stacking technology.

Switches using D-Link Single IP Management (labeled here as SIM) must conform to the following rules:

SIM is an optional feature on the Switch and can easily be enabled or disabled through the Command Line Interface or Web Interface. SIM grouping has no effect on the normal operation of the Switch in the user's network.

There are three classifications for switches using SIM. The **Commander Switch (CS)**, which is the master switch of the group, **Member Switch (MS)**, which is a switch that is recognized by the CS a member of a SIM group, and a **Candidate Switch (CaS)**, which is a Switch that has a physical link to the SIM group but has not been recognized by the CS as a member of the SIM group.

A SIM group can only have one Commander Switch (CS).

All switches in a particular SIM group must be in the same IP subnet (broadcast domain). Members of a SIM group cannot cross a router.

A SIM group accepts up to 32 switches (numbered 1-31), not including the Commander Switch (numbered 0).

There is no limit to the number of SIM groups in the same IP subnet (broadcast domain), however a single switch can only belong to one group.

If multiple VLANs are configured, the SIM group will only utilize the default VLAN on any switch.

SIM allows intermediate devices that do not support SIM. This enables the user to manage switches that are more than one hop away from the CS.

The SIM group is a group of switches that are managed as a single entity. The xStack DGS-3400 Series switch may take on three different roles:

1. **Commander Switch (CS)** - This is a switch that has been manually configured as the controlling device for a group, and takes on the following characteristics:

It has an IP Address.

It is not a command switch or member switch of another Single IP group.

It is connected to the member switches through its management VLAN.

2. **Member Switch (MS)** - This is a switch that has joined a single IP group and is accessible from the CS, and it takes on the following characteristics:

It is not a CS or MS of another IP group.

It is connected to the CS through the CS management VLAN.

3. **Candidate Switch (CaS)** - This is a switch that is ready to join a SIM group but is not yet a member of the SIM group. The Candidate Switch may join the SIM group of the xStack DGS-3400 Series switch by manually configuring it to be a MS of a SIM group. A switch configured as a CaS is not a member of a SIM group and will take on the following characteristics:

It is not a CS or MS of another Single IP group.

It is connected to the CS through the CS management VLAN

The following rules also apply to the above roles:

- Each device begins in a Candidate state.
- CS's must change their role to CaS and then to MS, to become a MS of a SIM group. Thus, the CS cannot directly be converted to a MS.

- The user can manually configure a CS to become a CaS.
- A MS can become a CaS by:
  - Being configured as a CaS through the CS.
  - If report packets from the CS to the MS time out.
- The user can manually configure a CaS to become a CS
- The CaS can be configured through the CS to become a MS.

After configuring one switch to operate as the CS of a SIM group, additional xStack DGS-3400 Series switch may join the group by manually configuring the Switch to be a MS. The CS will then serve as the in band entry point for access to the MS. The CS's IP address will become the path to all MS's of the group and the CS's Administrator's password, and/or authentication will control access to all MS's of the SIM group.

With SIM enabled, the applications in the CS will redirect the packet instead of executing the packets. The applications will decode the packet from the administrator, modify some data, then send it to the MS. After execution, the CS may receive a response packet from the MS, which it will encode and send it back to the administrator.

When a CaS becomes a MS, it automatically becomes a member of the first SNMP community (include read/write and read only) to which the CS belongs. However, if a MS has its own IP address, it can belong to SNMP communities to which other switches in the group, including the CS, do not belong.

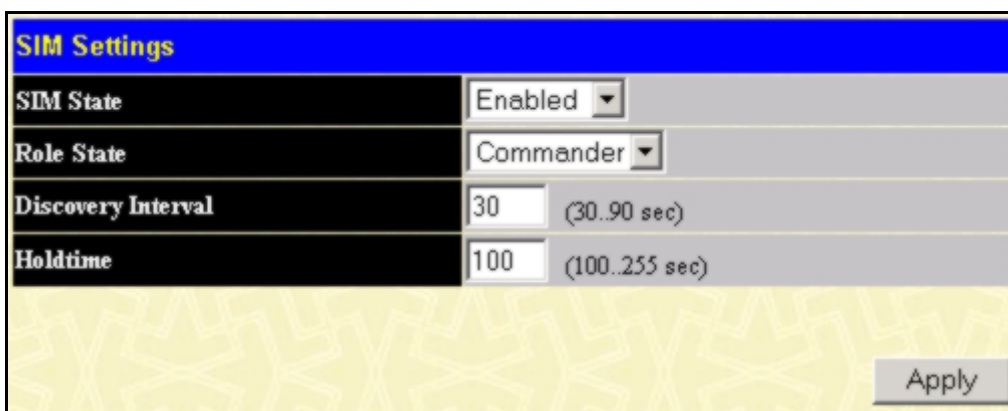
## SIM Using the Web Interface

All xStack DGS-3400 Series Switches are set as Candidate (CaS) switches as their factory default configuration and Single IP Management will be disabled. To enable SIM for the Switch using the Web interface, go to the **Single IP Management** folder and click the **SIM Settings** link, revealing the following window.



**Figure 6- 47. SIM Settings window (disabled)**

Change the **SIM State** to *Enabled* using the pull down menu and click **Apply**. The screen will then refresh and the **SIM Settings** window will look like this:



**Figure 6- 48. SIM Settings window (enabled)**

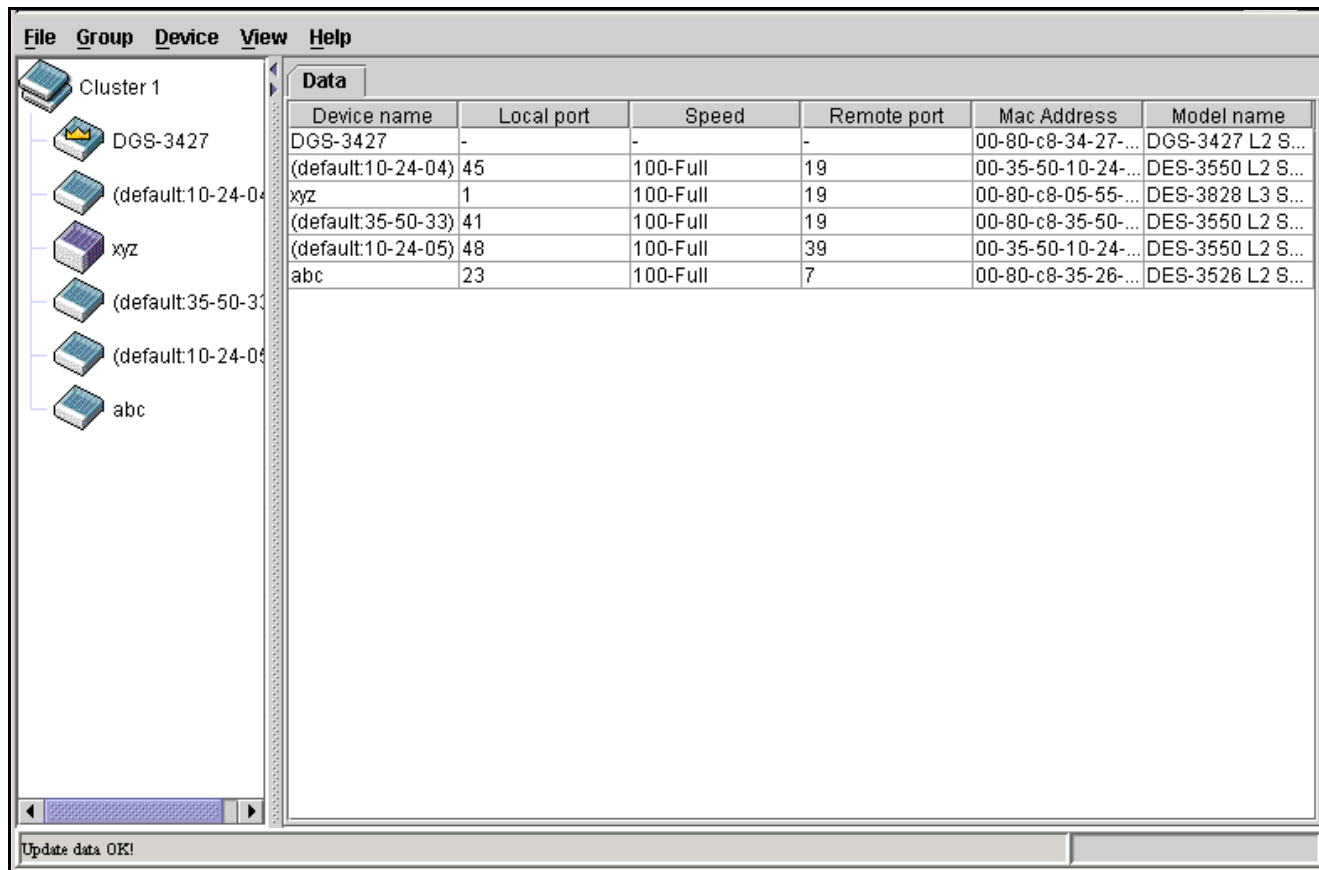
Parameter	Description
<b>SIM State</b>	Use the pull-down menu to either enable or disable the SIM state on the Switch. <i>Disabled</i> will render all SIM functions on the Switch inoperable.
<b>Role State</b>	Use the pull-down menu to change the SIM role of the Switch. The two choices are: <i>Candidate</i> - A Candidate Switch (CaS) is not the member of a SIM group but is connected to a Commander Switch. This is the default setting for the SIM role of the DGS-3400 Series. <i>Commander</i> - Choosing this parameter will make the Switch a Commander Switch (CS). The user may join other switches to this Switch, over Ethernet, to be part of its SIM group. Choosing this option will also enable the Switch to be configured for SIM.
<b>Discovery Interval</b>	The user may set the discovery protocol interval, in seconds that the Switch will send out discovery packets. Returning information to a Commander Switch will include information about other switches connected to it. (Ex. MS, CaS). The user may set the Discovery Interval from 30 to 90 seconds.
<b>Holdtime</b>	This parameter may be set for the time, in seconds; the Switch will hold information sent to it from other switches, utilizing the Discovery Interval. The user may set the hold time from 100 to 255 seconds.

Click **Apply** to implement the settings changed. After enabling the Switch to be a Commander Switch (CS), the **Single IP Management** folder will then contain three added links to aid the user in configuring SIM through the web, including **Topology**, **Firmware Upgrade** and **Configuration Backup/Restore**.

## Topology

The **Topology** window will be used to configure and manage the Switch within the SIM group and requires Java script to function properly on your computer.

The Java Runtime Environment on your server should initiate and lead you to the topology window, as seen below.

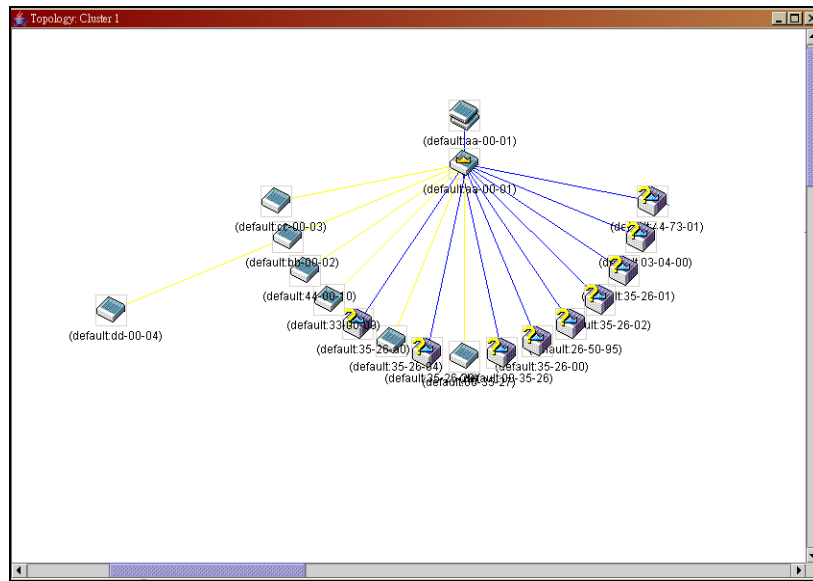


**Figure 6- 49. Single IP Management window - Tree View**

The Tree View window holds the following information under the Data tab:

Parameter	Description
<b>Device Name</b>	This field will display the Device Name of the switches in the SIM group configured by the user. If no device is configured by the name, it will be given the name default and tagged with the last six digits of the MAC Address to identify it.
<b>Local Port</b>	Displays the number of the physical port on the CS that the MS or CaS is connected to. The CS will have no entry in this field.
<b>Speed</b>	Displays the connection speed between the CS and the MS or CaS.
<b>Remote Port</b>	Displays the number of the physical port on the MS or CaS that the CS is connected to. The CS will have no entry in this field.
<b>MAC Address</b>	Displays the MAC Address of the corresponding Switch.
<b>Model Name</b>	Displays the full Model Name of the corresponding Switch.

To view the **Topology Map**, click the View menu in the toolbar and then Topology, which will produce the following screen. The **Topology View** will refresh itself periodically (20 seconds by default).



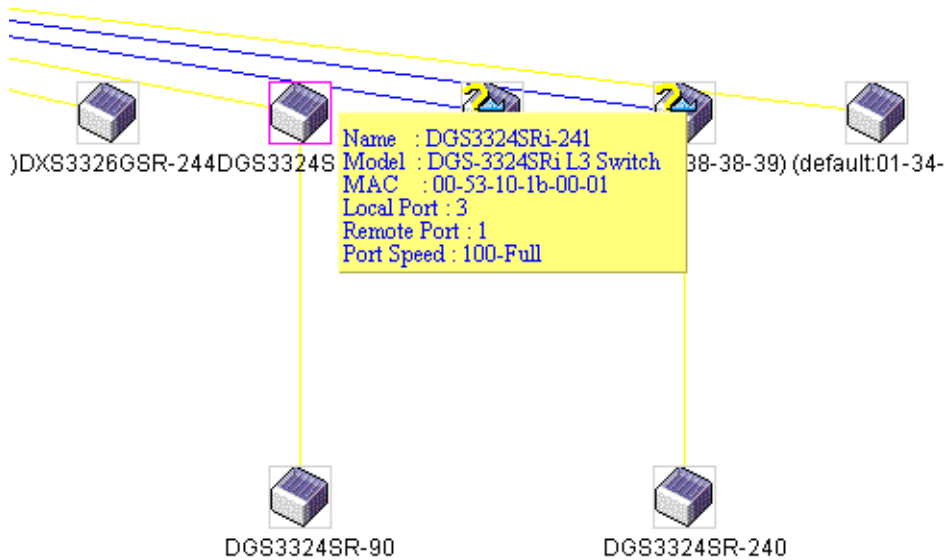
**Figure 6- 50. Topology view**

This screen will display how the devices within the Single IP Management Group connect to other groups and devices. Possible icons in this screen are as follows:

Icon	Description
	Group
	Layer 2 commander switch
	Layer 3 commander switch
	Commander switch of other group
	Layer 2 member switch.
	Layer 3 member switch
	Member switch of other group
	Layer 2 candidate switch
	Layer 3 candidate switch
	Unknown device
	Non-SIM devices

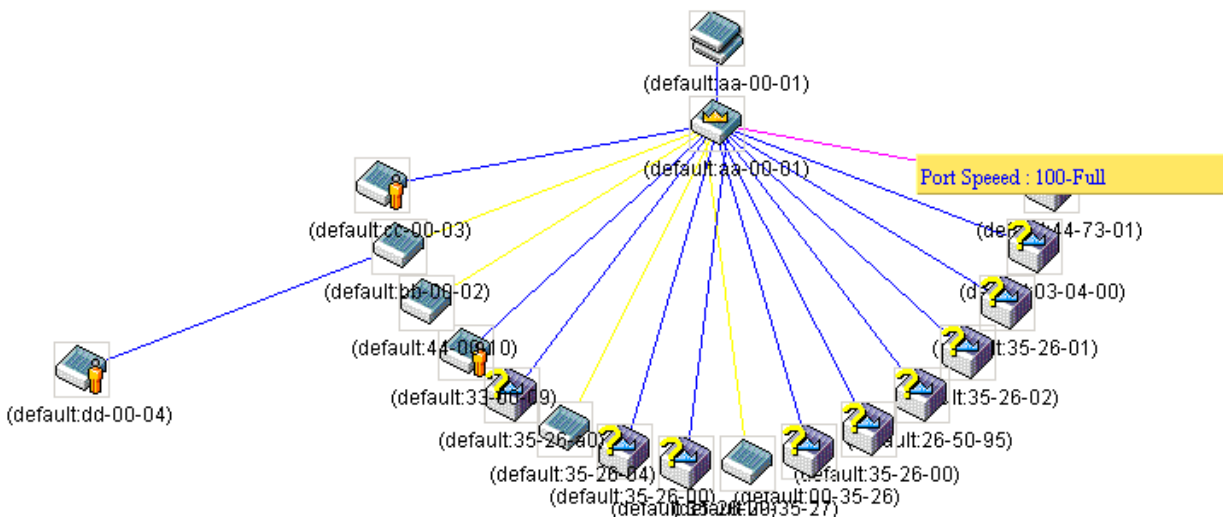
## Tool Tips

In the Topology view window, the mouse plays an important role in configuration and in viewing device information. Setting the mouse cursor over a specific device in the topology window (tool tip) will display the same information about a specific device as the Tree view does. See the window below for an example.



**Figure 6- 51. Device Information Utilizing the Tool Tip**

Setting the mouse cursor over a line between two devices will display the connection speed between the two devices, as shown below.



**Figure 6- 52. Port Speed Utilizing the Tool Tip**



## Right Click

Right clicking on a device will allow the user to perform various functions, depending on the role of the Switch in the SIM group and the icon associated with it.

## Group Icon

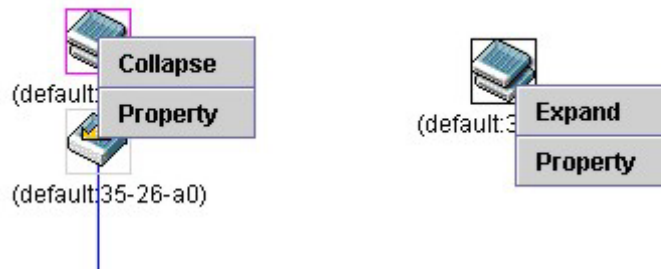


Figure 6- 53. Right Clicking a Group Icon

The following options may appear for the user to configure:

- **Collapse** - to collapse the group that will be represented by a single icon.
- **Expand** - to expand the SIM group, in detail.
- **Property** - to pop up a window to display the group information.

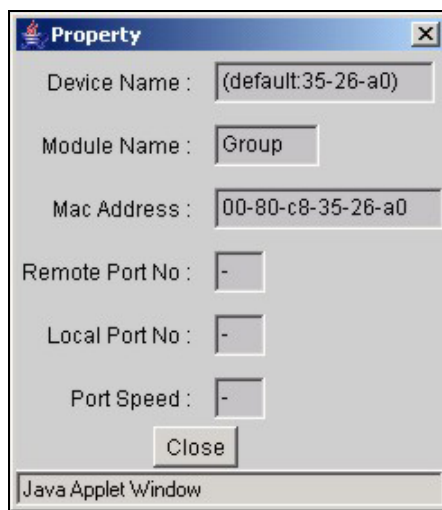


Figure 6- 54. Property window

## Commander Switch Icon

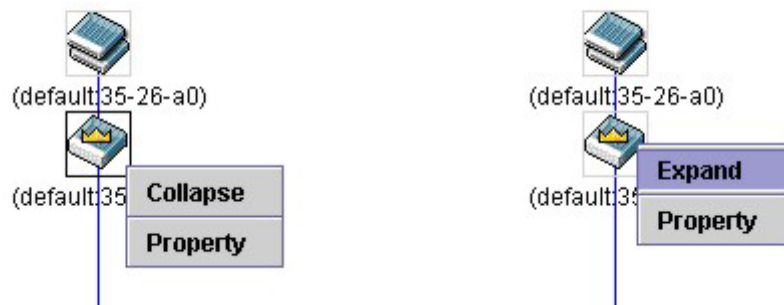


Figure 6- 55. Right Clicking a Commander Icon

The following options may appear for the user to configure:

- **Collapse** - to collapse the group that will be represented by a single icon.
- **Expand** - to expand the SIM group, in detail.
- **Property** - to pop up a window to display the group information.

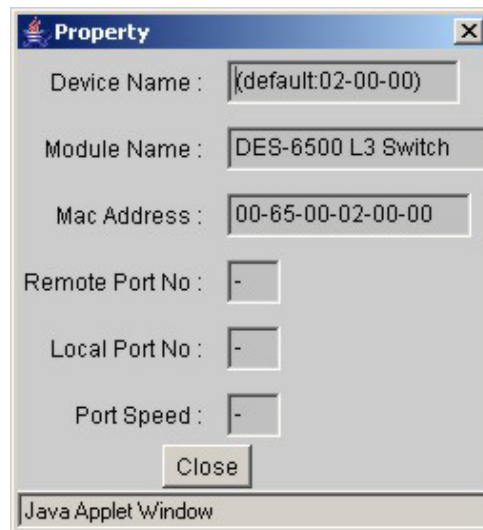


Figure 6- 56. Property window

## Member Switch Icon

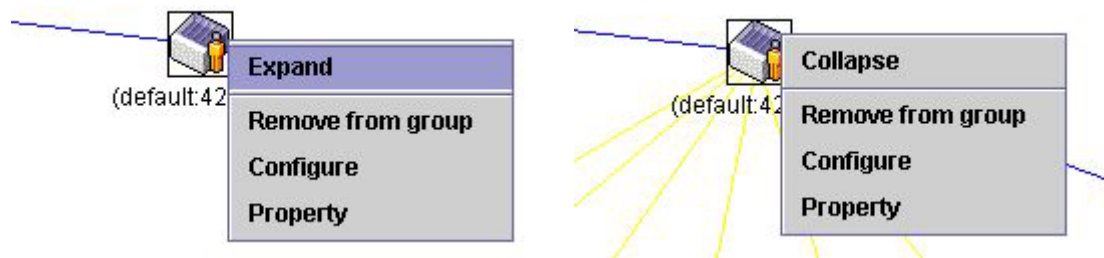
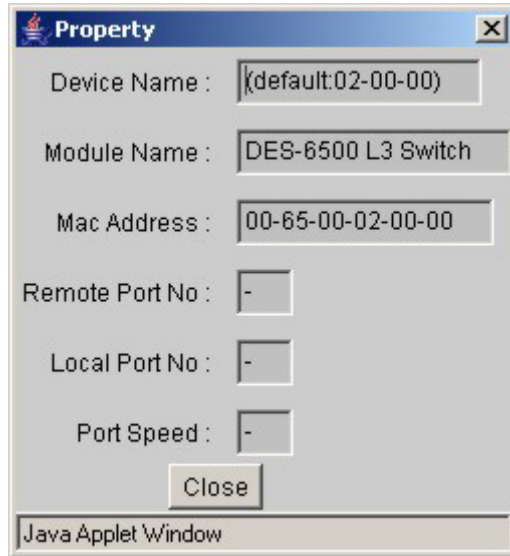


Figure 6- 57. Right Clicking a Member icon

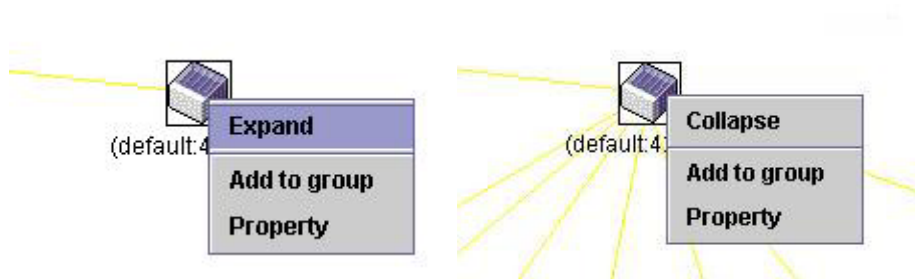
The following options may appear for the user to configure:

- **Collapse** - to collapse the group that will be represented by a single icon.
- **Expand** - to expand the SIM group, in detail.
- **Remove from group** - remove a member from a group.
- **Configure** - launch the web management to configure the Switch.
- **Property** - to pop up a window to display the device information.



**Figure 6- 58. Property window**

## Candidate Switch Icon



**Figure 6- 59. Right Clicking a Candidate icon**

The following options may appear for the user to configure:

**Collapse** - to collapse the group that will be represented by a single icon.

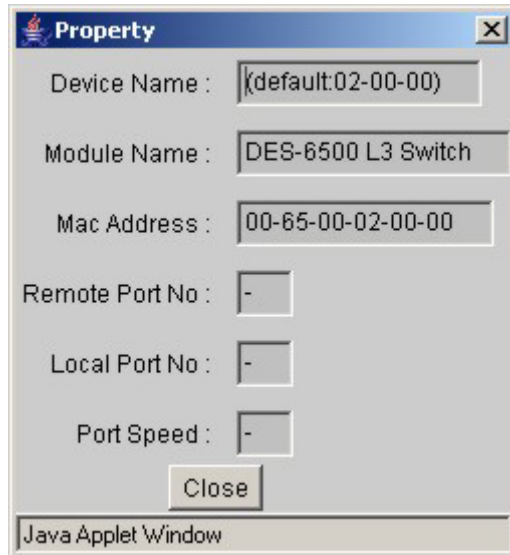
**Expand** - to expand the SIM group, in detail.

**Add to group** - add a candidate to a group. Clicking this option will reveal the following screen for the user to enter a password for authentication from the Candidate Switch before being added to the SIM group. Click OK to enter the password or Cancel to exit the window.



**Figure 6- 60. Input password window.**

**Property** - to pop up a window to display the device information, as shown below.



**Figure 6- 61. Device Property window.**

This window holds the following information:

Parameter	Description
<b>Device Name</b>	This field will display the Device Name of the switches in the SIM group configured by the user. If no Device Name is configured by the name, it will be given the name default and tagged with the last six digits of the MAC Address to identify it.
<b>Module Name</b>	Displays the full module name of the switch that was right-clicked.
<b>MAC Address</b>	Displays the MAC Address of the corresponding Switch.
<b>Remote Port No.</b>	Displays the number of the physical port on the MS or CaS that the CS is connected to. The CS will have no entry in this field.
<b>Local Port No.</b>	Displays the number of the physical port on the CS that the MS or CaS is connected to. The CS will have no entry in this field.
<b>Port Speed</b>	Displays the connection speed between the CS and the MS or CaS

Click **Close** to close the **Property** window.

## Menu Bar

The **Single IP Management** window contains a menu bar for device configurations, as seen below.



**Figure 6- 62. Menu Bar of the Topology View**

The five menus on the menu bar are as follows.

## File

- **Print Setup** - will view the image to be printed.
- **Print Topology** - will print the topology map.
- **Preference** - will set display properties, such as polling interval, and the views to open at SIM startup.

## Group

- **Add to group** - add a candidate to a group. Clicking this option will reveal the following screen for the user to enter a password for authentication from the Candidate Switch before being added to the SIM group. Click OK to enter the password or Cancel to exit the window.



Figure 6- 63. Input password window.

- **Remove from Group** - remove an MS from the group.

## Device

- **Configure** - will open the web manager for the specific device.

## View

- **Refresh** - update the views with the latest status.
- **Topology** - display the Topology view.

## Help

- **About** - Will display the SIM information, including the current SIM version.

## Single IP Management Firmware Upgrade

The Comander Switch may be used for firmware upgrades of member switches. To access the following window, click **Single IP Management > Firmware Upgrade**. Member Switches will be listed in the table and will be specified by **Port** (port on the CS where the MS resides), **MAC Address**, **Model Name** and **Version**. To specify a certain Switch for firmware download, click its corresponding check box under the **Port** heading. To update the firmware, enter the **Server IP Address** where the firmware resides and enter the **Path/Filename** of the firmware. Click **Download** to initiate the file transfer.

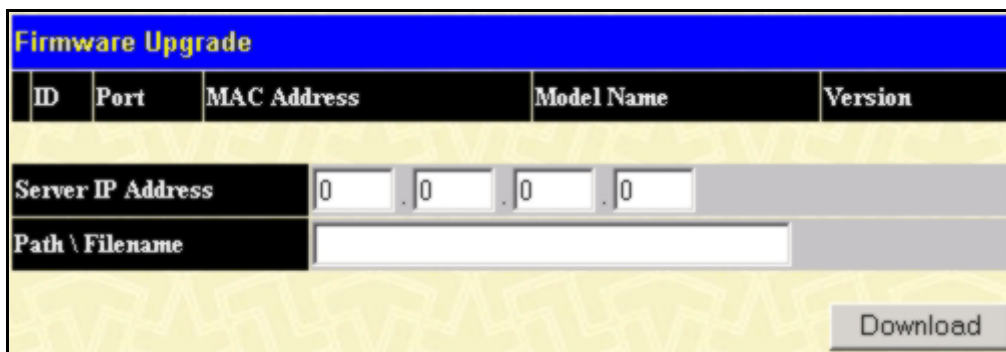


Figure 6- 64. Single IP Management Firmware Upgrade menu

## Single IP Management Configuration File Backup/Restore

The Commander Switch can instruct configuration file backup and restore to the Member Switch using a TFTP server. Member Switches will be listed in the table and will be specified by **Port** (port on the CS where the MS resides), **MAC Address**, **Model Name** and **Version**. To specify a certain Switch for upgrading configuration files, click its corresponding radio button under the **Port** heading. To update the configuration file, enter the **Server IP Address** where the file resides and enter the **Path/Filename** of the configuration file. Click **Download** to initiate the file transfer from a TFTP server to the Switch. Click **Upload** to backup the configuration file to a TFTP server.

Configuration File Backup/Restore				
ID	Port	MAC Address	Model Name	Version
Server IP Address		0	0	0
Path \ Filename				
				Upload
				Download

Figure 6- 65. Single IP Management Configuration File Backup and Restore

## Single IP Management Log Files

The Commander Switch can order a log file from a member switch sent to a server. Provide the Server IP address for storing the log and the log file path and filename on the member switch. Click **Upload** to send the log file to a TFTP server.

Upload Log File				
ID	Port	MAC Address	Model Name	Version
Server IP Address		0	0	0
Path \ Filename				
				Upload

Figure 6- 66. Single IP Management Upload Log menu

## **Layer 2 Features**

*VLANs*

*Trunking*

*IGMP Snooping*

*Spanning Tree*

*Forwarding and Filtering*

The following section will aid the user in configuring security functions for the Switch. The Switch includes various functions for VLAN, Trunking, IGMP Snooping, Spanning Tree, and Forwarding, all discussed in detail in the following section.

### **VLANs**

#### **Understanding IEEE 802.1p Priority**

Priority tagging is a function defined by the IEEE 802.1p standard designed to provide a means of managing traffic on a network where many different types of data may be transmitted simultaneously. It is intended to alleviate problems associated with the delivery of time critical data over congested networks. The quality of applications that are dependent on such time critical data, such as video conferencing, can be severely and adversely affected by even very small delays in transmission.

Network devices that are in compliance with the IEEE 802.1p standard have the ability to recognize the priority level of data packets. These devices can also assign a priority label or tag to packets. Compliant devices can also strip priority tags from packets. This priority tag determines the packet's degree of expeditiousness and determines the queue to which it will be assigned.

Priority tags are given values from 0 to 7 with 0 being assigned to the lowest priority data and 7 assigned to the highest. The highest priority tag 7 is generally only used for data associated with video or audio applications, which are sensitive to even slight delays, or for data from specified end users whose data transmissions warrant special consideration.

The Switch allows you to further tailor how priority tagged data packets are handled on your network. Using queues to manage priority tagged data allows you to specify its relative priority to suit the needs of your network. There may be circumstances where it would be advantageous to group two or more differently tagged packets into the same queue. Generally, however, it is recommended that the highest priority queue, Queue 7, be reserved for data packets with a priority value of 7. Packets that have not been given any priority value are placed in Queue 0 and thus given the lowest priority for delivery.

Strick mode and weighted round robin system are employed on the Switch to determine the rate at which the queues are emptied of packets. The ratio used for clearing the queues is 4:1. This means that the highest priority queue, Queue 7, will clear 4 packets for every 1 packet cleared from Queue 0.

Remember, the priority queue settings on the Switch are for all ports, and all devices connected to the Switch will be affected. This priority queuing system will be especially beneficial if your network employs switches with the capability of assigning priority tags.

### **VLAN Description**

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 LAN segments into an autonomous user group that appears as a single LAN. VLANs also logically segment the network into different broadcast domains so that packets are forwarded only between 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.

A VLAN is a collection of end nodes grouped by logic instead of physical location. End nodes that frequently communicate with each other are assigned to the same VLAN, regardless of where they are physically on the network. Logically, a VLAN can be equated to a broadcast domain, because broadcast packets are forwarded to only members of the VLAN on which the broadcast was initiated.

## Notes about VLANs on the DGS-3400 Series

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

The DGS-3400 Series supports IEEE 802.1Q VLANs and Port-Based 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's default is to assign all ports to a single 802.1Q VLAN named "default."

The "default" VLAN has a VID = 1.

The member ports of Port-based VLANs may overlap, if desired.

## IEEE 802.1Q VLANs

Some relevant terms:

**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 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 tagging decisions must be made.

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

VLANs allow a network to be segmented in order to reduce the size of broadcast domains. All packets entering a VLAN will only be forwarded to the stations (over IEEE 802.1Q enabled switches) that are members of that VLAN, and 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 only deliver packets 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 allows VLANs to work with legacy switches that don't recognize VLAN tags in packet headers. The tagging feature allows VLANs to span multiple 802.1Q-compliant switches through a single physical connection and allows 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 the receiving port is a member of.

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
- Packet forwarding decisions are made based upon the following three types of rules:
- Ingress rules - rules relevant to the classification of received frames belonging to a VLAN.
- Forwarding rules between ports - decides whether to filter or forward the packet.
- Egress rules - determines if the packet must be sent tagged or untagged.



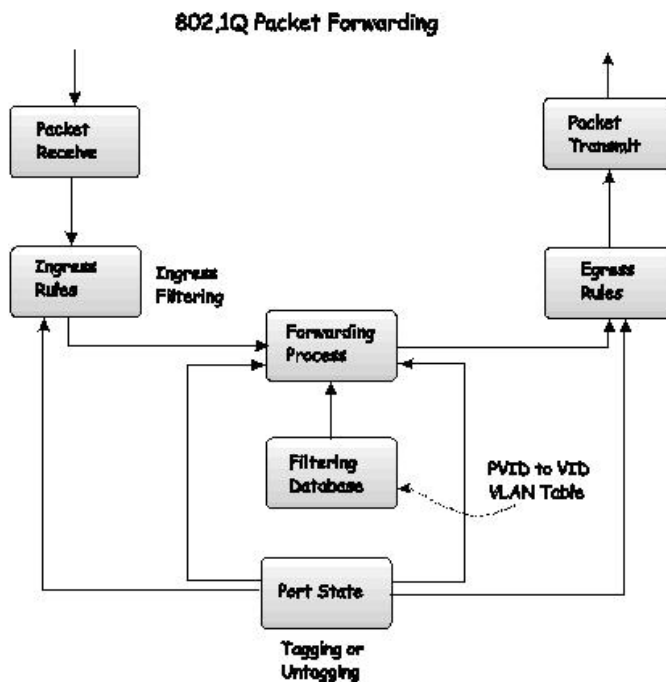


Figure 7- 1. IEEE 802.1Q Packet Forwarding

### 802.1Q VLAN Tags

The figure below shows the 802.1Q VLAN tag. There are four additional octets inserted after the source MAC address. Their presence is indicated by a value of 0x8100 in the EtherType field. When a packet's EtherType field is equal to 0x8100, the packet carries the IEEE 802.1Q/802.1p tag. The tag is contained in the following two octets and consists of 3 bits of user priority, 1 bit of Canonical Format Identifier (CFI - used for encapsulating Token Ring packets so they can be carried across Ethernet backbones), 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 making the entire packet longer by 4 octets. All of the information originally contained in the packet is retained.

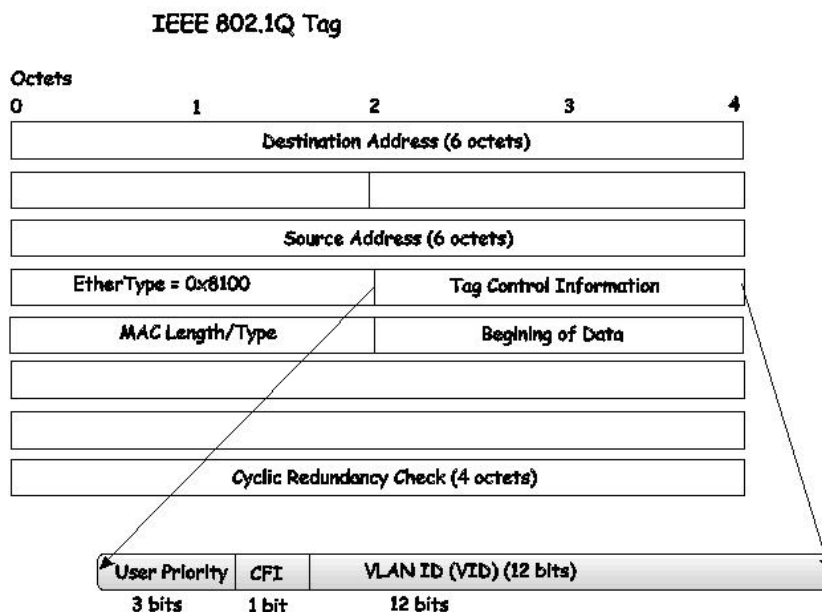
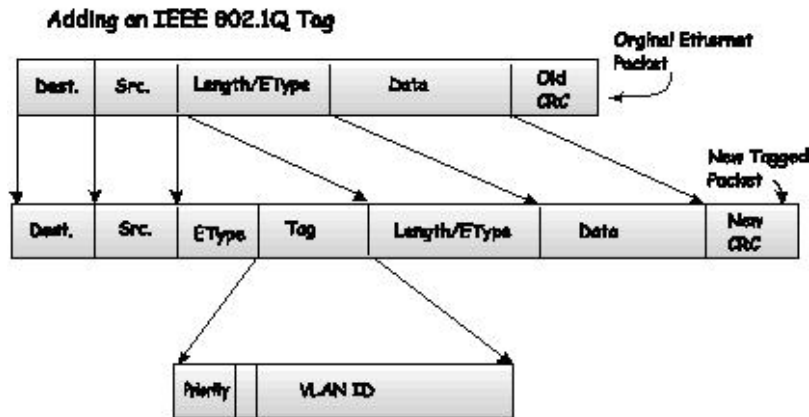


Figure 7- 2. IEEE 802.1Q Tag

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 a bit longer than it was originally, the Cyclic Redundancy Check (CRC) must be recalculated.



**Figure 7- 3. Adding an IEEE 802.1Q Tag**

## 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 allows 802.1Q VLANs to span network devices (and indeed, the entire network, if all network devices are 802.1Q compliant).

Unfortunately, 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.

Prior to 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's PVID and then be forwarded to the port that corresponded to the packet's destination address (found in the Switch's 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 equal to 1. Untagged packets are assigned the PVID of the port on which they were received. Forwarding decisions are based upon this PVID, in so far as 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 may be tag-unaware, a decision must be made at each port on a tag-aware device before packets are transmitted - should the packet to be transmitted have a tag or not? 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. Other 802.1Q compliant devices on the network to make packet-forwarding decisions can then use the VLAN information in the tag.

Ports with untagging enabled will strip the 802.1Q tag from all packets that flow into and out of those ports. If the packet doesn't 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 non-compliant 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 or not to forward the packet.

If the packet is tagged with VLAN information, the ingress port will first determine if 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 if 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 if 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.

## Default VLANs

The Switch initially configures one VLAN, VID = 1, called "default." The factory default setting assigns all ports on the Switch to the "default." As new VLANs are configured in Port-based mode, their respective member ports are removed from the "default."

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



**NOTE:** If no VLANs are configured on the Switch, then 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.

An example is presented below:

**Table 1. VLAN Example - Assigned Ports**

VLAN Name	VID	Switch Ports
System (default)	1	5, 6, 7, 8, 21, 22, 23, 24
Engineering	2	9, 10, 11, 12
Marketing	3	13, 14, 15, 16
Finance	4	17, 18, 19, 20
Sales	5	1, 2, 3, 4

## Port-based VLANs

Port-based VLANs limit traffic that flows into and out of switch ports. Thus, all devices connected to a port are members of the VLAN(s) the port belongs to, whether there is a single computer directly connected to a switch, or an entire department.

On port-based VLANs, NICs do not need to be able to identify 802.1Q tags in packet headers. NICs send and receive normal Ethernet packets. If the packet's destination lies on the same segment, communications take place using normal Ethernet protocols. Even though this is always the case, when the destination for a packet lies on another switch port, VLAN considerations come into play to decide if the packet gets dropped by the Switch or delivered.

## VLAN Segmentation

Take for example a packet that is transmitted by a machine on Port 1 that is a member of VLAN 2. If the destination lies on another port (found through a normal forwarding table lookup), the Switch then looks to see if the other port (Port 10) is a member of VLAN 2 (and can therefore receive VLAN 2 packets). If Port 10 is not a member of VLAN 2, then the packet will be dropped by the Switch and will not reach its destination. If Port 10 is a member of VLAN 2, the packet will go through. This selective forwarding feature based on VLAN criteria is how VLANs segment networks. The key point being that Port 1 will only transmit on VLAN 2.

Network resources such as printers and servers however, can be shared across VLANs. This is achieved by setting up overlapping VLANs. That is ports can belong to more than one VLAN group. For example, setting VLAN 1 members to ports 1, 2, 3, and 4 and VLAN 2 members to ports 1, 5, 6, and 7. Port 1 belongs to two VLAN groups. Ports 8, 9, and 10 are not configured to any VLAN group. This means ports 8, 9, and 10 are in the same VLAN group.

## VLAN and Trunk Groups

The members of a trunk group have the same VLAN setting. Any VLAN setting on the members of a trunk group will apply to the other member ports.



**NOTE:** In order to use VLAN segmentation in conjunction with port trunk groups, you can first set the port trunk group(s), and then you may configure VLAN settings. If you wish to change the port trunk grouping with VLANs already in place, you will not need to reconfigure the VLAN settings after changing the port trunk group settings. VLAN settings will automatically change in conjunction with the change of the port trunk group settings.

## Static VLAN Entry

In the **Layer 2 Features** folder, click **VLAN > Static VLAN Entry** to open the following window:

VLAN ID	VLAN name	Ports	Advertisement	Modify	Delete
1	default	1-27	Enabled	Modify	X

**Figure 7- 4. Current 802.1Q Static VLANs Entries window**

The **Current 802.1Q Static VLAN Entries** window lists all previously configured VLANs by VLAN ID and VLAN Name. To delete an existing 802.1Q VLAN, click the corresponding X button under the Delete heading.

To create a new 802.1Q VLAN, click the **Add** button in the **802.1Q Static VLANs** window. A new window will appear, as shown below, to configure the port settings and to assign a unique name and number to the new VLAN. See the table below for a description of the parameters in the new window.

802.1Q Static VLANs																										
VID	VLAN Name																									Advertisement
																										Disabled ▾
Port Settings	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
Tag	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
None	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Egress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Forbidden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Port Settings	26	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Tag	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
None	<input type="radio"/>	<input type="radio"/>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Egress	<input type="radio"/>	<input type="radio"/>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Forbidden	<input type="radio"/>	<input type="radio"/>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Apply																										
<a href="#">Show All Static VLAN Entries</a>																										

Figure 7- 5. 802.1Q Static VLAN window - Add

To return to the **Current 802.1Q Static VLANs Entries** window, click the [Show All Static VLAN Entries](#) link. To change an existing 802.1Q VLAN entry, click the **Modify** button of the corresponding entry you wish to modify. A new menu will appear to configure the port settings and to assign a unique name and number to the new VLAN. See the table below for a description of the parameters in the new menu.



**NOTE:** The Switch supports up to 4k static VLAN entries.

802.1Q Static VLANs														
Unit	VID	VLAN Name												Advertisement
1	2	natas												Disabled
Port Settings	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Tag	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
None	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Egress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forbidden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Port Settings	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Tag	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
None	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Egress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forbidden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Apply

[Show All Static VLAN Entries](#)

Figure 7- 6. 802.1Q Static VLAN window - Modify

The following fields can then be set in either the **Add** or **Modify** 802.1Q Static VLANs windows:

Parameter	Description
<b>VID (VLAN ID)</b>	Allows the entry of a VLAN ID in the Add window, or displays the VLAN ID of an existing VLAN in the Modify window. VLANs can be identified by either the VID or the VLAN name.
<b>VLAN Name</b>	Allows the entry of a name for the new VLAN in the Add window, or for editing the VLAN name in the Modify window.
<b>Advertisement</b>	Enabling this function will allow the Switch to send out GVRP packets to outside sources, notifying that they may join the existing VLAN.
<b>Port Settings</b>	Allows an individual port to be specified as member of a VLAN.
<b>Tag</b>	Specifies the port as either 802.1Q tagging or 802.1Q untagged. Checking the box will designate the port as Tagged.
<b>None</b>	Allows an individual port to be specified as a non-VLAN member.
<b>Egress</b>	Select this to specify the port as 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.
<b>Forbidden</b>	Select this to specify the port as not being a member of the VLAN and that the port is forbidden from becoming a member of the VLAN dynamically.

Click **Apply** to implement changes made.

## GVRP Setting

In the **Administration** menu, open the **VLAN** folder and click **GVRP Settings**. The **802.1Q Port Settings** window, shown below, allows you to determine whether the Switch will share its VLAN configuration information with other GARP VLAN Registration Protocol (GVRP) enabled switches. In addition, Ingress Checking can be used to limit traffic by filtering incoming packets whose PVID does not match the PVID of the port. Results can be seen in the table under the configuration settings, as seen below.

GVRP Settings						
From	To	GVRP	Ingress Check	Acceptable Frame Type	PVID	Apply
Port 1	Port 1	Disabled	Enabled	Admit_All		Apply

GVRP Table					
Port	PVID	GVRP	Ingress Check	PVID	Acceptable Frame Type
1	1	Disabled	Enabled		All Frames
2	1	Disabled	Enabled		All Frames
3	1	Disabled	Enabled		All Frames
4	1	Disabled	Enabled		All Frames
5	1	Disabled	Enabled		All Frames
6	1	Disabled	Enabled		All Frames
7	1	Disabled	Enabled		All Frames
8	1	Disabled	Enabled		All Frames
9	1	Disabled	Enabled		All Frames
10	1	Disabled	Enabled		All Frames
11	1	Disabled	Enabled		All Frames
12	1	Disabled	Enabled		All Frames
13	1	Disabled	Enabled		All Frames
14	1	Disabled	Enabled		All Frames
15	1	Disabled	Enabled		All Frames
16	1	Disabled	Enabled		All Frames
17	1	Disabled	Enabled		All Frames

**Figure 7- 7. 802.1Q Port Settings window**

Click **Apply** to implement changes made. See table below for description of parameters.

The following fields can be set:

<b>Parameter</b>	<b>Description</b>
<b>From/To</b>	These two fields allow you to specify the range of ports that will be included in the Port-based VLAN that you are creating using the 802.1Q Port Settings window.
<b>PVID</b>	The read-only field in the 802.1Q Port Table shows the current PVID assignment for each port, which may be manually assigned to a VLAN when created in the 802.1Q Port Settings table. The Switch's default is to assign all ports to the default VLAN with a VID of 1. 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 to accept only tagged frames - 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 the port receives a packet, 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.
<b>GVRP</b>	The Group VLAN Registration Protocol (GVRP) enables the port to dynamically become a member of a VLAN. GVRP is <i>Disabled</i> by default.
<b>Ingress Check</b>	This field can be toggled using the space bar between <i>Enabled</i> and <i>Disabled</i> . <i>Enabled</i> enables the port to compare the VID tag of an incoming packet with the PVID number assigned to the port. If the two are different, the port filters (drops) the packet. <i>Disabled</i> disables ingress filtering. Ingress Checking is <i>Disabled</i> by default.
<b>Acceptable Frame Type</b>	This field denotes the type of frame that will be accepted by the port. The user may choose between <i>Tagged Only</i> , which means only VLAN tagged frames will be accepted, and <i>Admit_All</i> , which mean both tagged and untagged frames will be accepted. <i>Admit_All</i> is enabled by default.

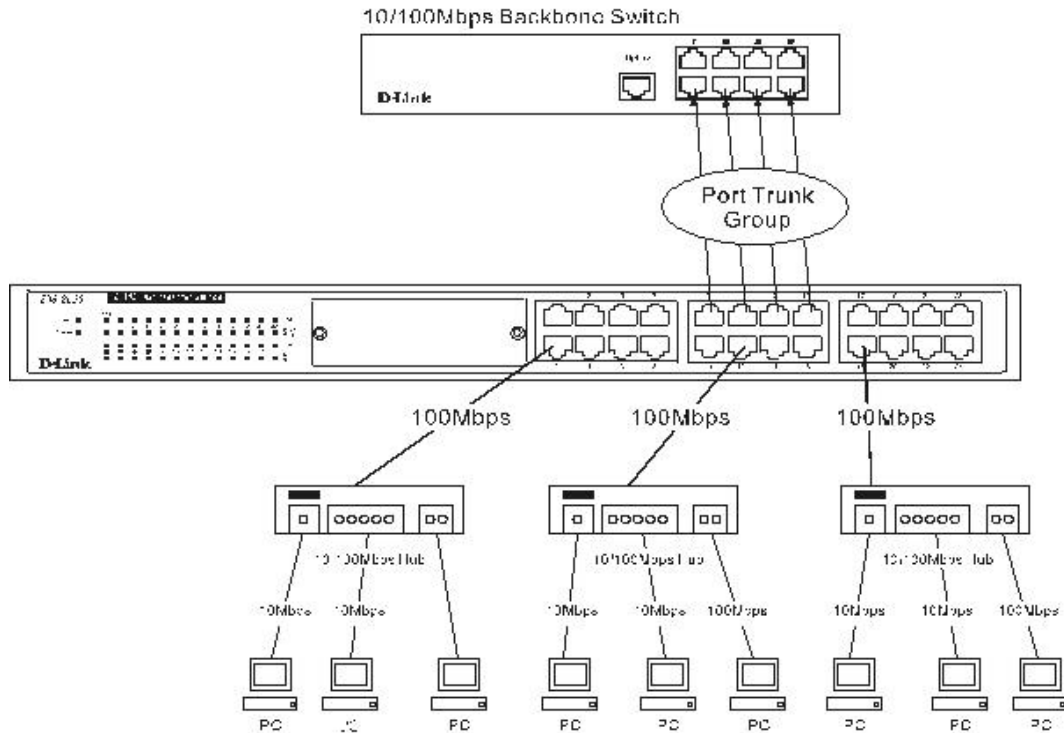
Click **Apply** to implement changes made.



## Trunking

### Understanding Port Trunk Groups

Port trunk groups are used to combine a number of ports together to make a single high-bandwidth data pipeline. DGS-3400 Series supports up to 32 port trunk groups with 2 to 8 ports in each group. A potential bit rate of 8000 Mbps can be achieved.



**Figure 7- 8. Example of Port Trunk Group**

The Switch treats all ports in a trunk group as a single port. Data transmitted to a specific host (destination address) will always be transmitted over the same port in a trunk group. This allows packets in a data stream to arrive in the same order they were sent.



**NOTE:** If any ports within the trunk group become disconnected, packets intended for the disconnected port will be load shared among the other unlinked ports of the link aggregation group.

Link aggregation allows 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's bandwidth.

Link aggregation 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 allows the creation of up to 32 link aggregation groups, each group consisting of 2 to 8 links (ports). The aggregated links must be contiguous (they must have sequential port numbers) except the four (optional) Gigabit ports, which can only belong to a single link aggregation group. All of the ports in the group must be members of the same VLAN, and their STP status, static multicast, traffic control; traffic segmentation and 802.1p default priority configurations must be identical. Port locking, port mirroring and 802.1X must not be enabled on the trunk group. Further, the aggregated links must all be of the same speed and should be configured as full duplex.

The Master Port of the group is to be configured by the user, and all configuration options, including the VLAN configuration that can be applied to the Master Port, are applied to the entire link aggregation group.

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

The Spanning Tree Protocol will treat a link aggregation 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 link aggregation group. If two redundant link aggregation 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.

## Link Aggregation

To configure port trunking, click on the **Link Aggregation** hyperlink in the **Trunking** folder under **Administration** to bring up the following window:

Link Aggregation Group Entries				
Group ID	State	Ports	Modify	Delete
1	Enabled	20-23	Modify	X

Figure 7- 9. Port Link Aggregation Group table

To configure port trunk groups, click the **Add** button to add a new trunk group and use the **Link Aggregation Group Configuration** window (see example below) to set up trunk groups. To modify a port trunk group, click the Hyperlinked Group ID. To delete a port trunk group, click the corresponding X under the Delete heading in the Current Link Aggregation Group Entries table.

Link Aggregation Group Configuration																										
Group ID	<input type="text"/>																									
Type	LACP																									
State	Disabled																									
Master Port	Port 1																									
Member Ports	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	26	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flooding Port	X																									
Apply																										

Figure 7- 10. Link Aggregation Settings – Add

Link Aggregation Group Configuration																										
Group ID	1																									
Type	LACP																									
State	Enabled																									
Master Port	Port 20																									
Member Ports	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	26	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Active Ports	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	26	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Flooding Port	X																									
Apply																										

Figure 7- 11. Link Aggregation Settings window - Modify

The user-changeable parameters are as follows:

Parameter	Description
Group ID	Select an ID number for the group, between 1 and 32.
State	Trunk groups can be toggled between <i>Enabled</i> and <i>Disabled</i> . 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.
Master Port	Choose the Master Port for the trunk group using the pull-down menu.
Member Ports	Choose the members of a trunked group. Up to eight ports per group can be assigned to a group.
Flooding Port	A trunking group must designate one port to allow transmission of broadcasts and unknown unicasts.
Active Port	Shows the port that is currently forwarding packets.
Type	This pull-down menu allows you to select between <i>Static</i> and <i>LACP</i> (Link Aggregation Control Protocol). LACP allows for the automatic detection of links in a Port Trunking Group.

After setting the previous parameters, click **Apply** to allow your changes to be implemented. Successfully created trunk groups will be show in the Current Link Aggregation Group Entries.

## LACP Port Setting

The **LACP Port Setting** window is used in conjunction with the **Link Aggregation** window to create port trunking groups on the Switch. Using the following window, the user may set which ports will be active and passive in processing and sending LACP control frames.

LACP Port Settings			
From	To	Mode	Apply
Port 1	Port 1	Active	Apply
LACP Port Information			
Port	Mode		
1	Passive		
2	Passive		
3	Passive		
4	Passive		
5	Passive		
6	Passive		
7	Passive		
8	Passive		
9	Passive		
10	Passive		
11	Passive		
12	Passive		
13	Passive		
14	Passive		

Figure 7- 12. LACP Port Settings window

The user may set the following parameters:

Parameter	Description
From/To	A consecutive group of ports may be configured starting with the selected port.
Mode	<p><i>Active</i> - Active LACP ports are capable of processing and sending LACP control frames. This allows LACP compliant devices to negotiate the aggregated link so the group may be changed dynamically as needs require. In order to utilize the ability to change an aggregated port group, that is, to add or subtract ports from the group, at least one of the participating devices must designate LACP ports as active. Both devices must support LACP.</p> <p><i>Passive</i> - LACP ports that are designated as passive cannot initially send LACP control frames. In order to allow the linked port group to negotiate adjustments and make changes dynamically, one end of the connection must have "active" LACP ports (see above).</p>

After setting the previous parameters, click **Apply** to allow your changes to be implemented. The LACP Port Table shows which ports are active and/or passive.

## IGMP

Internet Group Management Protocol (IGMP) snooping allows the Switch to recognize IGMP queries and reports sent between network stations or devices and an IGMP host. When enabled for IGMP snooping, the Switch can open or close a port to a specific device based on IGMP messages passing through the Switch.

In order to use IGMP Snooping it must first be enabled for the entire Switch (see **Device Information**). You may then fine-tune the settings for each VLAN using the **IGMP Snooping Settings** link in the **Administration** folder. When enabled for IGMP snooping, the Switch can open or close a port to a specific multicast group member based on IGMP messages sent from the device to the IGMP host or vice versa. The Switch monitors IGMP messages and discontinues forwarding multicast packets when there are no longer hosts requesting that they continue.

## IGMP Snooping

To view the IGMP Snooping Settings window, click Use the **Current IGMP Snooping Group Entries** window to view **IGMP Snooping** settings. To modify the settings, click the **Modify** button of the VLAN ID you want to change.

IGMP Snooping Settings				
VLAN ID	VLAN Name	State	Querier State	Modify
1	default	Disabled	Disabled	Modify
2	Natas	Disabled	Disabled	Modify

Figure 7- 13. Current IGMP Snooping Group Entries window

Clicking the **Modify** button will open the **IGMP Snooping Settings** window, shown below:

IGMP Snooping Settings-Edit	
VLAN ID	<input type="text" value="2"/>
VLAN Name	<input type="text" value="Natas"/>
Query Interval (1-65535 sec)	<input type="text" value="125"/>
Max Response Time (1-25 sec)	<input type="text" value="10"/>
Robustness Variable (1-255)	<input type="text" value="2"/>
Last Member Query Interval (1-25 sec)	<input type="text" value="1"/>
Host Timeout (1-16711450 sec)	<input type="text" value="260"/>
Router Timeout (1-16711450 sec)	<input type="text" value="260"/>
Leave Timer (1-16711450 sec)	<input type="text" value="2"/>
Querier State	Disabled ▾
Querier Router Behavior	Non-Querier
State	Disabled ▾
Fast Leave	Disabled ▾
<input type="button" value="Apply"/>	
<a href="#">Show All IGMP Snooping Entries</a>	

Figure 7- 14. IGMP Snooping Settings window

The following parameters may be viewed or modified:

Parameter	Description
<b>VLAN ID</b>	This is the VLAN ID that, along with the VLAN Name, identifies the VLAN the user wishes to modify the IGMP Snooping Settings for.
<b>VLAN Name</b>	This is the VLAN Name that, along with the VLAN ID, identifies the VLAN the user wishes to modify the IGMP Snooping Settings for.
<b>Query Interval</b>	The Query Interval field is used to set the time (in seconds) between transmitting IGMP queries. Entries between 1 and 65535 seconds are allowed. Default = 125.
<b>Max Response Time</b>	This determines the maximum amount of time in seconds allowed before sending an IGMP response report. The Max Response Time field allows an entry between 1 and 25 (seconds). Default = 10.
<b>Robustness Variable</b>	Adjust this variable according to expected packet loss. If packet loss on the VLAN is expected to be high, the Robustness Variable should be increased to accommodate increased packet loss. This entry field allows an entry of 1 to 255. Default = 2.
<b>Last Member Query Interval</b>	This field specifies the maximum amount of time between group-specific query messages, including those sent in response to leave group messages. Default = 1.
<b>Host Timeout</b>	This is the maximum amount of time in seconds allowed for a host to continue membership in a multicast group without the Switch receiving a host membership report. Default = 260.
<b>Route Timeout</b>	This is the maximum amount of time in seconds a route is kept in the forwarding table without receiving a membership report. Default = 260.
<b>Leave Timer</b>	This specifies the maximum amount of time in seconds between the Switch receiving a leave group message from a host, and the Switch issuing a group membership query. If no response to the membership query is received before the Leave Timer expires, the (multicast) forwarding entry for that host is deleted.
<b>Querier State</b>	Choose <i>Enabled</i> to enable transmitting IGMP Query packets or <i>Disabled</i> to disable. The default is <i>Disabled</i> .
<b>State</b>	Select <i>Enabled</i> to implement IGMP Snooping. This field is <i>Disabled</i> by default.
<b>Fast Leave</b>	The Fast Leave option may be enabled or disabled (default). This allows an interface to be pruned without sending group-specific queries.

Click **Apply** to implement the new settings. Click the [Show All IGMP Group Entries](#) link to return to the **Current IGMP Snooping Group Entries** window.

## Static Router Ports Entry

A static router port is a port that has a multicast router attached to it. Generally, this router would have a connection to a WAN or to the Internet. Establishing a router port will allow multicast packets coming from the router to be propagated through the network, as well as allowing multicast messages (IGMP) coming from the network to be propagated to the router.

A router port has the following behavior:

- All IGMP Report packets will be forwarded to the router port.
- IGMP queries (from the router port) will be flooded to all ports.



All UDP multicast packets will be forwarded to the router port. Because routers do not send IGMP reports or implement IGMP snooping, a multicast router connected to the router port of a Layer 3 switch would not be able to receive UDP data streams unless the UDP multicast packets were all forwarded to the router port.

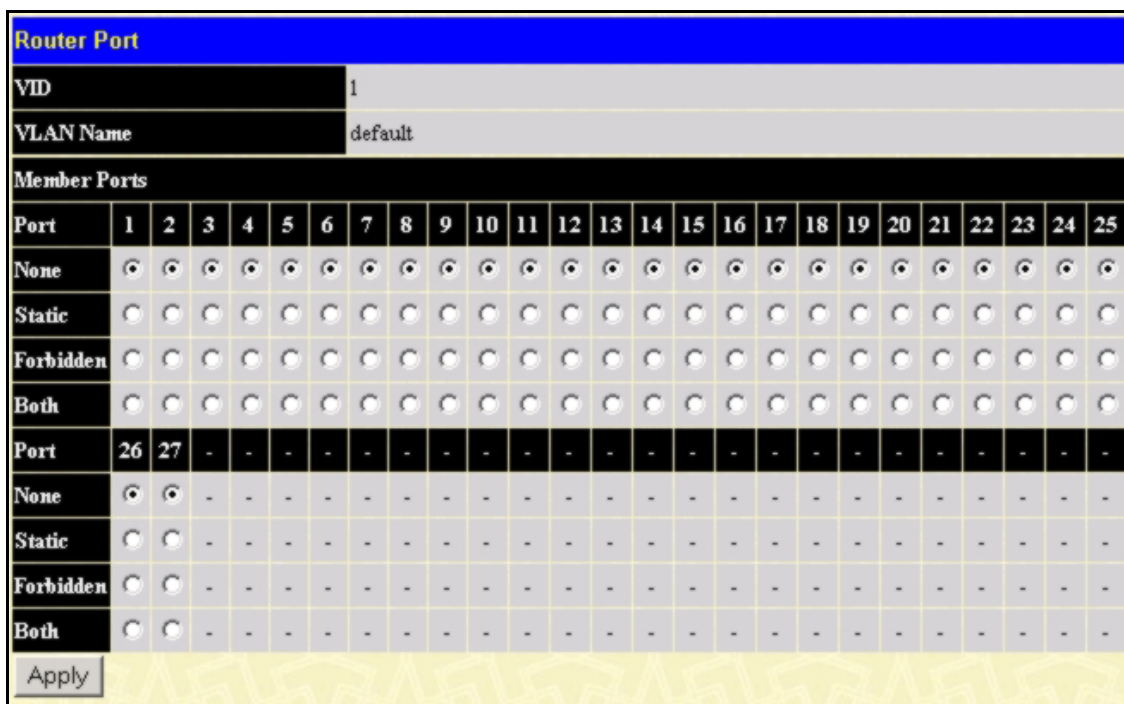
A router port will be dynamically configured when IGMP query packets, RIPv2 multicast, DVMRP multicast or PIM-DM multicast packets are detected flowing into a port.

Open the **IGMP Snooping** folder and the click on the **Static Router Ports Entry** link to open the **Current Static Router Ports Settings** page, as shown below.



**Figure 7- 15. Current Static Router Ports Entries window**

The **Current Static Router Ports Entries** window displays all of the current entries to the Switch's static router port table. To modify an entry, click the **Modify** button. This will open the **Static Router Ports Settings** window, as shown below.



**Figure 7- 16. Static Router Ports Settings window**

The following parameters can be set:

Parameter	Description
<b>VID (VLAN ID)</b>	This is the VLAN ID that, along with the VLAN Name, identifies the VLAN where the multicast router is attached.
<b>VLAN Name</b>	This is the name of the VLAN where the multicast router is attached.
<b>Member Ports</b>	Ports on the Switch that will have a multicast router attached to them.

Click **Apply** to implement the new settings.

## Spanning Tree

This Switch supports three versions of the Spanning Tree Protocol; 802.1d STP, 802.1w Rapid STP and 802.1s MSTP. 802.1d STP will be familiar to most networking professionals. However, since 802.1w RSTP and 802.1s MSTP has been recently introduced to D-Link managed Ethernet switches, a brief introduction to the technology is provided below followed by a description of how to set up 802.1d STP, 802.1w RSTP and 802.1s MSTP.

### 802.1s MSTP

Multiple Spanning Tree Protocol, or MSTP, is a standard defined by the IEEE community that allows multiple VLANs to be mapped to a single spanning tree instance, which will provide multiple pathways across the network. Therefore, these MSTP configurations will balance the traffic load, preventing wide scale disruptions when a single spanning tree instance fails. This will allow for faster convergences of new topologies for the failed instance. Frames designated for these VLANs will be processed quickly and completely throughout interconnected bridges utilizing any of the three spanning tree protocols (STP, RSTP or MSTP).

This protocol will also tag BPDU packets so receiving devices can distinguish spanning tree instances, spanning tree regions and the VLANs associated with them. An MSTI ID will classify these instances. MSTP will connect multiple spanning trees with a Common and Internal Spanning Tree (CIST). The CIST will automatically determine each MSTP region, its maximum possible extent and will appear as one virtual bridge that runs a single spanning tree. Consequentially, frames assigned to different VLANs will follow different data routes within administratively established regions on the network, continuing to allow simple and full processing of frames, regardless of administrative errors in defining VLANs and their respective spanning trees.

Each switch utilizing the MSTP on a network will have a single MSTP configuration that will have the following three attributes:

1. A configuration name defined by an alphanumeric string of up to 32 characters (defined in the **STP Bridge Global Settings** window in the Configuration Name field).
2. A configuration revision number (named here as a Revision Level and found in the **STP Bridge Global Settings** window) and;
3. A 4096-element table (defined here as a VID List in the **MST Configuration Table** window), which will associate each of the possible 4096 VLANs supported by the Switch for a given instance.

To utilize the MSTP function on the Switch, three steps need to be taken:

1. The Switch must be set to the MSTP setting (found in the **STP Bridge Global Settings** window in the STP Version field)
2. The correct spanning tree priority for the MSTP instance must be entered (defined here as a Priority in the **MST Configuration Table** window when configuring an MSTI ID settings).
3. VLANs that will be shared must be added to the MSTP Instance ID (defined here as a VID List in the **MST Configuration Table** window when configuring an MSTI ID settings).

### 802.1w Rapid Spanning Tree

The Switch implements three versions of the Spanning Tree Protocol, the Multiple Spanning Tree Protocol (MSTP) as defined by the IEEE 802.1s, the Rapid Spanning Tree Protocol (RSTP) as defined by the IEEE 802.1w specification and a version compatible with the IEEE 802.1d STP. RSTP can operate with legacy equipment implementing IEEE 802.1d, however the advantages of using RSTP will be lost.

The IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) evolved from the 802.1d STP standard. RSTP was developed in order to overcome some limitations of STP that impede the function of some recent switching innovations, in particular, certain Layer 3 functions that are increasingly handled by Ethernet switches. The basic function and much of the terminology is the same as STP. Most of the settings configured for STP are also used for RSTP. This section introduces some new Spanning Tree concepts and illustrates the main differences between the two protocols.

### Port Transition States

An essential difference between the three protocols is in the way ports transition to a forwarding state and in the way this transition relates to the role of the port (forwarding or not forwarding) in the topology. MSTP and RSTP combine the transition states disabled, blocking and listening used in 802.1d and creates a single state Discarding. In either case, ports do not forward packets. In the STP port transition states disabled, blocking or listening or in the RSTP/MSTP port state



discarding, there is no functional difference, the port is not active in the network topology. Table 6-1 below compares how the three protocols differ regarding the port state transition.

All three protocols calculate a stable topology in the same way. Every segment will have a single path to the root bridge. All bridges listen for BPDU packets. However, BPDU packets are sent more frequently - with every Hello packet. BPDU packets are sent even if a BPDU packet was not received. Therefore, each link between bridges is sensitive to the status of the link. Ultimately this difference results in faster detection of failed links, and thus faster topology adjustment. A drawback of 802.1d is this absence of immediate feedback from adjacent bridges.

**Table 2. Comparing Port States**

<b>802.1d MSTP</b>	<b>802.1w RSTP</b>	<b>802.1d STP</b>	<b>Forwarding</b>	<b>Learning</b>
Disabled	Disabled	Disabled	No	No
<i>Discarding</i>	<i>Discarding</i>	<i>Blocking</i>	No	No
<i>Discarding</i>	<i>Discarding</i>	<i>Listening</i>	No	No
<i>Learning</i>	<i>Learning</i>	<i>Learning</i>	No	<b>Yes</b>
<b>Forwarding</b>	<b>Forwarding</b>	<b>Forwarding</b>	<b>Yes</b>	<b>Yes</b>

RSTP is capable of a more rapid transition to a forwarding state - it no longer relies on timer configurations - RSTP compliant bridges are sensitive to feedback from other RSTP compliant bridge links. Ports do not need to wait for the topology to stabilize before transitioning to a forwarding state. In order to allow this rapid transition, the protocol introduces two new variables: the edge port and the point-to-point (P2P) port.

## Edge Port

The edge port is a configurable designation used for a port that is directly connected to a segment where a loop cannot be created. An example would be a port connected directly to a single workstation. Ports that are designated as edge ports transition to a forwarding state immediately without going through the listening and learning states. An edge port loses its status if it receives a BPDU packet, immediately becoming a normal spanning tree port.

## P2P Port

A P2P port is also capable of rapid transition. P2P ports may be used to connect to other bridges. Under RSTP/MSTP, all ports operating in full-duplex mode are considered to be P2P ports, unless manually overridden through configuration.

## 802.1d/802.1w/802.1s Compatibility

MSTP or RSTP can interoperate with legacy equipment and is capable of automatically adjusting BPDU packets to 802.1d format when necessary. However, any segment using 802.1d STP will not benefit from the rapid transition and rapid topology change detection of MSTP or RSTP. The protocol also provides for a variable used for migration in the event that legacy equipment on a segment is updated to use RSTP or MSTP.

The Spanning Tree Protocol (STP) operates on two levels:

1. On the switch level, the settings are globally implemented.
2. On the port level, the settings are implemented on a per user-defined group of ports basis.

## STP Bridge Global Settings

To open the following window, open the **Spanning Tree** folder in the **Layer 2 Features** menu and click the **STP Bridge Global Settings** link. Use the STP Status pull-down selector to enable or disable STP globally, and choose the STP method used with the STP Version menu.

STP Bridge Global Settings	
STP Status	Disabled ▾
STP Version	RSTP ▾
Hello Time(1-10 Sec)	2
Max Age(6-40 Sec)	20
Forward Delay(4-30 Sec)	15
Max Hops(1-20)	20
TX Hold Count(1-10)	3
Forwarding BPDU	Enabled ▾
LoopBack Guard	Enabled ▾
LBD Auto Recover	60
Apply	

Figure 7- 17. STP Bridge Global Settings window – RSTP (default)

STP Bridge Global Settings	
STP Status	Disabled ▾
STP Version	MSTP ▾
Max Age(6-40 Sec)	20
Forward Delay(4-30 Sec)	15
Max Hops(1-20)	20
TX Hold Count(1-10)	3
Forwarding BPDU	Enabled ▾
LoopBack Guard	Enabled ▾
LBD Auto Recover	60
Apply	

Figure 7- 18. STP Bridge Global Settings window - MSTP

STP Bridge Global Settings	
STP Status	Disabled ▾
STP Version	STP compatible ▾
Hello Time(1-10 Sec)	2
Max Age(6-40 Sec)	20
Forward Delay(4-30 Sec)	15
Max Hops(1-20)	20
TX Hold Count(1-10)	3
Forwarding BPDU	Enabled ▾
LoopBack Guard	Enabled ▾
LBD Auto Recover	60
Apply	

**Figure 7- 19. STP Bridge Global Settings – STP Compatible**

See the table below for descriptions of the STP versions and corresponding setting options.



**NOTE:** The Hello Time cannot be longer than the Max. Age. Otherwise, a configuration error will occur. Observe the following formulas when setting the above parameters:

Max. Age  $\leq$  2 x (Forward Delay - 1 second)

Max. Age  $\leq$  2 x (Hello Time + 1 second)

Configure the following parameters for STP:

Parameter	Description
<b>STP Status</b>	Use the pull-down menu to globally enable or disable STP.
<b>STP Version</b>	Use the pull-down menu to choose the desired version of STP: <i>STP</i> - Select this parameter to set the Spanning Tree Protocol (STP) globally on the switch. <i>RSTP</i> - Select this parameter to set the Rapid Spanning Tree Protocol (RSTP) globally on the Switch. <i>MSTP</i> - Select this parameter to set the Multiple Spanning Tree Protocol (MSTP) globally on the Switch.
<b>Hello Time (1 - 10 Sec) &lt;2&gt;</b>	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. This field will only appear here when STP or RSTP is selected for the STP Version. For MSTP, the Hello Time must be set on a port per port basis. See the MST Port Settings section for further details.
<b>Max Age (6 - 40 Sec) &lt;20&gt;</b>	The Max Age may be set to ensure that old information does not endlessly circulate through redundant paths in the network, preventing the effective propagation of the new information. Set by the Root Bridge, this value will aid in determining that the Switch has spanning tree configuration values consistent with other devices on the bridged LAN. If the value ages out and a BPDU has still not been received from the Root Bridge, the 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. The user may choose a time between 6 and 40 seconds. The default value is 20.
<b>Forward Delay (4 - 30 sec) &lt;15 &gt;</b>	The Forward Delay can be from 4 to 30 seconds. Any port on the Switch spends this time in the listening state while moving from the blocking state to the forwarding state.
<b>Max Hops (1-20) &lt;20&gt;</b>	Used to set the number of hops between devices in a spanning tree region before the BPDU (bridge protocol data unit) packet sent by the Switch will be discarded. Each switch on the hop count will reduce the hop count by one until the value reaches zero. The Switch will then discard the BPDU packet and the information held for the port will age out. The user may set a hop count from 1 to 20. The default is 20.
<b>TX Hold Count (1-10) &lt;3&gt;</b>	Used to set the maximum number of Hello packets transmitted per interval. The count can be specified from 1 to 10. The default is 3.
<b>Forwarding BPDU &lt;Enabled&gt;</b>	This field can be <i>Enabled</i> or <i>Disabled</i> . When <i>Enabled</i> , it allows the forwarding of STP BPDU packets from other network devices. The default is <i>Enabled</i> .
<b>Loopback Guard &lt;Enabled&gt;</b>	When enabled, the Switch will temporarily block STP switch-wide when a BPDU packet has looped back. If the Switch detects its own BPDU packet coming back, it signifies a loop on the network – STP is automatically blocked and an alert is sent to the administrator. The default is <i>Enabled</i> .
<b>LBD Auto Recover &lt;60&gt;</b>	Time allowed (in seconds) for recovery when an STP loopback is detected. After the timer has expired the Switch checks for an STP loopback, if no loopback detected, STP is resumed. Entering 0 will disable LDB recovery.

Click **Apply** to implement changes made.

## MST Configuration Identification

The following screens in the **MST Configuration Identification** window allow the user to configure a MSTI instance on the Switch. These settings will uniquely identify a multiple spanning tree instance set on the Switch. The Switch initially possesses one *CIST* or Common Internal Spanning Tree of which the user may modify the parameters for but cannot change the MSTI ID for, and cannot be deleted. To view the **Current MST Configuration Identification** window, click **Layer 2 Features > Spanning Tree > MST Configuration Identification**:

Figure 7- 20. Current MST Configuration Identification menu

The window above contains the following information:

Parameter	Description
<b>Configuration Name</b>	A previously configured name set on the Switch to uniquely identify the MSTI (Multiple Spanning Tree Instance). If a configuration name is not set, this field will show the MAC address to the device running MSTP. This field can be set in the STP Bridge Global Settings window.
<b>Revision Level</b>	This value, along with the Configuration Name will identify the MSTP region configured on the Switch.
<b>MSTI ID</b>	This field shows the MSTI IDs currently set on the Switch. This field will always have the CIST MSTI, which may be configured but not deleted. Clicking the hyperlinked name will open a new window for configuring parameters associated with that particular MSTI.
<b>VID List</b>	This field displays the VLAN IDs associated with the specific MSTI.

Clicking the **Add** button will reveal the following window to configure:

**Figure 7- 21. Instance ID Settings window – Add**

The user may configure the following parameters to create a MSTI in the Switch.

Parameter	Description
<b>MSTI ID</b>	Enter a number between 1 and 15 to set a new MSTI on the Switch.
<b>Type</b>	<i>Create</i> is selected to create a new MSTI. No other choices are available for this field when creating a new MSTI.
<b>VID List (1-4094)</b>	This field is used to specify the VID range from configured VLANs set on the Switch. Supported VIDs on the Switch range from ID number 1 to 4094.

Click **Apply** to implement changes made.

To configure the settings for the CIST, click on its hyperlinked name in the **Current MST Configuration Identification** window, which will reveal the following window to configure:

**Figure 7- 22. Instance ID Settings window - CIST modify**

The user may configure the following parameters to configure the CIST on the Switch.

Parameter	Description
<b>MSTI ID</b>	The MSTI ID of the CIST is 0 and cannot be altered.
<b>Type</b>	This field allows the user to choose a desired method for altering the MSTI settings. The user has 2 choices. <i>Add VID</i> - Select this parameter to add VIDs to the MSTI ID, in conjunction with the VID List parameter. <i>Remove VID</i> - Select this parameter to remove VIDs from the MSTI ID, in conjunction with the VID List parameter.
<b>VID List (1-4094)</b>	This field is used to specify the VID range from configured VLANs set on the Switch. Supported VIDs on the Switch range from ID number 1 to 4094. This field is inoperable when configuring the CIST.

Click **Apply** to implement changes made.

To configure the parameters for a previously set MSTI, click on its hyperlinked MSTI ID number, which will reveal the following window for configuration.

**Figure 7- 23. Instance ID Settings window – modify**

The user may configure the following parameters for a MSTI on the Switch.

Parameter	Description
<b>MSTI ID</b>	Displays the MSTI ID previously set by the user.
<b>Type</b>	This field allows the user to choose a desired method for altering the MSTI settings. The user has four choices. <i>Add</i> - Select this parameter to add VIDs to the MSTI ID, in conjunction with the VID List parameter. <i>Remove</i> - Select this parameter to remove VIDs from the MSTI ID, in conjunction with the VID List parameter.
<b>VID List (1-4094)</b>	This field is used to specify the VID range from configured VLANs set on the Switch that the user wishes to add to this MSTI ID. Supported VIDs on the Switch range from ID number 1 to 4094. This parameter can only be utilized if the Type chosen is <i>Add</i> or <i>Remove</i> .

Click **Apply** to implement changes made.

## MSTP Port Information

This window displays the current MSTP Port Information and can be used to update the port configuration for an MSTI ID. If a loop occurs, the MSTP function will use the port priority to select an interface to put into the forwarding state. Set a higher priority value for interfaces to be selected for forwarding first. In instances where the priority value is identical, the MSTP function will implement the lowest MAC address into the forwarding state and other interfaces will be blocked. Remember that lower priority values mean higher priorities for forwarding packets. To view the following window, click **Layer 2 Features > Spanning Tree > MSTP Port Information**:

Msti	Designated Bridge	Internal PathCost	Prio	Status	Role
0	N/A	20000	128	Disabled	Disabled

Figure 7- 24. MSTP Port Information

To view the MSTI settings for a particular port, select the Port number, located in the top left hand corner of the screen and click **Apply**. To modify the settings for a particular MSTI Instance, click on its hyperlinked MSTI ID, which will reveal the following window.

Figure 7- 25. MSTI Settings

Parameter	Description
<b>Instance ID</b>	Displays the MSTI ID of the instance being configured. An entry of 0 in this field denotes the CIST (default MSTI).
<b>Internal cost (0=Auto)</b>	This parameter is set to represent the relative cost of forwarding packets to specified ports when an interface is selected within a STP instance. The default setting is 0 (auto). There are two options: <i>0 (auto)</i> - Selecting this parameter for the <i>internalCost</i> will set quickest route automatically and optimally for an interface. The default value is derived from the media speed of the interface. <i>value 1-200000000</i> - Selecting this parameter with a value in the range of 1-200000000 will set the quickest route when a loop occurs. A lower Internal cost represents a quicker transmission.
<b>Priority</b>	Enter a value between 0 and 240 to set the priority for the port interface. A higher priority will designate the interface to forward packets first. A lower number denotes a higher priority.

Click **Apply** to implement changes made.



## STP Instance Settings

The following window displays MSTIs currently set on the Switch. To view the following table, click **Layer 2 Features > Spanning Tree > STP Instance Settings**:

Instance Type	Instance Status	Instance Priority	Priority
CIST	Enabled	4096(bridge priority : 4096, sys ID ext : 0)	Modify

Figure 7- 26. STP Instance Table

The following information is displayed:

Parameter	Description
Instance Type	Displays the instance type(s) currently configured on the Switch. Each instance type is classified by a MSTI ID. CIST refers to the default MSTI configuration set on the Switch.
Instance Status	Displays the current status of the corresponding MSTI ID
Instance Priority	Displays the priority of the corresponding MSTI ID. The lowest priority will be the root bridge.

Click **Apply** to implement changes made.

Click the **Modify** button to change the priority of the MSTI. This will open the Instance ID Settings window to configure.

Instance ID Settings	
MSTI ID	0
Type	Set Priority Only
Priority (0-61440)	
Apply	

Figure 7- 27. STP Instance Settings Modify

Parameter	Description
MSTI ID	Displays the MSTI ID of the instance being Modified. An entry of 0 in this field denotes the CIST (default MSTI).
Type	The Type field in this window will be permanently set to <i>Set Priority Only</i> .
Priority (0-61440)	Enter the new priority in the Priority field

Click **Apply** to implement the new priority setting.

## STP Port Settings

STP can be set up on a port per port basis. To view the STP Port Settings window click **Layer 2 Features > Spanning Tree > STP Port Settings**:

STP Port Settings									
From	To	External Cost(0=Auto)	Hello Time	Migrate	Edge	P2P	State	LBD	Apply
Port 1	Port 1	0		Yes	False	True	Enabled	Disabled	Apply

STP Port Settings Table							
Port	External Cost	Hello Time	Edge	P2P	Port STP	LBD	
1	AUTO/200000	2/2	No/No	Auto/Yes	Enabled	Disabled	
2	AUTO/200000	2/2	No/No	Auto/Yes	Enabled	Disabled	
3	AUTO/200000	2/2	No/No	Auto/Yes	Enabled	Disabled	
4	AUTO/200000	2/2	No/No	Auto/Yes	Enabled	Disabled	
5	AUTO/200000	2/2	No/No	Auto/Yes	Enabled	Disabled	
6	AUTO/200000	2/2	No/No	Auto/Yes	Enabled	Disabled	
7	AUTO/200000	2/2	No/No	Auto/Yes	Enabled	Disabled	
8	AUTO/200000	2/2	No/No	Auto/Yes	Enabled	Disabled	
9	AUTO/200000	2/2	No/No	Auto/Yes	Enabled	Disabled	
10	AUTO/200000	2/2	No/No	Auto/Yes	Enabled	Disabled	
11	AUTO/200000	2/2	No/No	Auto/Yes	Enabled	Disabled	

**Figure 7- 28. STP Port Settings window**

In addition to setting Spanning Tree parameters for use on the switch level, the Switch allows for the configuration of groups of ports, each port-group of which will have its own spanning tree, and will require some of its own configuration settings. An STP Group will use the switch-level parameters entered above, with the addition of Port Priority and Port Cost. An STP Group spanning tree works in the same way as the switch-level spanning tree, but the root bridge concept is replaced with a root port concept. A root port is a port of the group that is elected based on port priority and port cost, to be the connection to the network for the group. Redundant links will be blocked, just as redundant links are blocked on the switch level. The STP on the switch level blocks redundant links between switches (and similar network devices). The port level STP will block redundant links within an STP Group.

It is advisable to define an STP Group to correspond to a VLAN group of ports.

The following STP Port Settings fields can be set:

<b>Parameter</b>	<b>Description</b>
<b>From/To</b> <Port 1>	A consecutive group of ports may be configured starting with the selected port.
<b>External Cost</b> < 0 = Auto>	<p>This defines a metric that indicates the relative cost of forwarding packets to the specified port list. Port cost can be set automatically or as a metric value. The default value is 0 (auto).</p> <p>0 (auto) - Setting 0 for the external cost will automatically set the speed for forwarding packets to the specified port(s) in the list for optimal efficiency. Default port cost: 100Mbps port = 200000. Gigabit port = 20000.</p> <p>value 1-200000000 - Define a value between 1 and 200000000 to determine the external cost. The lower the number, the greater the probability the port will be chosen to forward packets.</p>
<b>Hello Time</b>	The time interval between transmissions of configuration messages by the designated port, to other devices on the bridged LAN. The user may choose a time between 1 and 10 seconds. The default is 2 seconds. This field is only operable when the Switch is enabled for MSTP.
<b>Migration</b> <Yes>	When operating in RSTP mode, selecting yes forces the port that has been selected to transmit RSTP BPDUs.
<b>Edge</b> <False>	Choosing the True parameter designates the port as an edge port. Edge ports cannot create loops, however an edge port can lose edge port status if a topology change creates a potential for a loop. An edge port normally should not receive BPDU packets. If a BPDU packet is received, it automatically loses edge port status. Choosing the False parameter indicates that the port does not have edge port status.
<b>P2P</b> <True>	Choosing the True parameter indicates a point-to-point (P2P) shared link. P2P ports are similar to edge ports, however they are restricted in that a P2P port must operate in full duplex. Like edge ports, P2P ports transition to a forwarding state rapidly thus benefiting from RSTP. A p2p value of False indicates that the port cannot have p2p status. Auto allows the port to have p2p status whenever possible and operate as if the p2p status were true. If the port cannot maintain this status, (for example if the port is forced to half-duplex operation) the p2p status changes to operate as if the p2p value were false. The default setting for this parameter is true.
<b>Forward BPDU</b>	This drop-down menu allows you to enable or disable STP for the selected group of ports. The default is Enabled.
<b>State</b>	This drop-down menu allows you to enable or disable STP for the selected group of ports. The default is Enabled.
<b>LBD</b>	Use the pull-down menu to enable or disable the loop-back detection function on the switch for the ports configured above.

Click **Apply** to implement changes made.

## Forwarding & Filtering

### Unicast Forwarding

Open the **Forwarding & Filtering** folder in the **Layer 2 Features** menu and click on the **Unicast Forwarding** link.

**Figure 7- 29. Setup Static Unicast Forwarding Table window**

To add or edit an entry, define the following parameters and then click **Add/Modify**:

Parameter	Description
<b>VLAN ID (VID)</b>	The VLAN ID number of the VLAN on which the above Unicast MAC address resides.
<b>MAC Address</b>	The MAC address to which packets will be statically forwarded. This must be a unicast MAC address.
<b>Port</b>	Allows the selection of the port number on which the MAC address entered above resides.

Click **Add** to implement the changes made. To delete an entry in the Static Unicast Forwarding Table, click the corresponding **X** under the Delete heading.

### Static Multicast Forwarding

The following figure and table describe how to set up **Multicast Forwarding** on the Switch. Open the **Forwarding Filtering** folder and click on the **Multicast Forwarding** link to see the entry screen below:

**Figure 7- 30. Static Multicast Forwarding Settings window**

The **Static Multicast Forwarding Settings** window displays all of the entries made into the Switch's static multicast forwarding table. Click the **Add** button to open the **Setup Static Multicast Forwarding Table** window, as shown below:

Setup Static Multicast Forwarding Table																									
VID	Multicast MAC Address																								
	00:00:00:00:00:00																								
Port	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
None	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Egress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Port	26	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
None	<input type="radio"/>	<input type="radio"/>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Egress	<input type="radio"/>	<input type="radio"/>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apply																									

Figure 7- 31. Setup Static Multicast Forwarding Table window

The following parameters can be set:

Parameter	Description
<b>VID</b>	The VLAN ID of the VLAN the corresponding MAC address belongs to.
<b>Multicast MAC Address</b>	The MAC address of the static source of multicast packets. This must be a multicast MAC address.
<b>Port Settings</b>	<p>Allows the selection of ports that will be members of the static multicast group and ports that are either forbidden from joining dynamically, or that can join the multicast group dynamically, using GMRP. The options are:</p> <p><i>None</i> - No restrictions on the port dynamically joining the multicast group. When None is chosen, the port will not be a member of the Static Multicast Group.</p> <p><i>Egress</i> - The port is a static member of the multicast group.</p>

Click **Apply** to implement the changes made. To delete an entry in the Static Multicast Forwarding Table, click the corresponding **X** under the Delete heading. Click the **Show All Multicast Forwarding Entries** link to return to the **Static Multicast Forwarding Settings** window.

## Multicast Filtering Mode

Open the **Forwarding Filtering** folder and click on the **Multicast Filtering Mode** link to see the entry screen below:

Multicast Filtering Mode Setting		
VLAN Name	Filtering Mode	Apply
<input type="text"/> All <input type="checkbox"/>	forward_all_groups	Apply
Multicast Filtering Mode Table		
VLAN Name	Multicast Filtering Mode	
default	forward_unregistered_groups	

Figure 7- 32. Multicast Filtering Mode

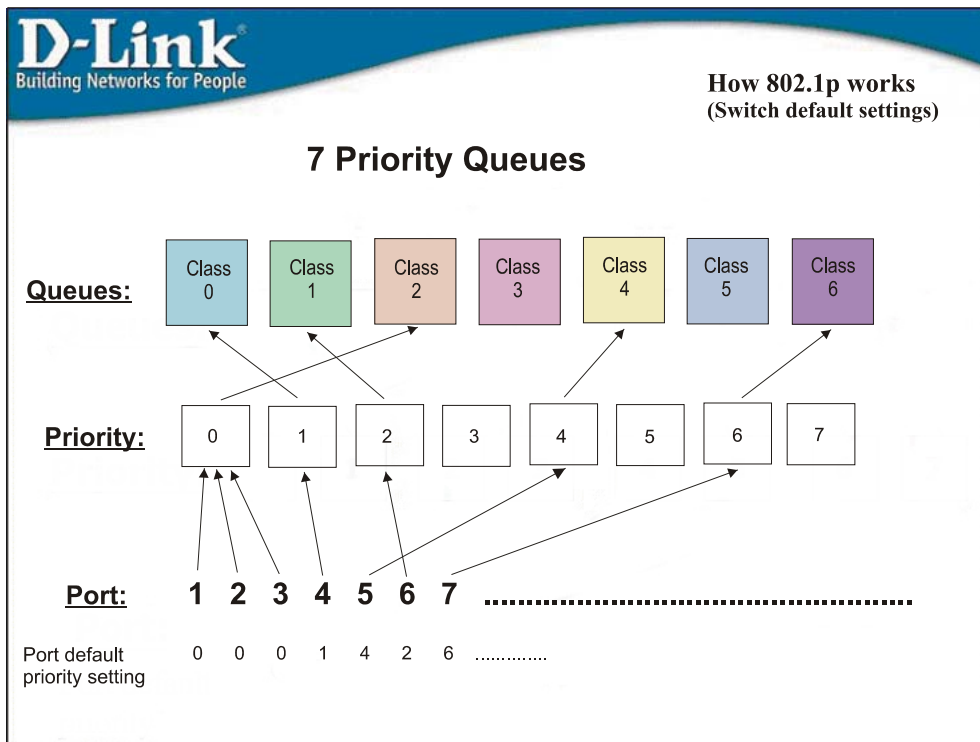
<b>Parameter</b>	<b>Description</b>
<b>VLAN Name</b>	The VLAN to which the specified filtering action applies. Select the <b>All</b> option to apply the action to all VLANs on the Switch.
<b>Filtering Mode</b>	<p>This drop-down menu allows you to select the action the Switch will take when it receives a multicast packet that requires forwarding to a port in the specified VLAN.</p> <ul style="list-style-type: none"><li>• <i>Forward All Groups</i> – This will instruct the Switch to forward a multicast packet to all multicast groups residing within the range of ports specified above.</li><li>• <i>Forward Unregistered Groups</i> – This will instruct the Switch to forward a multicast packet whose destination is an unregistered multicast group residing within the range of ports specified above.</li><li>• <i>Filter Unregistered Groups</i> – This will instruct the Switch to filter any multicast packets whose destination is an unregistered multicast group residing within the range of ports specified above.</li></ul>

## QoS

The xStack DGS-3400 switch series supports 802.1p priority queuing Quality of Service. The following section discusses the implementation of QoS (Quality of Service) and benefits of using 802.1p priority queuing.

### The Advantages of QoS

QoS is an implementation of the IEEE 802.1p standard that allows network administrators a method of reserving bandwidth for important functions that require a large bandwidth or have a high priority, such as VoIP (voice-over Internet Protocol), web browsing applications, file server applications or video conferencing. Not only can a larger bandwidth be created, but other less critical traffic can be limited, so excessive bandwidth can be saved. The Switch has separate hardware queues on every physical port to which packets from various applications can be mapped to, and, in turn prioritized. View the following map to see how the xStack DGS-3400 switch series implements basic 802.1P priority queuing.



**Figure 7- 33. An Example of the Default QoS Mapping on the Switch**

The picture above shows the default priority setting for the Switch. Class-6 has the highest priority of the seven priority classes of service on the Switch. In order to implement QoS, the user is required to instruct the Switch to examine the header of a packet to see if it has the proper identifying tag. Then the user may forward these tagged packets to designated classes of service on the Switch where they will be emptied, based on priority.

For example, lets say a user wishes to have a video conference between two remotely set computers. The administrator can add priority tags to the video packets being sent out, utilizing the Access Profile commands. Then, on the receiving end, the administrator instructs the Switch to examine packets for this tag, acquires the tagged packets and maps them to a class queue on the Switch. Then in turn, the administrator will set a priority for this queue so that will be emptied before any other packet is forwarded. This results in the end user receiving all packets sent as quickly as possible, thus prioritizing the queue and allowing for an uninterrupted stream of packets, which optimizes the use of bandwidth available for the video conference.

## Understanding QoS

The DGS-3400 Series supports 802.1p priority queuing. The Switch has 8 priority queues. These priority queues are numbered from 7 (Class 6) — the highest priority queue — to 0 (Class 0) — the lowest priority queue. The eight priority tags specified in IEEE 802.1p (p0 to p7) are mapped to the Switch's priority queues as follows:

- Priority 0 is assigned to the Switch's Q2 queue.
- Priority 1 is assigned to the Switch's Q0 queue.
- Priority 2 is assigned to the Switch's Q1 queue.
- Priority 3 is assigned to the Switch's Q3 queue.
- Priority 4 is assigned to the Switch's Q4 queue.
- Priority 5 is assigned to the Switch's Q5 queue.
- Priority 6 is assigned to the Switch's Q6 queue.
- Priority 7 is assigned to the Switch's Q7 queue.

For strict priority-based scheduling, any packets residing in the higher priority classes of service are transmitted first. Multiple strict priority classes of service are emptied based on their priority tags. Only when these classes are empty, are packets of lower priority transmitted.

For weighted round-robin queuing, the number of packets sent from each priority queue depends upon the assigned weight. For a configuration of 8 CoS queues, A~H with their respective weight value: 8~1, the packets are sent in the following sequence: A1, B1, C1, D1, E1, F1, G1, H1, A2, B2, C2, D2, E2, F2, G2, A3, B3, C3, D3, E3, F3, A4, B4, C4, D4, E4, A5, B5, C5, D5, A6, B6, C6, A7, B7, A8, A1, B1, C1, D1, E1, F1, G1, H1.

For weighted round-robin queuing, if each CoS queue has the same weight value, then each CoS queue has an equal opportunity to send packets just like round-robin queuing.

For weighted round-robin queuing, if the weight for a CoS is set to 0, then it will continue processing the packets from this CoS until there are no more packets for this CoS. The other CoS queues that have been given a nonzero value, and depending upon the weight, will follow a common weighted round-robin scheme.

Remember that the xStack DGS-3400 switch series has 7 configurable priority queues (and seven Classes of Service) for each port on the Switch.



**NOTICE:** The Switch contains eight classes of service for each port on the Switch. One of these classes is reserved for internal use on the Switch and is therefore not configurable. All references in the following section regarding classes of service will refer to only the seven classes of service that may be used and configured by the administrator.



## Bandwidth Control

The bandwidth control settings are used to place a ceiling on the transmitting and receiving data rates for any selected port. In the **QoS** folder, click **Bandwidth Control**, to view the screen shown below.

Bandwidth Settings					
From	To	Type	No Limit	Rate (1-156249)	Apply
Port 1	Port 1	Both	Disabled	1	Apply

Port Bandwidth Table		
Port	RX Rate (64Kbit/sec)	TX Rate (64Kbit/sec)
1	No Limit	No Limit
2	No Limit	No Limit
3	No Limit	No Limit
4	No Limit	No Limit
5	No Limit	No Limit
6	No Limit	No Limit
7	No Limit	No Limit
8	No Limit	No Limit
9	No Limit	No Limit
10	No Limit	No Limit

**Figure 7- 34. Bandwidth Settings and Port Bandwidth Table window**

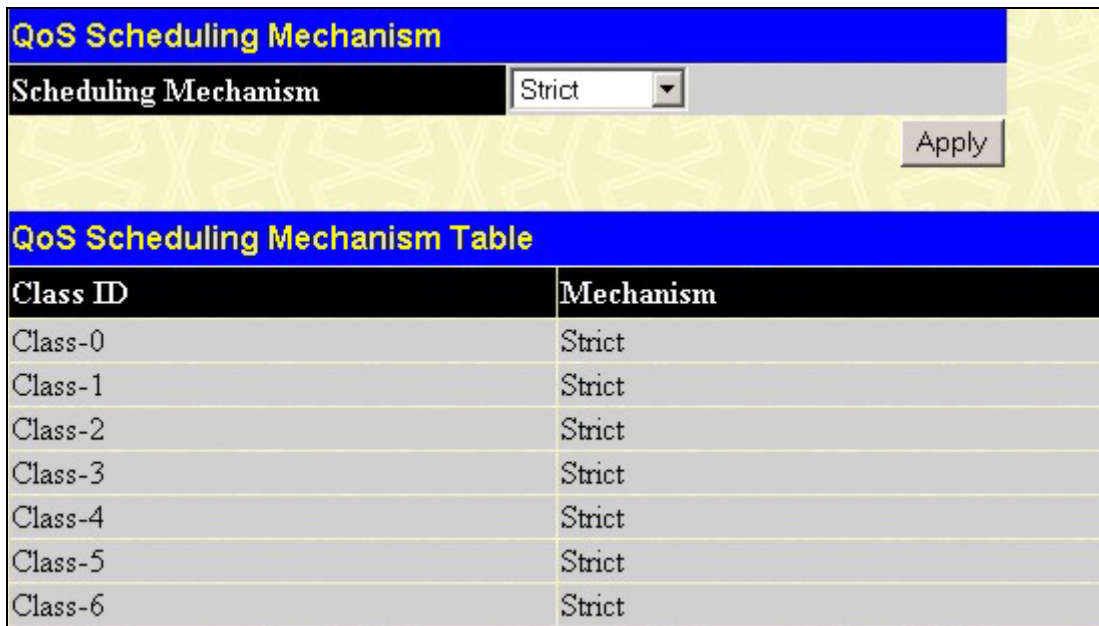
The following parameters can be set or are displayed:

Parameter	Description
<b>From/To</b>	A consecutive group of ports may be configured starting with the selected port.
<b>Type</b>	This drop-down menu allows a selection between <i>RX</i> (receive,) <i>TX</i> (transmit,) and <i>Both</i> . This setting will determine whether the bandwidth ceiling is applied to receiving, transmitting, or both receiving and transmitting packets.
<b>No Limit</b>	This drop-down menu allows the user to specify that the selected port will have no bandwidth limit. <i>Enabled</i> disables the limit.
<b>Rate</b>	This field allows the input of the data rate, in Mbit/s, that will be the limit for the selected port. The user may choose a rate between 1 and 9999 Mbit/s.

Click **Apply** to set the bandwidth control for the selected ports. Results of configured **Bandwidth Settings** will be displayed in the **Port Bandwidth Table**.

## QoS Scheduling Mechanism

This drop-down menu allows a selection between a **Weight Fair** and a **Strict** mechanism for emptying the priority classes. In the **Configuration** menu open the **QoS** folder and click **QoS Scheduling Mechanism**, to view the screen shown below.



**Figure 7- 35. QoS Scheduling Mechanism menu and table**

The **Scheduling Mechanism** has the following parameters.

Parameter	Description
<b>Strict</b>	The highest class of service is the first to process traffic. That is, the highest class of service will finish before other queues empty.
<b>Weight fair</b>	Use the weighted round-robin ( <i>WRR</i> ) algorithm to handle packets in an even distribution in priority classes of service.

Click **Apply** to let your changes take effect.

## QoS Output Scheduling

QoS can be customized by changing the output scheduling used for the hardware classes of service in the Switch. As with any changes to QoS implementation, careful consideration should be given to how network traffic in lower priority classes of service is affected. Changes in scheduling may result in unacceptable levels of packet loss or significant transmission delay. If choosing to customize this setting, it is important to monitor network performance, especially during peak demand, as bottlenecks can quickly develop if the QoS settings are not suitable. In the **Configuration** folder open the **QoS** folder and click **QoS Output Scheduling**, to view the screen shown below.

Class	Max. Packets
Class-0	1
Class-1	2
Class-2	3
Class-3	4
Class-4	5
Class-5	6
Class-6	7

Figure 7- 36. QoS Output Scheduling Configuration window

The following values may be assigned to the QoS classes to set the scheduling.

Parameter	Description
<b>Max. Packets</b>	Specifies the maximum number of packets the above specified hardware priority class of service will be allowed to transmit before allowing the next lowest priority queue to transmit its packets. A value between 0 and 15 can be specified.

Click **Apply** to implement changes made.



**NOTE:** Entering a 0 for the **Max Packets** field in the **QoS Output Scheduling Configuration** window above will create a Combination Queue. For more information on implementation of this feature, see the next section, **Configuring the Combination Queue**.

## Configuring the Combination Queue

Utilizing the **QoS Output Scheduling Configuration** window shown above, the xStack DGS-3400 series can implement a combination queue for forwarding packets. This combination queue allows for a combination of strict and weight-fair (weighted round-robin “*WRR*”) scheduling for emptying given classes of service. To set the combination queue, enter a 0 for the Max Packets entry of the corresponding priority classes of service listed in the window above. Priority classes of service that have a 0 in the **Max Packet** field will forward packets with strict priority scheduling. The remaining classes of service, that do not have a 0 in their **Max Packet** field, will follow a weighted round-robin (*WRR*) method of forwarding packets — as long as the priority classes of service with a 0 in their **Max Packet** field are empty. When a packet arrives in a priority class with a 0 in its **Max Packet** field, this class of service will automatically begin forwarding packets until it is empty. Once a priority class of service with a 0 in its **Max Packet** field is empty, the remaining priority classes of service will reset the weighted round-robin (*WRR*) cycle of forwarding packets, starting with the highest available priority class of service. Priority classes of service with an equal level of priority and equal entries in their **Max Packet** field will empty their fields based on hardware priority scheduling. The **Max Packet** parameter allows the maximum number of packets a given priority class of service can transmit per weighted round-robin (*WRR*) scheduling cycle to be selected. This provides for a controllable CoS behavior while allowing other classes to empty as well. A value between 0 and 15 packets can be specified per priority class of service to create the combination queue.

The example window below displays an example of the combination queue where Class-1 will have a strict priority for emptying its class, while the other classes will follow a weight fair scheduling.

QoS Output Scheduling	
	Max. Packets
Class-0	1
Class-1	0
Class-2	3
Class-3	4
Class-4	5
Class-5	6
Class-6	7

Apply

Figure 7- 37. QoS Output Scheduling window – Combination queue example

## 802.1p Default Priority

The Switch allows the assignment of a default 802.1p priority to each port on the Switch. In the **Configuration** folder open the **QoS** folder and click **802.1p Default Priority**, to view the screen shown below.

From	To	Priority(0~7)	Apply
Port 1	Port 1	0	Apply

Port	Priority
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0

**Figure 7- 38. 802.1p Default Priority window**

This page allows the user to assign a default 802.1p priority to any given port on the Switch. The priority tags are numbered from 0, the lowest priority, to 7, the highest priority. To implement a new default priority, choose a port range by using the **From** and **To** pull-down menus and then insert a priority value, from 0-7 in the **Priority** field. Click **Apply** to implement settings made.

## 802.1p User Priority

The xStack DGS-3400 switch series allows the assignment of a class of service to each of the 802.1p priorities. In the **Configuration** folder open the **QoS** folder and click **802.1p User Priority**, to view the screen shown below.

802.1p User Priority	
Priority-0	Class-2
Priority-1	Class-0
Priority-2	Class-1
Priority-3	Class-3
Priority-4	Class-4
Priority-5	Class-5
Priority-6	Class-6
Priority-7	Class-6

Apply

**Figure 7- 39. 802.1p User Priority window**

Once a priority has been assigned to the port groups on the Switch, then a Class may be assigned to each of the eight levels of 802.1p priorities. Click **Apply** to set changes made.

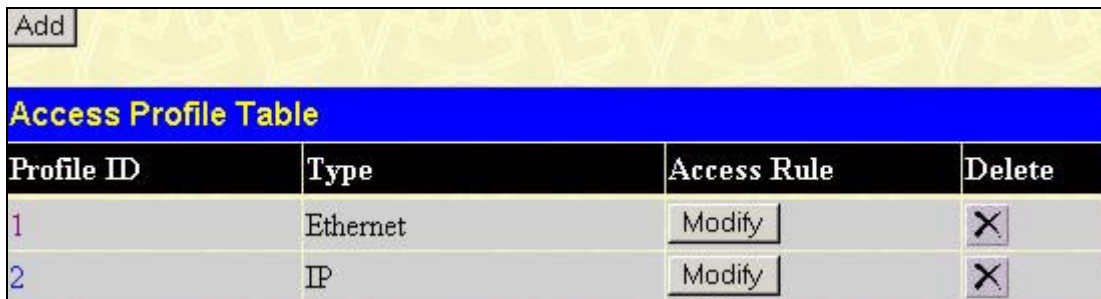
# Access Profile Table

## Configuring the Access Profile Table

Access profiles allow you to establish criteria to determine whether the Switch will forward packets based on the information contained in each packet's header. These criteria can be specified on a basis of VLAN, MAC address or IP address.

Creating an access profile is divided into two basic parts. The first is to specify which part or parts of a frame the Switch will examine, such as the MAC source address or the IP destination address. The second part is entering the criteria the Switch will use to determine what to do with the frame. The entire process is described below in two parts.

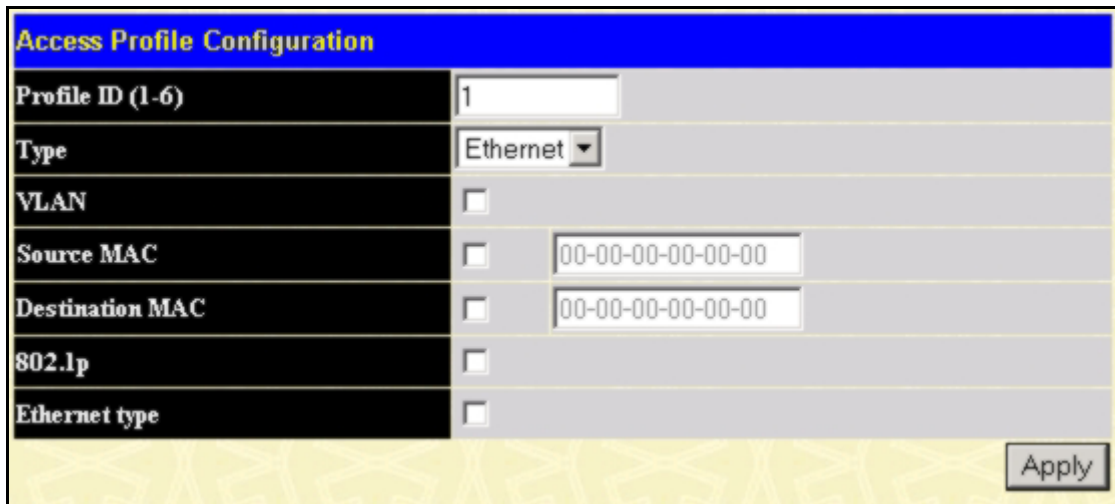
To display the currently configured Access Profiles on the Switch, open the **Configuration** folder and click on the **Access Profile Table** link. This will open the **Access Profile Table** page, as shown below.



Add			
Access Profile Table			
Profile ID	Type	Access Rule	Delete
1	Ethernet	Modify	X
2	IP	Modify	X

Figure 7- 40. Access Profile Table

To add an entry to the **Access Profile Table**, click the **Add** button. This will open the **Access Profile Configuration** page, as shown below. There are four **Access Profile Configuration** pages; one for **Ethernet** (or MAC address-based) profile configuration, one for **IP** address-based profile configuration, one for the **Packet Content Mask** and one for **IPv6**. You can switch between the three **Access Profile Configuration** pages by using the **Type** drop-down menu. The page shown below is the **Ethernet Access Profile Configuration** page.



Access Profile Configuration	
Profile ID (1-6)	1
Type	Ethernet
VLAN	<input type="checkbox"/>
Source MAC	<input type="checkbox"/> 00-00-00-00-00-00
Destination MAC	<input type="checkbox"/> 00-00-00-00-00-00
802.1p	<input type="checkbox"/>
Ethernet type	<input type="checkbox"/>
Apply	

Figure 7- 41. Access Profile Configuration (Ethernet)

The following parameters can be set, for the **Ethernet** type:

Parameter	Description
<b>Profile ID (1-6)</b>	Type in a unique identifier number for this profile set. This value can be set from 1 - 6.
<b>Type</b>	Select profile based on Ethernet (MAC Address), IP or IPv6 address. This will change the menu according to the requirements for the type of profile. Select <i>Ethernet</i> to instruct the Switch to examine the layer 2 part of each packet header. Select <i>IP</i> to instruct the Switch to examine the IP address in each frame's header. Select <i>IPv6</i> to instruct the Switch to examine the IPv6 address in each frame's header.
<b>VLAN</b>	Selecting this option instructs the Switch to examine the VLAN identifier of each packet header and use this as the full or partial criterion for forwarding.
<b>Source MAC</b>	Source MAC Mask - Enter a MAC address mask for the source MAC address.
<b>Destination MAC</b>	Destination MAC Mask - Enter a MAC address mask for the destination MAC address.
<b>802.1p</b>	Selecting this option instructs the Switch to examine the 802.1p priority value of each packet header and use this as the, or part of the criterion for forwarding.
<b>Ethernet type</b>	Selecting this option instructs the Switch to examine the Ethernet type value in each frame's header.

The page shown below is the **IP Access Profile Configuration** page.

**Figure 7- 42. Access Profile Configuration (IP)**



The following parameters can be set, for **IP**:

<b>Parameter</b>	<b>Description</b>
<b>Profile ID (1-6)</b>	Type in a unique identifier number for this profile set. This value can be set from 1 -6.
<b>Type</b>	<p>Select profile based on Ethernet (MAC Address), IP or IPv6 address. This will change the menu according to the requirements for the type of profile.</p> <p>Select <i>Ethernet</i> to instruct the Switch to examine the layer 2 part of each packet header.</p> <p>Select <i>IP</i> to instruct the Switch to examine the IP address in each frame's header.</p> <p>Select <i>IPv6</i> to instruct the Switch to examine the IPv6 address in each frame's header.</p>
<b>Source IP Mask</b>	Enter an IP address mask for the source IP address.
<b>Destination IP Mask</b>	Enter an IP address mask for the destination IP address.
<b>DSCP</b>	Selecting this option instructs the Switch to examine the DiffServ Code part of each packet header and use this as the, or part of the criterion for forwarding.
<b>Protocol</b>	<p>Selecting this option instructs the Switch to examine the protocol type value in each frame's header. You must then specify what protocol(s) to include according to the following guidelines:</p> <p>Select ICMP to instruct the Switch to examine the Internet Control Message Protocol (ICMP) field in each frame's header.</p> <p>Select Type to further specify that the access profile will apply an ICMP type value, or specify Code to further specify that the access profile will apply an ICMP code value.</p> <p>Select IGMP to instruct the Switch to examine the Internet Group Management Protocol (IGMP) field in each frame's header.</p> <p>Select Type to further specify that the access profile will apply an IGMP type value</p> <p>Select TCP to use the TCP port number contained in an incoming packet as the forwarding criterion. Selecting TCP requires that you specify a source port mask and/or a destination port mask. The user may also identify which flag bits to filter. Flag bits are parts of a packet that determine what to do with the packet. The user may filter packets by filtering certain flag bits within the packets, by checking the boxes corresponding to the flag bits of the TCP field. The user may choose between urg (urgent), ack (acknowledgement), psh (push), rst (reset), syn (synchronize), fin (finish).</p> <p>src port mask - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff), which you wish to filter.</p> <p>dest port mask - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff) which you wish to filter.</p> <p>Select UDP to use the UDP port number contained in an incoming packet as the forwarding criterion. Selecting UDP requires that you specify a source port mask and/or a destination port mask.</p> <p>src port mask - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff).</p> <p>dest port mask - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff).</p> <p>protocol id - Enter a value defining the protocol ID in the packet header to mask. Specify the protocol ID mask in hex form (hex 0x0-0xffffffff).</p>

The page shown below is the **IPv6** configuration window.

**Figure 7- 43. Access Profile Configuration window (IPv6)**

The following parameters can be set, for **IP**:

Parameter	Description
<b>Profile ID (1-6)</b>	Type in a unique identifier number for this profile set. This value can be set from 1 - 6.
<b>Type</b>	Select profile based on Ethernet (MAC Address), IP or IPv6 address. This will change the menu according to the requirements for the type of profile. Select <i>Ethernet</i> to instruct the Switch to examine the layer 2 part of each packet header. Select <i>IP</i> to instruct the Switch to examine the IP address in each frame's header. Select <i>IPv6</i> to instruct the Switch to examine the IPv6 address in each frame's header.
<b>Class</b>	Checking this field will instruct the Switch to examine the <i>class</i> field of the IPv6 header. This class field is a part of the packet header that is similar to the Type of Service (ToS) or Precedence bits field in IPv4.
<b>Flowlabel</b>	Checking this field will instruct the Switch to examine the <i>flow label</i> field of the IPv6 header. This flow label field is used by a source to label sequences of packets such as non-default quality of service or real time service packets.
<b>Source IPv6 Mask</b>	The user may specify an IP address mask for the source IPv6 address by checking the corresponding box and entering the IP address mask.
<b>Destination IPv6 Mask</b>	The user may specify an IP address mask for the destination IPv6 address by checking the corresponding box and entering the IP address mask.

Click **Apply** to implement changes made.

To establish the rule for a previously created Access Profile:

In the **Configuration** folder, click the **Access Profile Table** link opening the **Access Profile Table**. Under the heading **Access Rule**, clicking **Modify**, will open the following window.

Profile ID	Mode	Type	Access ID	Display	Delete
2	Permit	IP	1	<a href="#">View</a>	

[Show All Access Profile Entries](#)

**Figure 7- 44. Access Rule Table window – IP**

To create a new rule set for an access profile click the **Add** button. A new window is displayed. To remove a previously created rule, click the corresponding button.

**Access Rule Configuration**

Profile ID: 1

Mode:  Permit  Deny

Access ID (1-128): 1  Auto assign

Type: IP

Priority (0-7):  0  replace priority

Replace Dscp(0-63):  0

Source IP: 0.0.0.0

Destination IP: 0.0.0.0

Dscp (0-63): 0

Protocol: Protocol id 0 user define 00000000

Port:

Rx Rate: No Limit  1 (1-156249)

[Apply](#)

**Figure 7- 45. Access Rule Configuration window (IP)**

Configure the following **Access Rule Configuration** settings for IP:

Parameter	Description
<b>Profile ID</b>	This is the identifier number for this profile set.
<b>Mode</b>	Select Permit to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select Deny to specify that packets that do not match the access profile are not forwarded by the Switch and will be filtered.
<b>Access ID</b>	Type in a unique identifier number for this access. This value can be set from 1 - 128.
<b>Type</b>	Selected profile based on Ethernet (MAC Address), IP address or IPv6 address <i>Ethernet</i> instructs the Switch to examine the layer 2 part of each packet header. <i>IP</i> instructs the Switch to examine the IP address in each frame's header. <i>IPv6</i> instructs the Switch to examine the IPv6 address in each frame's header.
<b>Priority (0-7)</b>	This parameter is specified if you want to re-write the 802.1p default priority previously set in the Switch, which is used to determine the CoS queue to which packets are forwarded to. Once this field is specified, packets accepted by the Switch that match this priority are forwarded to the CoS queue specified previously by the user. <i>Replace priority with</i> – Click the corresponding box if you want to re-write the 802.1p default priority of a packet to the value entered in the Priority field, which meets the criteria specified previously in this command, before forwarding it on to the specified CoS queue. Otherwise, a packet will have its incoming 802.1p user priority re-written to its original value before being forwarded by the Switch. For more information on priority queues, CoS queues and mapping for 802.1p, see the QoS section of this manual.
<b>Replace Dscp (0-63)</b>	Select this option to instruct the Switch to replace the DSCP value (in a packet that meets the selected criteria) with the value entered in the adjacent field.
<b>Source IP</b>	Source IP Address - Enter an IP Address mask for the source IP address.
<b>Destination IP</b>	Destination IP Address- Enter an IP Address mask for the destination IP address.
<b>Dscp (0-63)</b>	This field allows the user to enter a DSCP value in the space provided, which will instruct the Switch to examine the DiffServ Code part of each packet header and use this as the, or part of the criterion for forwarding. The user may choose a value between 0 and 63.
<b>Protocol</b>	This field allows the user to modify the protocol used to configure the Access Rule Table; depending on which protocol the user has chosen in the Access Profile Table.
<b>Port</b>	The Access Rule may be configured on a per-port basis by entering the port number of the switch.
<b>Rx rate</b>	A limit may be set on the incoming rate for the access rule.

To view the settings of a previously correctly configured rule, click **View** in the **Access Rule Table** to view the following screen:

Access Profile Entry Display	
Profile ID	1
Type	IP
Source IP Mask	10.1.1.25
Destination IP Mask	-----
Dscp	-----
Protocol	-----

**Figure 7- 46. Access Rule Display window (IP)**

To configure the **Access Rule for Ethernet**, open the **Access Profile Table** and click **Modify** for an Ethernet entry. This will open the following screen:

Access Rule Table						
Profile ID	Mode	Type	Access ID	Display	Delete	
1	Permit	Ethernet	1	<b>View</b>		

[Show All Access Profile Entries](#)

**Figure 7- 47. Access Rule Table**

To remove a previously created rule, select it and click the button. To add a new Access Rule, click the **Add** button:

Access Rule Configuration	
Profile ID	2
Mode	<input checked="" type="radio"/> Permit <input type="radio"/> Deny
Access ID (1-128)	1 <input type="checkbox"/> Auto assign <input type="checkbox"/>
Type	Ethernet
Priority (0-7)	<input type="checkbox"/> 0 <input type="checkbox"/> replace priority
VLAN Name	
Source MAC	00-00-00-00-00-00
Destination MAC	00-00-00-00-00-00
802.1p (0-7)	0
Ethernet Type	0000
Port	
Rx Rate	No Limit <input checked="" type="checkbox"/> 1 (1-156249)
<input type="button" value="Apply"/>	

Figure 7- 48. Access Rule Configuration window - Ethernet

To set the Access Rule for Ethernet, adjust the following parameters and click **Apply**.

Parameter	Description
<b>Profile ID</b>	This is the identifier number for this profile set.
<b>Mode</b>	Select Permit to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select Deny to specify that packets that do not match the access profile are not forwarded by the Switch and will be filtered.
<b>Access ID</b>	Type in a unique identifier number for this access. This value can be set from 1 - 128.
<b>Type</b>	Selected profile based on Ethernet (MAC Address), IP address or IPv6 address <i>Ethernet</i> instructs the Switch to examine the layer 2 part of each packet header. <i>IP</i> instructs the Switch to examine the IP address in each frame's header. <i>IPv6</i> instructs the Switch to examine the IPv6 address in each frame's header.
<b>Priority (0-7)</b>	This parameter is specified if you want to re-write the 802.1p default priority previously set in the Switch, which is used to determine the CoS queue to which packets are forwarded to. Once this field is specified, packets accepted by the Switch that match this priority are forwarded to the CoS queue specified previously by the user.  <i>replace priority</i> – Click the corresponding box if you want to re-write the 802.1p default priority of a packet to the value entered in the Priority field, which meets the criteria specified previously in this command, before forwarding it on to the specified CoS queue. Otherwise, a packet will have its incoming 802.1p user priority re-written to its original value before being forwarded by the Switch. For more information on priority queues, CoS queues and mapping for 802.1p, see the QoS section of this manual.
<b>VLAN Name</b>	Allows the entry of a name for a previously configured VLAN.
<b>Source MAC</b>	Source MAC Address - Enter a MAC Address for the source MAC address.
<b>Destination MAC</b>	Destination MAC Address - Enter a MAC Address mask for the destination MAC address.
<b>802.1p (0-7)</b>	Enter a value from 0-7 to specify that the access profile will apply only to packets with this 802.1p priority value.
<b>Ethernet Type</b>	Specifies that the access profile will apply only to packets with this hexadecimal 802.1Q Ethernet type value (hex 0x0-0xffff) in the packet header. The Ethernet type value may be set in the form: hex 0x0-0xffff, which means the user may choose any combination of letters and numbers ranging from a-f and from 0-9999.
<b>Port</b>	The Access Rule may be configured on a per-port basis by entering the port number of the switch.
<b>Rx rate</b>	A limit may be set on the incoming rate for the access rule.

To view the settings of a previously correctly configured rule, click **View** in the **Access Rule Table** to view the following screen:

Access Rule Display	
Profile ID	1
Access ID	1
Mode	Permit
Type	Ethernet
Priority	-----
Replace Dscp	-----
Vlan Name	-----
Source Mac	-----
Destination Mac	-----
802.1p	-----
Ethernet Type	-----

[Show All Access Rule Entries](#)

**Figure 7- 49. Access Rule Display window (Ethernet)**

To configure the Access Rule for IPv6, open the **Access Profile Table** and click **Modify** for an IPv6 entry. This will open the following screen:

[Add](#)

Access Rule Table					
Profile ID	Mode	Type	Access ID	Display	Delete
<a href="#">Show All Access Profile Entries</a>					

**Figure 7- 50. Access Rule Table**

Click **Add** to open the next screen to configure the IPv6 entry for an access rule.

Access Rule Configuration	
Profile ID	3
Mode	<input checked="" type="radio"/> Permit <input type="radio"/> Deny
Access ID (1-128)	1 <input type="text"/> Auto assign <input type="checkbox"/>
Type	IPv6
Priority (0-7)	<input type="checkbox"/> <input type="text"/> <input type="checkbox"/> replace priority
Class (0-255)	<input type="text"/>
Flowlabel (0-FFFFF)	00000 <input type="text"/>
Source IPv6 Address	0000:0000:0000:0000:00 <input type="text"/>
Destination IPv6 Address	0000:0000:0000:0000:00 <input type="text"/>
Port	<input type="text"/>
Rx Rate	No Limit <input checked="" type="checkbox"/> <input type="text"/> 1 (1-156249)


[Apply](#)

**Figure 7- 51. Access Rule Configuration – IPv6**



To set the Access Rule for the **Packet Content Mask**, adjust the following parameters and click **Apply**.

<b>Parameter</b>	<b>Description</b>
<b>Profile ID</b>	This is the identifier number for this profile set.
<b>Mode</b>	Select <i>Permit</i> to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select <i>Deny</i> to specify that packets that match the access profile are not forwarded by the Switch and will be filtered.
<b>Access ID</b>	Type in a unique identifier number for this access rule. This value can be set from 1 - 128.
<b>Type</b>	Selected profile based on Ethernet (MAC Address), IP address or IPv6 address <i>Ethernet</i> instructs the Switch to examine the layer 2 part of each packet header. <i>IP</i> instructs the Switch to examine the IP address in each frame's header. <i>IPv6</i> instructs the Switch to examine the IPv6 address in each frame's header.
<b>Priority</b>	This parameter is specified to re-write the 802.1p default priority previously set in the Switch, which is used to determine the CoS queue to which packets are forwarded to. Once this field is specified, packets accepted by the Switch that match this priority are forwarded to the CoS queue specified previously by the user.  Replace priority with – Click the corresponding box to re-write the 802.1p default priority of a packet to the value entered in the Priority field, which meets the criteria specified previously in this command, before forwarding it on to the specified CoS queue. Otherwise, a packet will have its incoming 802.1p user priority re-written to its original value before being forwarded by the Switch.  For more information on priority queues, CoS queues and mapping for 802.1p, see the QoS section of this manual.
<b>Class</b>	Entering a value between 0 and 255 will instruct the Switch to examine the class field of the IPv6 header. This class field is a part of the packet header that is similar to the Type of Service (ToS) or Precedence bits field of IPv4.
<b>Flowlabel</b>	Configuring this field, in hex form, will instruct the Switch to examine the flow label field of the IPv6 header. This flow label field is used by a source to label sequences of packets such as non-default quality of service or real time service packets.
<b>Source IPv6 Address</b>	The user may specify an IP address mask for the source IPv6 address by entering the IP address mask, in hex form.
<b>Destination IPv6 Address</b>	The user may specify an IP address mask for the destination IPv6 address by and entering the IP address mask, in hex form.
<b>Port</b>	The Access Rule may be configured on a per-port basis by entering the port number of the switch.
<b>Rx rate</b>	A limit may be set on the incoming rate for the access rule.

To view the settings of a previously correctly configured rule, click  in the **Access Rule Table** to view the following screen:

Access Rule Display	
Profile ID	1
Access ID	1
Mode	Permit
Type	IPv6
Priority	-----
Class	-----
Flowlabel	-----
Source IPV6	-----
Destination IPV6	-----
Port	5
Rx Rate(64Kbps)	No Limit

Figure 7- 52. Access Rule Display (IPv6)

## CPU Interface Filtering

Due to a chipset limitation and needed extra switch security, the xStack DGS-3400 Series switch incorporates CPU Interface filtering. This added feature increases the running security of the Switch by enabling the user to create a list of access rules for packets destined for the Switch’s CPU interface. Employed similarly to the Access Profile feature previously mentioned, CPU interface filtering examines Ethernet, IP and Packet Content Mask packet headers destined for the CPU and will either forward them or filter them, based on the user’s implementation. As an added feature for the CPU Filtering, the xStack DGS-3400 Series switch allows the CPU filtering mechanism to be enabled or disabled globally, permitting the user to create various lists of rules without immediately enabling them.

Creating an access profile for the CPU is divided into two basic parts. The first is to specify which part or parts of a frame the Switch will examine, such as the MAC source address or the IP destination address. The second part is entering the criteria the Switch will use to determine what to do with the frame. The entire process is described below.

### CPU Interface Filtering State Settings

In the following window, the user may globally enable or disable the CPU Interface Filtering mechanism by using the pull-down menu to change the running state. To access this window, click **Configuration > CPU Interface Filtering > CPU Interface Filtering State**. Choose **Enabled** to enable CPU packets to be scrutinized by the Switch and **Disabled** to disallow this scrutiny.


CPU Interface Filtering State Settings	
State	Disabled 
<input type="button" value="Apply"/>	

Figure 7- 53. CPU Interface Filtering State Settings window

## CPU Interface Filtering Table

The **CPU Interface Filtering Table** displays the CPU Access Profile Table entries created on the Switch. To view the configurations for an entry, click the hyperlinked **Profile ID** number.

CPU Interface Filtering Table			
Profile ID	Type	Access Rule	Delete
1	Ethernet	Modify	X
2	IP	Modify	X
3	Packet Content	Modify	X

Figure 7- 54. CPU Interface Filtering Table

To add an entry to the **CPU Interface Filtering Table**, click the **Add** button. This will open the **CPU Interface Filtering Configuration** page, as shown below. There are three **Access Profile Configuration** pages; one for **Ethernet** (or MAC address-based) profile configuration, one for **IP** address-based profile configuration and one for the **Packet Content Mask**. You can switch between the three **Access Profile Configuration** pages by using the **Type** drop-down menu. The page shown below is the **Ethernet CPU Interface Filtering Configuration** page.

CPU Interface Filtering Configuration	
Profile ID(1-5)	1
Type	Ethernet
Vlan	<input type="checkbox"/>
Source Mac	<input type="checkbox"/> 00-00-00-00-00-00
Destination Mac	<input type="checkbox"/> 00-00-00-00-00-00
Ethernet type	<input type="checkbox"/>
Apply	
<a href="#">Show All CPU Interface Filtering Table Entries</a>	

Figure 7- 55. CPU Interface Filtering Configuration window – Ethernet

Parameter	Description
<b>Profile ID (1-5)</b>	Type in a unique identifier number for this profile set. This value can be set from 1 - 5.
<b>Type</b>	Select profile based on Ethernet (MAC Address), IP address or packet content mask. This will change the menu according to the requirements for the type of profile. Select <i>Ethernet</i> to instruct the Switch to examine the layer 2 part of each packet header. Select <i>IP</i> to instruct the Switch to examine the IP address in each frame's header. Select <i>Packet Content Mask</i> to specify a mask to hide the content of the packet header.
<b>VLAN</b>	Selecting this option instructs the Switch to examine the VLAN identifier of each packet header and use this as the full or partial criterion for forwarding.
<b>Source MAC</b>	Source MAC Mask - Enter a MAC address mask for the source MAC address.
<b>Destination MAC</b>	Destination MAC Mask - Enter a MAC address mask for the destination MAC address.
<b>Ethernet type</b>	Selecting this option instructs the Switch to examine the Ethernet type value in each frame's header.

Click **Apply** to set this entry in the Switch's memory.

The page shown below is the **IP Access Profile Configuration** page.

CPU Interface Filtering Configuration

<b>Profile ID(1-5)</b>	<input type="text" value="1"/>		
<b>Type</b>	IP <span style="float: right;">▼</span>		
<b>Vlan</b>	<input type="checkbox"/>		
<b>Source IP Mask</b>	<input type="checkbox"/>	<input type="text" value="0.0.0.0"/>	
<b>Destination IP Mask</b>	<input type="checkbox"/>	<input type="text" value="0.0.0.0"/>	
<b>Dscp</b>	<input type="checkbox"/>		
<b>Protocol</b>	<input type="checkbox"/>	<input checked="" type="radio"/> ICMP <input type="checkbox"/> type <input type="checkbox"/> code <input type="radio"/> IGMP <input type="checkbox"/> type <input type="radio"/> TCP <input type="checkbox"/> src port mask <input type="text" value="0000"/> <input type="checkbox"/> dest port mask <input type="text" value="0000"/> <input type="checkbox"/> flag mask bit <input type="checkbox"/> urg <input type="checkbox"/> ack <input type="checkbox"/> psh <input type="checkbox"/> rst <input type="checkbox"/> syn <input type="checkbox"/> fin <input type="radio"/> UDP <input type="checkbox"/> src port mask <input type="text" value="0000"/> <input type="checkbox"/> dest port mask <input type="text" value="0000"/> <input type="radio"/> protocol id <input type="checkbox"/> user mask <input type="text" value="00000000"/>	
<input type="button" value="Apply"/>			

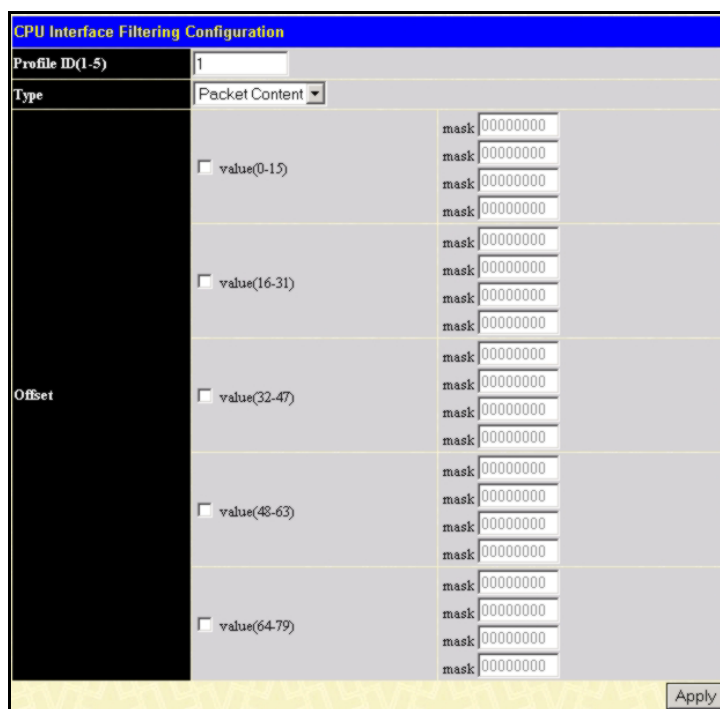
[Show All CPU Interface Filtering Table Entries](#)

**Figure 7- 56. CPU Interface Filtering Configuration window- IP**

<b>Parameter</b>	<b>Description</b>
<b>Profile ID (1-5)</b>	Type in a unique identifier number for this profile set. This value can be set from 1 - 5.
<b>Type</b>	Select profile based on Ethernet (MAC Address), IP address or Packet Content Mask. This will change the menu according to the requirements for the type of profile. Select <i>Ethernet</i> to instruct the Switch to examine the layer 2 part of each packet header. Select <i>IP</i> to instruct the Switch to examine the IP address in each frame's header. Select <i>Packet Content Mask</i> to specify a mask to hide the content of the packet header.
<b>VLAN</b>	Selecting this option instructs the Switch to examine the VLAN part of each packet header and use this as the, or part of the criterion for forwarding.
<b>Source IP Mask</b>	Enter an IP address mask for the source IP address.
<b>Destination IP Mask</b>	Enter an IP address mask for the destination IP address.
<b>DSCP</b>	Selecting this option instructs the Switch to examine the DiffServ Code part of each packet header and use this as the, or part of the criterion for forwarding.
<b>Protocol</b>	Selecting this option instructs the Switch to examine the protocol type value in each frame's header. You must then specify what protocol(s) to include according to the following guidelines: Select ICMP to instruct the Switch to examine the Internet Control Message Protocol (ICMP) field in each frame's header. Select Type to further specify that the access profile will apply an ICMP type value, or specify Code to further specify that the access profile will apply an ICMP code value. Select IGMP to instruct the Switch to examine the Internet Group Management Protocol (IGMP) field in each frame's header. Select Type to further specify that the access profile will apply an IGMP type value Select TCP to use the TCP port number contained in an incoming packet as the forwarding criterion. Selecting TCP requires that you specify a source port mask and/or a destination port mask. The user may also identify which flag bits to filter. Flag bits are parts of a packet that determine what to do with the packet. The user may filter packets by filtering certain flag bits within the packets, by checking the boxes corresponding to the flag bits of the TCP field. The user may choose between urg (urgent), ack (acknowledgement), psh (push), rst (reset), syn (synchronize), fin (finish). src port mask - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff), which you wish to filter. dest port mask - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff) which you wish to filter. Select UDP to use the UDP port number contained in an incoming packet as the forwarding criterion. Selecting UDP requires that you specify a source port mask and/or a destination port mask. src port mask - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff). dest port mask - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff). protocol id - Enter a value defining the protocol ID in the packet header to mask. Specify the protocol ID mask in hex form (hex 0x0-0xffffffff).

Click **Apply** to set this entry in the Switch's memory.

The page shown below is the **Packet Content Mask** configuration window.



**Figure 7- 57. CPU Interface Filtering Configuration window- Packet Content**

This screen will aid the user in configuring the Switch to mask packet headers beginning with the offset value specified. The following fields are used to configure the **Packet Content Mask**:

Parameter	Description
<b>Profile ID (1-5)</b>	Type in a unique identifier number for this profile set. This value can be set from 1 - 5.
<b>Type</b>	<p>Select profile based on Ethernet (MAC Address), IP address or packet content mask. This will change the menu according to the requirements for the type of profile.</p> <p>Select <i>Ethernet</i> to instruct the Switch to examine the layer 2 part of each packet header.</p> <p>Select <i>IP</i> to instruct the Switch to examine the IP address in each frame's header.</p> <p>Select <i>Packet Content Mask</i> to specify a mask to hide the content of the packet header.</p>
<b>Offset</b>	<p>This field will instruct the Switch to mask the packet header beginning with the offset value specified:</p> <p><i>value (0-15)</i> - Enter a value in hex form to mask the packet from the beginning of the packet to the 15th byte.</p> <p><i>value (16-31)</i> – Enter a value in hex form to mask the packet from byte 16 to byte 31.</p> <p><i>value (32-47)</i> – Enter a value in hex form to mask the packet from byte 32 to byte 47.</p> <p><i>value (48-63)</i> – Enter a value in hex form to mask the packet from byte 48 to byte 63.</p> <p><i>value (64-79)</i> – Enter a value in hex form to mask the packet from byte 64 to byte 79.</p>

Click **Apply** to implement changes made.

To establish the rule for a previously created CPU Access Profile:

In the Configuration folder, click the CPU Interface Filtering > CPU Interface Filtering State to open the CPU Interface Filtering Table.

Profile ID	Type	Access Rule	Display	Delete
1	Ethernet	Modify	View	X
2	IP	Modify	View	X
3	Packet Content	Modify	View	X

Figure 7- 58. CPU Interface Filtering Table

In this window, the user may add a rule to a previously created CPU access profile by clicking the corresponding Modify button of the entry to configure, Ethernet, IP or Packet Content. Each entry will open a new and unique window, as shown in the examples below.

Profile ID	Mode	Type	Access ID	Display	Delete
1	Permit	Ethernet	1	View	X

Figure 7- 59. CPU Interface Filtering Table – Ethernet

To create a new rule set for an access profile click the Add button. A new window is displayed. To remove a previously created rule, click the corresponding X button. The following window is used for the Ethernet Rule configuration.

CPU Interface Filtering Rule Configuration	
Profile ID	1
Mode	<input checked="" type="radio"/> Permit <input type="radio"/> Deny
Access ID(1-100)	1
Type	Ethernet
Vlan Name	
Source Mac	00-00-00-00-00-00
Destination Mac	00-00-00-00-00-00
802.1p(0-7)	0
Ethernet Type	0000
Port	
Apply	

Figure 7- 60. CPU Interface Filtering Rule Configuration – Ethernet

To set the Access Rule for Ethernet, adjust the following parameters and click **Apply**.

Parameter	Description
<b>Profile ID</b>	This is the identifier number for this profile set.
<b>Mode</b>	Select Permit to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select Deny to specify that packets that do not match the access profile are not forwarded by the Switch and will be filtered.
<b>Access ID</b>	Type in a unique identifier number for this access and priority. This value can be set from 1 - 100.
<b>Type</b>	Selected profile based on Ethernet (MAC Address), IP address or Packet Content. <i>Ethernet</i> instructs the Switch to examine the layer 2 part of each packet header. <i>IP</i> instructs the Switch to examine the IP address in each frame's header. <i>Packet Content Mask</i> instructs the Switch to examine the packet header.
<b>VLAN Name</b>	Allows the entry of a name for a previously configured VLAN.
<b>Source MAC</b>	Source MAC Address - Enter a MAC Address for the source MAC address.
<b>Destination MAC</b>	Destination MAC Address - Enter a MAC Address mask for the destination MAC address.
<b>802.1p (0-7)</b>	Specify the rule be based on 802.1p priority.
<b>Ethernet Type</b>	Specifies that the access profile will apply only to packets with this hexadecimal 802.1Q Ethernet type value (hex 0x0-0xffff) in the packet header. The Ethernet type value may be set in the form: hex 0x0-0xffff, which means the user may choose any combination of letters and numbers ranging from a-f and from 0-9999.
<b>Port</b>	The rule may be configured on a per-port basis by entering the port number of the switch.



To view the settings of a previously correctly configured rule, click **View** in the **Access Rule Table** to view the following screen:

CPU Interface Filtering Entry Display	
Profile ID	1
Type	Ethernet
Vlan	Enabled
Source Mac	-----
Destination Mac	-----
802.1p	-----
Ethernet Type	-----

Figure 7- 61. CPU Interface Filtering Rule Display – Ethernet

The following window is the **CPU Interface Filtering Rule Table** for IP.

CPU Interface Filtering Rule Table					
Profile ID	Mode	Type	Access ID	Display	Delete
2	Permit	IP	1	<b>View</b>	

[Show All CPU Interface Filtering Entries](#)

Figure 7- 62. CPU Interface Filtering Rule Table – IP

To create a new rule set for an access profile click the **Add** button. A new window is displayed. To remove a previously created rule, click the corresponding button. The following window is used for the IP Rule configuration.

CPU Interface Filtering Rule Configuration	
Profile ID	2
Mode	<input checked="" type="radio"/> Permit <input type="radio"/> Deny
Access ID(1-100)	1
Type	IP
Vlan Name	
Source IP	0.0.0.0
Destination IP	0.0.0.0
Dscp(0-63)	0
Port	

**Apply**

Figure 7- 63. CPU Interface Filtering Rule Configuration – IP

Configure the following **Access Rule Configuration** settings for IP:

Parameter	Description
<b>Profile ID</b>	This is the identifier number for this profile set.
<b>Mode</b>	Select Permit to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select Deny to specify that packets that do not match the access profile are not forwarded by the Switch and will be filtered.
<b>Access ID</b>	Type in a unique identifier number for this access. This value can be set from 1 - 100.
<b>Type</b>	Selected profile based on Ethernet (MAC Address), IP address or Packet Content. <i>Ethernet</i> instructs the Switch to examine the layer 2 part of each packet header. <i>IP</i> instructs the Switch to examine the IP address in each frame's header. <i>Packet Content Mask</i> instructs the Switch to examine the packet header.
<b>VLAN Name</b>	Allows the entry of a name for a previously configured VLAN.
<b>Source IP</b>	Source IP Address - Enter an IP Address mask for the source IP address.
<b>Destination IP</b>	Destination IP Address- Enter an IP Address mask for the destination IP address.
<b>Port</b>	The rule may be configured on a per-port basis by entering the port number of the switch.

To view the settings of a previously correctly configured rule, click [View](#) in the **Access Rule Table** to view the following screen:

CPU Interface Filtering Entry Display	
Profile ID	2
Type	IP
Vlan	Enabled
Source IP Mask	-----
Destination IP Mask	-----
Dscp	-----
Protocol	-----

**Figure 7- 64. CPU Interface Filtering Rule Display - IP**

The following window is the **CPU Interface Filtering Rule Table** for Packet Content.

CPU Interface Filtering Rule Table					
Profile ID	Mode	Type	Access ID	Display	Delete
3	Permit	Packet Content	1	<a href="#">View</a>	<input type="button" value="X"/>

[Show All CPU Interface Filtering Entries](#)

**Figure 7- 65. CPU Interface Filtering Rule Table – Packet Content**


To remove a previously created rule, select it and click the  button. To add a new Access Rule, click the **Add** button:

CPU Interface Filtering Rule Configuration		
Profile ID	3	
Mode	<input checked="" type="radio"/> Permit <input type="radio"/> Deny	
Access ID(1-100)	1	
Type	Packet Content	
Offset	<input type="checkbox"/> value(0-15)	mask 00000000
		mask 00000000
		mask 00000000
		mask 00000000
	<input type="checkbox"/> value(16-31)	mask 00000000
		mask 00000000
		mask 00000000
		mask 00000000
	<input type="checkbox"/> value(32-47)	mask 00000000
		mask 00000000
		mask 00000000
		mask 00000000
	<input type="checkbox"/> value(48-63)	mask 00000000
		mask 00000000
		mask 00000000
		mask 00000000
	<input type="checkbox"/> value(64-79)	mask 00000000
		mask 00000000
		mask 00000000
		mask 00000000
Port	<input type="text"/>	
<input type="button" value="Apply"/>		

**Figure 7- 66. CPU Interface Filtering Rule Configuration - Packet Content**

To set the Access Rule for Ethernet, adjust the following parameters and click **Apply**.

Parameter	Description
<b>Profile ID</b>	This is the identifier number for this profile set.
<b>Mode</b>	Select Permit to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select Deny to specify that packets that do not match the access profile are not forwarded by the Switch and will be filtered.
<b>Access ID</b>	Type in a unique identifier number for this access. This value can be set from 1 - 100.
<b>Type</b>	Selected profile based on Ethernet (MAC Address), IP address or Packet Content. <i>Ethernet</i> instructs the Switch to examine the layer 2 part of each packet header. <i>IP</i> instructs the Switch to examine the IP address in each frame's header. <i>Packet Content Mask</i> instructs the Switch to examine the packet header.
<b>Offset</b>	This field will instruct the Switch to mask the packet header beginning with the offset value specified: <i>value (0-15)</i> - Enter a value in hex form to mask the packet from the beginning of the packet to the 15th byte. <i>value (16-31)</i> - Enter a value in hex form to mask the packet from byte 16 to byte 31. <i>value (32-47)</i> - Enter a value in hex form to mask the packet from byte 32 to byte 47. <i>value (48-63)</i> - Enter a value in hex form to mask the packet from byte 48 to byte 63. <i>value (64-79)</i> - Enter a value in hex form to mask the packet from byte 64 to byte 79.
<b>Port</b>	The rule may be configured on a per-port basis by entering the port number of the switch.

To view the settings of a previously correctly configured rule, click  in the **Access Rule Table** to view the following screen:

CPU Interface Filtering Entry Display	
Profile ID	3
Type	Packet Content
Offset 0-15	0x00000000 0x00000000 0x00000000 0x00000000
Offset 16-31	-----
Offset 32-47	-----
Offset 48-63	-----
Offset 64-79	-----

**Figure 7- 67. CPU Interface Filtering Rule Display – Packet Content**

# **Security**

*Traffic Control*

*Port Security*

*Port Lock Entities*

*802.1x*

*Access Authentication Control*

*Traffic Segmentation*

*SSL*

*SSH*

## Traffic Control

On a computer network, packets such as Multicast packets and Broadcast packets continually flood the network as normal procedure. At times, this traffic may increase do to a malicious endstation on the network or a malfunctioning device, such as a faulty network card. Thus, switch throughput problems will arise and consequently affect the overall performance of the switch network. To help rectify this packet storm, the Switch implements two methods to monitor and control the situation.

**Hardware:** The packet storm is monitored using the Switch’s hardware to determine if too many packets are flooding the network, based on the threshold level provided by the user. Once a packet storm has been detected, the Switch will drop packets coming into the Switch until the storm has subsided. This method can be utilized by selecting the **Drop** option of the **Action** field in the window below.

**Software:** The device’s software will scan and monitor packets coming into the Switch by monitoring the Switch’s chip counter. This method is only viable for Broadcast and Multicast storms because the chip only has counters for these two types of packets. Once a storm has been detected (that is, once the packet threshold set below has been exceeded), the Switch will shutdown the port to all incoming traffic with the exception of STP BPDU packets for a time period, specified using the CountDown field. If this field times out and the packet storm continues, the port will be placed in a Shutdown Forever mode which will produce a warning message to be sent to the Trap Receiver. Once in Shutdown Forever mode, the only method of recovering this port is to manually recoup it using the **Storm Control Recover** setting seen in the figure below. To utilize the Software method of Storm Control, choose the **Shutdown** option of the **Action** field in the window below.

Use the **Traffic Control** menu to enable or disable storm control and adjust the threshold for multicast and broadcast storms, as well as DLF (Destination Look Up Failure). To view the following window, click **Security > Traffic Control**:

**Traffic Control Recover**

From: Port 1 To: Port 1 Apply

**Traffic Trap Configuration**

Traffic Trap: None Apply

**Traffic Control Settings**

From	To	Broadcast	Multicast	DLF	Action	Threshold	Count Down	Interval	Apply
Port 1	Port 1	Enabled	Enabled	Enabled	Drop	128	5	5	Apply

**Traffic Control Table**

Port	Broadcast	Multicast	DLF	Action	Threshold	Count Down	Time Interval	Forever
1	Disabled	Disabled	Disabled	Drop	1024	0	5	
2	Disabled	Disabled	Disabled	Drop	1024	0	5	
3	Disabled	Disabled	Disabled	Drop	1024	0	5	
4	Disabled	Disabled	Disabled	Drop	1024	0	5	
5	Disabled	Disabled	Disabled	Drop	1024	0	5	
6	Disabled	Disabled	Disabled	Drop	1024	0	5	
7	Disabled	Disabled	Disabled	Drop	1024	0	5	
8	Disabled	Disabled	Disabled	Drop	1024	0	5	
9	Disabled	Disabled	Disabled	Drop	1024	0	5	
10	Disabled	Disabled	Disabled	Drop	1024	0	5	
11	Disabled	Disabled	Disabled	Drop	1024	0	5	

**Figure 8- 1. Traffic Control Settings and Traffic Control Table window**

To configure **Traffic Control**, enable or disable the **Broadcast Storm**, **Multicast Storm** and **DLF** using their corresponding pull-down menus. Click **Apply** to implement changes made.

Parameter	Description
<b>Traffic Control Recover</b>	
<b>From... To</b>	Select the ports to be shutdown.
<b>Traffic Trap Configuration</b>	
<b>Traffic Trap</b>	<p>Enable sending of Storm Trap messages when the type of action taken by the Traffic Control function in handling a Traffic Storm is one of the following:</p> <p><i>None</i> – Will send no Storm trap warning messages regardless of action taken by the Traffic Control mechanism.</p> <p><i>Storm Occurred</i> – Will send Storm Trap warning messages upon the occurrence of a Traffic Storm only.</p> <p><i>Storm Cleared</i> – Will send Storm Trap messages when a Traffic Storm has been cleared by the Switch only.</p> <p><i>Both</i> – Will send Storm Trap messages when a Traffic Storm has been both detected and cleared by the Switch.</p> <p>This function cannot be implemented in the Hardware mode. (When Drop is chosen in the Action field.)</p>
<b>Storm Control Settings</b>	
<b>From...To</b>	Select the ports of this Switch to configure for Storm Control.
<b>Broadcast</b>	Enables or disable Broadcast Storm Control.
<b>Multicast</b>	Enables or disables Multicast Storm Control.
<b>DLF</b>	Enables or disables Destination Lookup Failure (DLF) storm control. (Not available for Software based Traffic Control {Shutdown}).
<b>Action</b>	<p>Select the method of traffic Control from the pull down menu. The choices are:</p> <p><i>Drop</i> – Utilizes the hardware Traffic Control mechanism, which means the Switch's hardware will determine the Packet Storm based on the Threshold value stated and drop packets until the issue is resolved.</p> <p><i>Shutdown</i> – Utilizes the Switch's software Traffic Control mechanism to determine the Packet Storm occurring. Once detected, the port will deny all incoming traffic to the port except STP BPDU packets, which are essential in keeping the Spanning Tree operational on the Switch. If the Countdown timer has expired and yet the Packet Storm continues, the port will be placed in Shutdown Forever mode and is no longer operational until the user manually resets the port using the Storm Control Recover setting at the top of this window. Choosing this option obligates the user to configure the Interval setting as well, which will provide packet count samplings from the Switch's chip to determine if a Packet Storm is occurring.</p>
<b>Threshold</b>	Specifies the maximum number of packets per second that will trigger the Traffic Control function to commence. This entry should be made in multiples of 128. Other entries will be set internally closest to the multiple of 128. The configurable threshold range is from 0-2047 with a default setting of 1024.
<b>Count Down</b>	The Count Down timer is set to determine the amount of time, in minutes, that the Switch will wait before shutting down the port that is experiencing a traffic storm. This parameter is only useful for ports configured as Shutdown in their Action field and therefore will not operate for Hardware based Traffic Control implementations. The possible time settings for this field are 0, 5-30 minutes. 0 is the default setting for this field and 0 will denote that the port will never shutdown.
<b>Interval</b>	The Interval will set the time between Multicast and Broadcast packet counts sent from the Switch's chip to the Traffic Control function. These packet counts are the determining factor in deciding when incoming packets exceed the Threshold value. The Interval may be set between 5 and 30 seconds with the default setting of 5 seconds.

Click Apply to implement the settings of each field.



**NOTE:** Traffic Control cannot be implemented on ports that are set for Link Aggregation (Port Trunking).



**NOTE:** Ports that are in the Shutdown forever mode will be seen as Discarding in Spanning Tree windows and implementations though these ports will still be forwarding BDPUs to the Switch's CPU.



**NOTE:** Ports that are in Shutdown Forever mode will be seen as link down in all windows and screens until the user recovers these ports.



## Port Security

A given ports' (or a range of ports') dynamic MAC address learning can be locked such that the current source MAC addresses entered into the MAC address forwarding table can not be changed once the port lock is enabled. The port can be locked by using the **Admin State** pull-down menu to *Enabled*, and clicking **Apply**.

**Port Security** is a security feature that prevents unauthorized computers (with source MAC addresses) unknown to the Switch prior to locking the port (or ports) from connecting to the Switch's locked ports and gaining access to the network. To view the following window, click **Security > Port Security**.

Port Security Settings					
From	To	Admin State	Max.Addr (0-16)	Mode	Apply
Port 1	Port 1	Disabled	0	DeleteOnReset	Apply

Port Security Table				
Port	Admin State	MaxLearning Addr	Lock Address Mode	Clear
1	Disabled	1	DeleteOnReset	X
2	Disabled	1	DeleteOnReset	X
3	Disabled	1	DeleteOnReset	X
4	Disabled	1	DeleteOnReset	X
5	Disabled	1	DeleteOnReset	X
6	Disabled	1	DeleteOnReset	X
7	Disabled	1	DeleteOnReset	X
8	Disabled	1	DeleteOnReset	X
9	Disabled	1	DeleteOnReset	X
10	Disabled	1	DeleteOnReset	X
11	Disabled	1	DeleteOnReset	X
12	Disabled	1	DeleteOnReset	X
13	Disabled	1	DeleteOnReset	X
14	Disabled	1	DeleteOnReset	X

Figure 8- 2. Port Security Settings and Table


The following parameters can be set:

Parameter	Description
<b>From/To</b>	A consecutive group of ports may be configured starting with the selected port.
<b>Admin State</b>	This pull-down menu allows the user to enable or disable Port Security (locked MAC address table for the selected ports).
<b>Max. Learning Addr. (0-16)</b>	The number of MAC addresses that will be in the MAC address forwarding table for the selected switch and group of ports.
<b>Mode</b>	This pull-down menu allows the option of how the MAC address table locking will be implemented on the Switch, for the selected group of ports. The options are: <i>Permanent</i> – The locked addresses will only age out after the Switch has been reset. <i>DeleteOnTimeout</i> – The locked addresses will age out after the aging timer expires. <i>DeleteOnReset</i> – The locked addresses will not age out until the Switch has been reset or rebooted.

Click **Apply** to implement changes made.

## Port Lock Entries

The **Port Lock Entry Delete** window is used to remove an entry from the port security entries learned by the Switch and entered into the forwarding database. To view this window, click **Security > Port Lock Entries**.

This function is only operable if the **Mode** in the **Port Security** window is selected as **Permanent** or **DeleteOnReset**, or in other words, only addresses that are permanently learned by the Switch can be deleted. Once the entry has been defined by entering the correct information into the window above, click the  under the **Delete** heading of the corresponding MAC address to be deleted. Click the **Next** button to view the next page of entries listed in this table.






















Port Lock Entries Table						
VID	VLAN Name	MAC Address	Unit	Port	Type	Delete
1	default	00-00-80-c8-09-89	1	11	Secured_Permanent	
1	default	00-01-30-10-00-0b	1	11	Secured_Permanent	
1	default	00-02-06-12-34-56	1	11	Secured_Permanent	
1	default	00-02-a5-9a-f5-61	1	11	Secured_Permanent	
1	default	00-03-09-18-10-01	1	11	Secured_Permanent	
1	default	00-04-13-04-03-01	1	11	Secured_Permanent	
1	default	00-05-5d-ed-84-ea	1	11	Secured_Permanent	
1	default	00-06-01-01-01-00	1	11	Secured_Permanent	
1	default	00-08-02-54-0e-9d	1	11	Secured_Permanent	
1	default	00-08-02-54-0f-ce	1	11	Secured_Permanent	
1	default	00-0c-6e-12-e1-1a	1	11	Secured_Permanent	
1	default	00-0c-6e-1f-9c-aa	1	11	Secured_Permanent	
1	default	00-0c-6e-35-90-ee	1	11	Secured_Permanent	
1	default	00-0c-6e-d5-5b-f0	1	11	Secured_Permanent	
1	default	00-0c-f8-20-90-01	1	11	Secured_Permanent	
1	default	00-0c-f8-3e-e0-0d	1	11	Secured_Permanent	
1	default	00-0c-f8-42-c0-01	1	11	Secured_Permanent	
1	default	00-0c-f8-44-10-01	1	11	Secured_Permanent	
1	default	00-0e-a6-01-d5-6c	1	11	Secured_Permanent	
1	default	00-0e-a6-11-7c-5f	1	11	Secured_Permanent	

Figure 8- 3. Port Lock Entries Table

This window displays the following information:

Parameter	Description
<b>VID</b>	The VLAN ID of the entry in the forwarding database table that has been permanently learned by the Switch.
<b>VLAN NAME</b>	The VLAN Name of the entry in the forwarding database table that has been permanently learned by the Switch.
<b>MAC Address</b>	The MAC address of the entry in the forwarding database table that has been permanently learned by the Switch.
<b>Port</b>	The ID number of the port that has permanently learned the MAC address.
<b>Type</b>	The type of MAC address in the forwarding database table. Only entries marked Secured_Permanent can be deleted.
<b>Delete</b>	Click the  in this field to delete the corresponding MAC address that was permanently learned by the Switch.

## Configure 802.1x Authenticator

To configure the 802.1X authenticator settings, click **Configuration > Port Access Entity > Configure 802.1x Authenticator Parameter**:

Configure 802.1x Authenticator Parameter											
Port	AdmDir	Port Control	TxPeriod	Quiet Period	Supp-Timeout	Server-Timeout	MaxReq	ReAuth Period	ReAuth Enabled	Capability	Modify
1	both	Auto	30	60	30	30	2	3600	No	None	Modify
2	both	Auto	30	60	30	30	2	3600	No	None	Modify
3	both	Auto	30	60	30	30	2	3600	No	None	Modify
4	both	Auto	30	60	30	30	2	3600	No	None	Modify
5	both	Auto	30	60	30	30	2	3600	No	None	Modify
6	both	Auto	30	60	30	30	2	3600	No	None	Modify
7	both	Auto	30	60	30	30	2	3600	No	None	Modify
8	both	Auto	30	60	30	30	2	3600	No	None	Modify
9	both	Auto	30	60	30	30	2	3600	No	None	Modify
10	both	Auto	30	60	30	30	2	3600	No	None	Modify
11	both	Auto	30	60	30	30	2	3600	No	None	Modify

Figure 8- 4. Configure 802.1X Authenticator Parameter window

To view the 802.1X authenticator settings on a different switch in the switch STACK, use the **UNIT** pull-down menu to select that switch by its ID number in the switch STACK. To configure the settings by port, click on the hyperlinked port number under the **Port** heading, which will display the following table to configure:

802.1X Authenticator Settings	
From	Port 1
To	Port 1
AdmDir	both
PortControl	auto
TxPeriod	30
QuietPeriod	60
SuppTimeout	30
ServerTimeout	30
MaxReq	2
ReAuthPeriod	3600
ReAuth	Disabled
Capability	None
<a href="#">Show Authenticators Settings</a> <span style="float: right;">Apply</span>	

Figure 8- 5. 802.1X Authenticator Settings – Modify

This screen allows setting of the following features:

Parameter	Description
<b>From [ ] To [ ]</b>	Enter the port or ports to be set.
<b>AdmCtrlDir</b>	<p>Sets the administrative-controlled direction to either <i>in</i> or <i>both</i>.</p> <p>If <i>in</i> is selected, control is only exerted over incoming traffic through the port selected in the first field.</p> <p>If <i>both</i> is selected, control is exerted over both incoming and outgoing traffic through the controlled port selected in the first field.</p>
<b>PortControl</b>	<p>This allows the user to control the port authorization state.</p> <p>Select <i>forceAuthorized</i> to disable 802.1X and cause the port to transition to the authorized state without any authentication exchange required. This means the port transmits and receives normal traffic without 802.1X-based authentication of the client.</p> <p>If <i>forceUnauthorized</i> is selected, the port will remain in the unauthorized state, ignoring all attempts by the client to authenticate. The Switch cannot provide authentication services to the client through the interface.</p> <p>If <i>Auto</i> is selected, it will enable 802.1X and cause the port to begin in the unauthorized state, allowing only EAPOL frames to be sent and received through the port. The authentication process begins when the link state of the port transitions from down to up, or when an EAPOL-start frame is received. The Switch then requests the identity of the client and begins relaying authentication messages between the client and the authentication server.</p> <p>The default setting is <i>Auto</i>.</p>
<b>TxPeriod</b>	This sets the TxPeriod of time for the authenticator PAE state machine. This value determines the period of an EAP Request/Identity packet transmitted to the client. The default setting is 30 seconds.
<b>QuietPeriod</b>	This allows the user to set the number of seconds that the Switch remains in the quiet state following a failed authentication exchange with the client. The default setting is 60 seconds.
<b>SuppTimeout</b>	This value determines timeout conditions in the exchanges between the Authenticator and the client. The default setting is 30 seconds.
<b>ServerTimeout</b>	This value determines timeout conditions in the exchanges between the Authenticator and the authentication server. The default setting is 30 seconds.
<b>MaxReq</b>	The maximum number of times that the Switch will retransmit an EAP Request to the client before it times out of the authentication sessions. The default setting is 2.
<b>ReAuthPeriod</b>	A constant that defines a nonzero number of seconds between periodic reauthentication of the client. The default setting is 3600 seconds.
<b>ReAuth</b>	Determines whether regular reauthentication will take place on this port. The default setting is <i>Disabled</i> .

Click **Apply** to implement your configuration changes. To view configurations for the **802.1X Authenticator Settings** on a port-by-port basis, see the **802.1X Authenticator Settings** table.

## RADIUS Server

The RADIUS feature of the Switch allows the user to facilitate centralized user administration as well as providing protection against a sniffing, active hacker. The Web Manager offers three windows.

Click **Configuration > Port Access Entity > RADIUS Server > Authentic RADIUS Server** to open the **Authentic RADIUS Server Setting** window shown below:

Authentic RADIUS Server					
Succession	First				
RADIUS Server	0.0.0.1				
Authentic Port	1812				
Accounting Port	1813				
Key					
Confirm Key					
Status	Valid				
Apply					
Current RADIUS Server(s) Settings Table					
Succession	RADIUS Server	Auth UDP Port	Acct UDP Port	Status	Key
First					
Second					
Third					

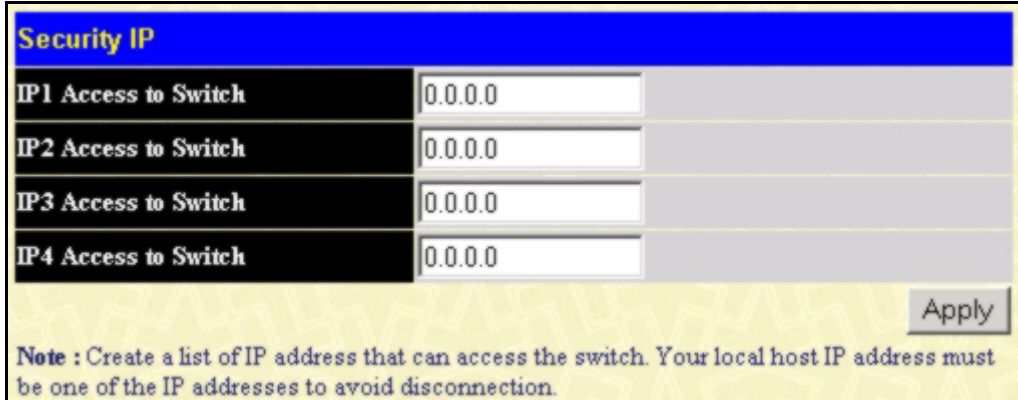
**Figure 8- 6. Authentic RADIUS Server and Current RADIUS Server Settings Table window**

This window displays the following information:

Parameter	Description
<b>Succession</b>	Choose the desired RADIUS server to configure: <i>First</i> , <i>Second</i> or <i>Third</i> .
<b>RADIUS Server</b>	Set the RADIUS server IP.
<b>Authentic Port</b>	Set the RADIUS authentic server(s) UDP port. The default port is 1812.
<b>Accounting Port</b>	Set the RADIUS account server(s) UDP port. The default port is 1813.
<b>Key</b>	Set the key the same as that of the RADIUS server.
<b>Confirm Key</b>	Confirm the shared key is the same as that of the RADIUS server.
<b>Status</b>	This allows the user to set the RADIUS Server as <i>Valid</i> (Enabled) or <i>Invalid</i> (Disabled).

## Trusted Host

Up to four trusted-host secure IP addresses may be configured and used for remote Switch management. It should be noted that if one or more trusted hosts are enabled, the Switch will immediately accept remote instructions from only the specified IP address or addresses. If you enable this feature be sure to first enter the IP address of the station you are currently using.



Security IP	
IP1 Access to Switch	0.0.0.0
IP2 Access to Switch	0.0.0.0
IP3 Access to Switch	0.0.0.0
IP4 Access to Switch	0.0.0.0

Apply

Note : Create a list of IP address that can access the switch. Your local host IP address must be one of the IP addresses to avoid disconnection.

**Figure 8- 7. Security IP menu for Trusted Host configuration**

To configure secure IP addresses for trusted host management of the Switch, type the IP address of the station you are currently using in the first field as well as up to three additional IP addresses of trusted hosts. Click the **Apply** button to assign trusted host status to the IP addresses. This goes into effect immediately.



## Access Authentication Control

The TACACS / XTACACS / TACACS+ / RADIUS commands let you secure access to the Switch using the TACACS / XTACACS / TACACS+ / RADIUS protocols. When a user logs in to the Switch or tries to access the administrator level privilege, he or she is prompted for a password. If TACACS / XTACACS / TACACS+ / RADIUS authentication is enabled on the Switch, it will contact a TACACS / XTACACS / TACACS+ / RADIUS server to verify the user. If the user is verified, he or she is granted access to the Switch.

There are currently three versions of the TACACS security protocol, each a separate entity. The Switch's software supports the following versions of TACACS:

**TACACS (Terminal Access Controller Access Control System)** - Provides password checking and authentication, and notification of user actions for security purposes utilizing via one or more centralized TACACS servers, utilizing the UDP protocol for packet transmission.

**Extended TACACS (XTACACS)** - An extension of the TACACS protocol with the ability to provide more types of authentication requests and more types of response codes than TACACS. This protocol also uses UDP to transmit packets.

**TACACS+ (Terminal Access Controller Access Control System plus)** - Provides detailed access control for authentication for network devices. TACACS+ is facilitated through Authentication commands via one or more centralized servers. The TACACS+ protocol encrypts all traffic between the Switch and the TACACS+ daemon, using the TCP protocol to ensure reliable delivery

In order for the TACACS / XTACACS / TACACS+ / RADIUS security function to work properly, a TACACS / XTACACS / TACACS+ / RADIUS server must be configured on a device other than the Switch, called an Authentication Server Host and it must include usernames and passwords for authentication. When the user is prompted by the Switch to enter usernames and passwords for authentication, the Switch contacts the TACACS / XTACACS / TACACS+ / RADIUS server to verify, and the server will respond with one of three messages:

The server verifies the username and password, and the user is granted normal user privileges on the Switch.

The server will not accept the username and password and the user is denied access to the Switch.

The server doesn't respond to the verification query. At this point, the Switch receives the timeout from the server and then moves to the next method of verification configured in the method list.

The Switch has four built-in **Authentication Server Groups**, one for each of the TACACS, XTACACS, TACACS+ and RADIUS protocols. These built-in Authentication Server Groups are used to authenticate users trying to access the Switch. The users will set **Authentication Server Hosts** in a preferable order in the built-in Authentication Server Groups and when a user tries to gain access to the Switch, the Switch will ask the first Authentication Server Hosts for authentication. If no authentication is made, the second server host in the list will be queried, and so on. The built-in Authentication Server Groups can only have hosts that are running the specified protocol. For example, the TACACS Authentication Server Groups can only have TACACS Authentication Server Hosts.

The administrator for the Switch may set up six different authentication techniques per user-defined method list (TACACS / XTACACS / TACACS+ / RADIUS / local / none) for authentication. These techniques will be listed in an order preferable, and defined by the user for normal user authentication on the Switch, and may contain up to eight authentication techniques. When a user attempts to access the Switch, the Switch will select the first technique listed for authentication. If the first technique goes through its Authentication Server Hosts and no authentication is returned, the Switch will then go to the next technique listed in the server group for authentication, until the authentication has been verified or denied, or the list is exhausted.

Please note that users granted access to the Switch will be granted normal user privileges on the Switch. To gain access to administrator level privileges, the user must access the **Enable Admin** window and then enter a password, which was previously configured by the administrator of the Switch.



**NOTE:** TACACS, XTACACS and TACACS+ are separate entities and are not compatible. The Switch and the server must be configured exactly the same, using the same protocol. (For example, if the Switch is set up for TACACS authentication, so must be the host server.)

## Authentication Policy & Parameters

This command will enable an administrator-defined authentication policy for users trying to access the Switch. When enabled, the device will check the **Login Method List** and choose a technique for user authentication upon login.

To access the following window, click **Security > Access Authentication Control > Authentication Policy & Parameter Settings**:

Policy & Parameters Settings	
Authentication Policy	Disabled ▾
Response timeout(1-255)	30
User attempts(1-255)	3
Apply	

**Figure 8- 8. Authentication Policy and Parameter Settings window**

The following parameters can be set:

Parameter	Description
<b>Authentication Policy</b>	Use the pull down menu to enable or disable the Authentication Policy on the Switch.
<b>Response Timeout (1-255)</b>	This field will set the time the Switch will wait for a response of authentication from the user. The user may set a time between 1 and 255 seconds. The default setting is 30 seconds.
<b>User Attempts (1-255)</b>	This command will configure the maximum number of times the Switch will accept authentication attempts. Users failing to be authenticated after the set amount of attempts will be denied access to the Switch and will be locked out of further authentication attempts. Command line interface users will have to wait 60 seconds before another authentication attempt. TELNET and web users will be disconnected from the Switch. The user may set the number of attempts from 1 to 255. The default setting is 3.

Click **Apply** to implement changes made.

## Application's Authentication Settings

This window is used to configure switch configuration applications (console, Telnet, SSH, web) for login at the user level and at the administration level (**Enable Admin**) utilizing a previously configured method list. To view the following window, click **Security Management > Access Authentication Control > Application Authentication Settings**:

Application's authentication settings		
Application	Login Method List	Enable Method List
Console	default ▾	default ▾
Telnet	default ▾	default ▾
SSH	default ▾	default ▾
HTTP	default ▾	default ▾
Apply		

**Figure 8- 9. Application's Authentication Settings window**

The following parameters can be set:



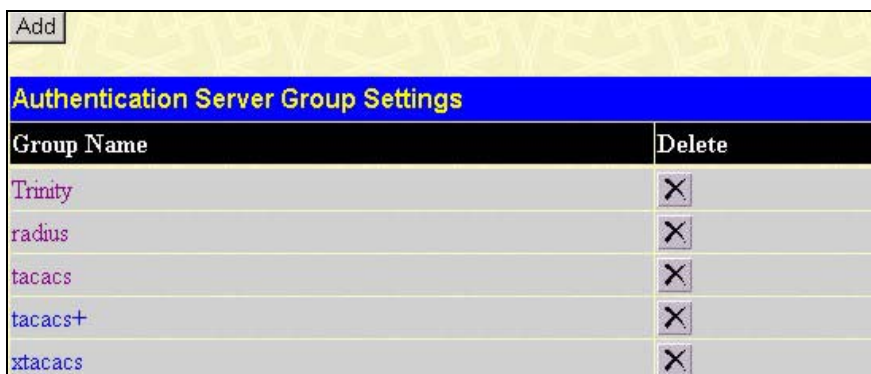
Parameter	Description
<b>Application</b>	Lists the configuration applications on the Switch. The user may configure the Login Method List and Enable Method List for authentication for users utilizing the Console (Command Line Interface) application, the Telnet application, SSH and the Web (HTTP) application.
<b>Login Method List</b>	Using the pull down menu, configure an application for normal login on the user level, utilizing a previously configured method list. The user may use the default Method List or other Method List configured by the user. See the Login Method Lists window, in this section, for more information.
<b>Enable Method List</b>	Using the pull down menu, configure an application for normal login on the user level, utilizing a previously configured method list. The user may use the default Method List or other Method List configured by the user. See the Enable Method Lists window, in this section, for more information.

Click **Apply** to implement changes made.

## Authentication Server Group

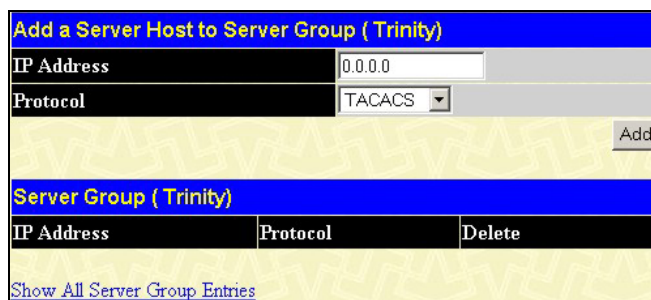
This window will allow users to set up **Authentication Server Groups** on the Switch. A server group is a technique used to group TACACS/XTACACS/TACACS+/RADIUS server hosts into user-defined categories for authentication using method lists. The user may define the type of server group by protocol or by previously defined server group. The Switch has three built-in Authentication Server Groups that cannot be removed but can be modified. Up to eight authentication server hosts may be added to any particular group.

To view the following window, click **Security Management > Access Authentication Control > Authentication Server Group**:



**Figure 8- 10. Authentication Server Group window**

This screen displays the Authentication Server Groups on the Switch. The Switch has four built-in Authentication Server Groups that cannot be removed but can be modified. To modify a particular group, click its hyperlinked **Group Name**, which will then display the following window.



**Figure 8- 11. Add a Server Host to Server Group (XTACACS) window.**

To add an Authentication Server Host to the list, enter its IP address in the IP Address field, choose the protocol associated with the IP address of the Authentication Server Host and click **Add** to add this Authentication Server Host to the group.

To add a server group other than the ones listed, click the add button, revealing the following window to configure.



**Figure 8- 12. Authentication Server Group Table Add Settings window**

Enter a group name of up to 15 characters into the **Group Name** field and click **Apply**. The entry should appear in the **Authentication Server Group Settings** window, as shown in Figure 8-12 (Trinity).



**NOTE:** The user must configure Authentication Server Hosts using the Authentication Server Hosts window before adding hosts to the list. Authentication Server Hosts must be configured for their specific protocol on a remote centralized server before this function can work properly.

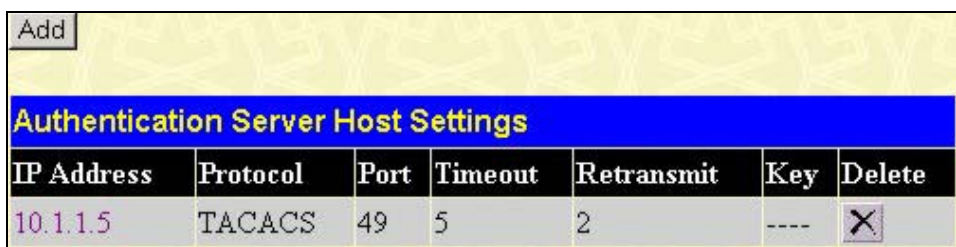


**NOTE:** The three built in server groups can only have server hosts running the same TACACS daemon. TACACS/XTACACS/TACACS+ protocols are separate entities and are not compatible with each other.

### Authentication Server Host

This window will set user-defined *Authentication Server Hosts* for the TACACS / XTACACS / TACACS+ / RADIUS security protocols on the Switch. When a user attempts to access the Switch with Authentication Policy enabled, the Switch will send authentication packets to a remote TACACS / XTACACS / TACACS+ / RADIUS server host on a remote host. The TACACS / XTACACS / TACACS+ / RADIUS server host will then verify or deny the request and return the appropriate message to the Switch. More than one authentication protocol can be run on the same physical server host but, remember that TACACS / XTACACS / TACACS+ / RADIUS are separate entities and are not compatible with each other. The maximum supported number of server hosts is 16.

To view the following window, click **Security Management > Access Authentication Control > Authentication Server Host**:



**Figure 8- 13. Authentication Server Host window**

To add an Authentication Server Host, click the **Add** button, revealing the following window:

**Figure 8- 14. Authentication Server Host Setting - Add window**

Configure the following parameters to add an Authentication Server Host:

Parameter	Description
<b>IP Address</b>	The IP address of the remote server host to add.
<b>Protocol</b>	The protocol used by the server host. The user may choose one of the following: <i>TACACS</i> - Enter this parameter if the server host utilizes the TACACS protocol. <i>XTACACS</i> - Enter this parameter if the server host utilizes the XTACACS protocol. <i>TACACS+</i> - Enter this parameter if the server host utilizes the TACACS+ protocol. <i>RADIUS</i> - Enter this parameter if the server host utilizes the RADIUS protocol.
<b>Port (1-65535)</b>	Enter a number between 1 and 65535 to define the virtual port number of the authentication protocol on a server host. The default port number is 49 for TACACS/XTACACS/TACACS+ servers and 1813 for RADIUS servers but the user may set a unique port number for higher security.
<b>Timeout (1-255)</b>	Enter the time in seconds the Switch will wait for the server host to reply to an authentication request. The default value is 5 seconds.
<b>Retransmit (1-255)</b>	Enter the value in the retransmit field to change how many times the device will resend an authentication request when the TACACS server does not respond.
<b>Key</b>	Authentication key to be shared with a configured TACACS+ or RADIUS servers only. Specify an alphanumeric string up to 254 characters.

Click **Apply** to add the server host.



**NOTE:** More than one authentication protocol can be run on the same physical server host but, remember that TACACS/XTACACS/TACACS+ are separate entities and are not compatible with each other

## Login Method Lists

This command will configure a user-defined or default **Login Method List** of authentication techniques for users logging on to the Switch. The sequence of techniques implemented in this command will affect the authentication result. For example, if a user enters a sequence of techniques, for example TACACS - XTACACS- local, the Switch will send an authentication request to the first TACACS host in the server group. If no response comes from the server host, the Switch will send an authentication request to the second TACACS host in the server group and so on, until the list is exhausted. At that point, the Switch will restart the same sequence with the following protocol listed, XTACACS. If no authentication takes place using the XTACACS list, the local account database set in the Switch is used to authenticate the user. When the local method is used, the privilege level will be dependant on the local account privilege configured on the Switch.

Successful login using any of these techniques will give the user a "User" privilege only. If the user wishes to upgrade his or her status to the administrator level, the user must use the **Enable Admin** window, in which the user must enter a previously configured password, set by the administrator. (See the **Enable Admin** part of this section for more detailed information concerning the **Enable Admin** command.)

To view the following screen click **Security Management > Access Authentication Control > Login Method Lists**:

Method List Name	Method 1	Method 2	Method 3	Method 4	Delete
default	local				

**Figure 8- 15. Login Method List Settings window**

The Switch contains one **Method List** that is set and cannot be removed, yet can be modified. To delete a Login Method List defined by the user, click the under the **Delete** heading corresponding to the entry desired to be deleted. To modify a Login Method List, click on its hyperlinked **Method List Name**. To configure a new Method List, click the **Add** button.

Both actions will result in the same screen to configure:

**Figure 8- 16. Login Method List - Edit window (default)**

**Figure 8- 17. Login Method List – Add window**

To define a Login Method List, set the following parameters and click **Apply**:

Parameter	Description
Method List Name	Enter a method list name defined by the user of up to 15 characters.
Method 1, 2, 3, 4	<p>The user may add one, or a combination of up to four (4) of the following authentication methods to this method list:</p> <p><i>tacacs</i> - Adding this parameter will require the user to be authenticated using the TACACS protocol from a remote TACACS server.</p> <p><i>xtacacs</i> - Adding this parameter will require the user to be authenticated using the XTACACS protocol from a remote XTACACS server.</p> <p><i>tacacs+</i> - Adding this parameter will require the user to be authenticated using the TACACS+ protocol from a remote TACACS+ server.</p> <p><i>radius</i> - Adding this parameter will require the user to be authenticated using the RADIUS protocol from a remote RADIUS server.</p> <p><i>server_group</i> - Adding this parameter will require the user to be authenticated using a user-defined server group previously configured on the Switch.</p> <p><i>local</i> - Adding this parameter will require the user to be authenticated using the local user account database on the Switch.</p> <p><i>none</i> - Adding this parameter will require no authentication to access the Switch.</p>

## Enable Method Lists

The *Enable Method Lists* window is used to set up Method Lists to promote users with user level privileges to Administrator (Admin) level privileges using authentication methods on the Switch. Once a user acquires normal user level privileges on the Switch, he or she must be authenticated by a method on the Switch to gain administrator privileges on the Switch, which is defined by the Administrator. A maximum of eight (8) Enable Method Lists can be implemented on the Switch, one of which is a default Enable Method List. This default Enable Method List cannot be deleted but can be configured.

The sequence of methods implemented in this command will affect the authentication result. For example, if a user enters a sequence of methods like TACACS - XTACACS - Local Enable, the Switch will send an authentication request to the first TACACS host in the server group. If no verification is found, the Switch will send an authentication request to the second TACACS host in the server group and so on, until the list is exhausted. At that point, the Switch will restart the same sequence with the following protocol listed, XTACACS. If no authentication takes place using the XTACACS list, the Local Enable password set in the Switch is used to authenticate the user.

Successful authentication using any of these methods will give the user an "Admin" privilege.



**NOTE:** To set the Local Enable Password, see the next section, entitled Local Enable Password.

To view the following table, click **Security Management > Access Authentication Control > Enable Method Lists**:

Add					
Enable Method List Settings					
Method List Name	Method 1	Method 2	Method 3	Method 4	Delete
default	local_enable				

**Figure 8- 18. Enable Method List Settings window**

To delete an Enable Method List defined by the user, click the under the **Delete** heading corresponding to the entry desired to be deleted. To modify an Enable Method List, click on its hyperlinked **Method List Name**. To configure a Method List, click the **Add** button.



Both actions will result in the same screen to configure:

Figure 8- 19. Enable Method List - Edit window

Figure 8- 20. Enable Method List - Add window

To define an Enable Login Method List, set the following parameters and click **Apply**:

Parameter	Description
<b>Method List Name</b>	Enter a method list name defined by the user of up to 15 characters.
<b>Method 1, 2, 3, 4</b>	<p>The user may add one, or a combination of up to four (4) of the following authentication methods to this method list:</p> <p><i>local_enable</i> - Adding this parameter will require the user to be authenticated using the local enable password database on the Switch. The local enable password must be set by the user in the next section entitled Local Enable Password.</p> <p><i>none</i> - Adding this parameter will require no authentication to access the Switch.</p> <p><i>radius</i> - Adding this parameter will require the user to be authenticated using the RADIUS protocol from a remote RADIUS server.</p> <p><i>tacacs</i> - Adding this parameter will require the user to be authenticated using the TACACS protocol from a remote TACACS server.</p> <p><i>xtacacs</i> - Adding this parameter will require the user to be authenticated using the XTACACS protocol from a remote XTACACS server.</p> <p><i>tacacs+</i> - Adding this parameter will require the user to be authenticated using the TACACS protocol from a remote TACACS server.</p> <p><i>server_group</i> - Adding a previously configured server group will require the user to be authenticated using a user-defined server group previously configured on the Switch.</p>

## Local Enable Password

This window will configure the locally enabled password for the **Enable Admin** command. When a user chooses the "local\_enable" method to promote user level privileges to administrator privileges, he or she will be prompted to enter the password configured here that is locally set on the Switch.

To view the following window, click **Security Management > Access Authentication Control > Local Enable Password**:

**Figure 8- 21. Configure Local Enable Password window**

To set the Local Enable Password, set the following parameters and click **Apply**.

Parameter	Description
<b>Old Local Enable</b>	If a password was previously configured for this entry, enter it here in order to change it to a new password
<b>New Local Enable</b>	Enter the new password that you wish to set on the Switch to authenticate users attempting to access Administrator Level privileges on the Switch. The user may set a password of up to 15 characters.
<b>Confirm Local Enable</b>	Confirm the new password entered above. Entering a different password here from the one set in the New Local Enabled field will result in a fail message.

Click **Apply** to implement changes made.

## Enable Admin

The **Enable Admin** window is for users who have logged on to the Switch on the normal user level, and wish to be promoted to the administrator level. After logging on to the Switch, users will have only user level privileges. To gain access to administrator level privileges, the user will open this window and will have to enter an authentication password. Possible authentication methods for this function include TACACS/XTACACS/TACACS+/RADIUS, user defined server groups, local enable (local account on the Switch), or no authentication (none). Because XTACACS and TACACS do not support the enable function, the user must create a special account on the server host, which has the username "enable", and a password configured by the administrator that will support the "enable" function. This function becomes inoperable when the authentication policy is disabled.

To view the following window, click **Security > Access Authentication Control > Enable Admin**:

**Figure 8- 22. Enable Admin Screen**

When this screen appears, click the **Enable Admin** button revealing a window for the user to enter authentication (password, username), as seen below. A successful entry will promote the user to Administrator level privileges on the Switch.

## Traffic Segmentation

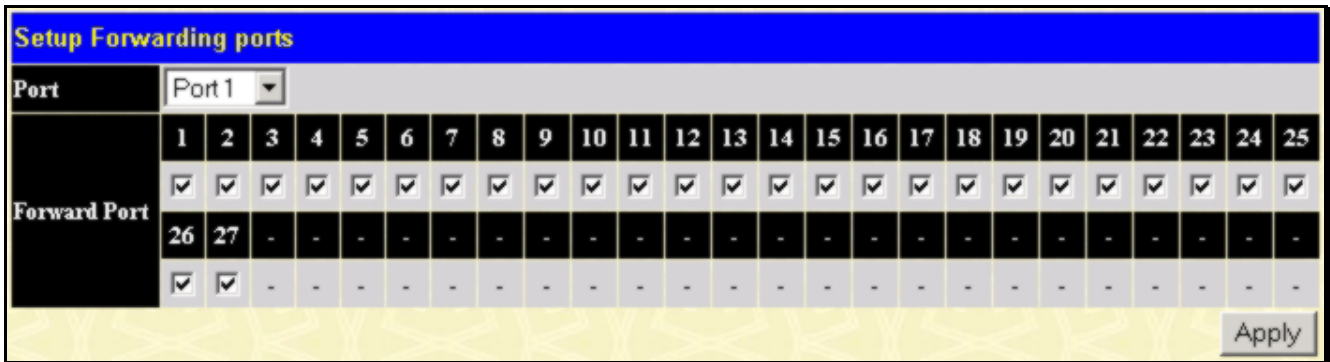
Traffic segmentation is used to limit traffic flow from a single port to a group of ports. This method of segmenting the flow of traffic is similar to using VLANs to limit traffic, but is more restrictive. It provides a method of directing traffic that does not increase the overhead of the Master switch CPU.

Open the **Security** folder and click **Traffic Segmentation**, to view the screen shown below.



**Figure 8- 23. Current Traffic Segmentation Table**

Click on the **Setup** button to open the **Setup Forwarding ports** menu, as shown below.



**Figure 8- 24. Setup Forwarding Ports**

Configuring traffic segmentation on the xStack DGS-3400 switch series is accomplished in two parts. First, specify a port from the switch, using the **Port** pull-down menu. Then specify which ports on the switch that are able to receive packets from the switch and port specified in the first part.

Clicking the **Apply** button will enter the combination of transmitting port and allowed receiving ports into the Switch's **Traffic Segmentation** table.



## Secure Socket Layer (SSL)

*Secure Sockets Layer* or *SSL* is a security feature that will provide a secure communication path between a host and client through the use of authentication, digital signatures and encryption. These security functions are implemented through the use of a *ciphersuite*, which is a security string that determines the exact cryptographic parameters, specific encryption algorithms and key sizes to be used for an authentication session and consists of three levels:

1. **Key Exchange:** The first part of the cyphersuite string specifies the public key algorithm to be used. This switch utilizes the Rivest Shamir Adleman (RSA) public key algorithm and the Digital Signature Algorithm (DSA), specified here as the *DHE DSS* Diffie-Hellman (DHE) public key algorithm. This is the first authentication process between client and host as they “exchange keys” in looking for a match and therefore authentication to be accepted to negotiate encryptions on the following level.
2. **Encryption:** The second part of the ciphersuite that includes the encryption used for encrypting the messages sent between client and host. The Switch supports two types of cryptology algorithms:

Stream Ciphers – There are two types of stream ciphers on the Switch, *RC4 with 40-bit keys* and *RC4 with 128-bit keys*. These keys are used to encrypt messages and need to be consistent between client and host for optimal use.

CBC Block Ciphers – CBC refers to Cipher Block Chaining, which means that a portion of the previously encrypted block of encrypted text is used in the encryption of the current block. The Switch supports the *3DES EDE* encryption code defined by the Data Encryption Standard (DES) to create the encrypted text.

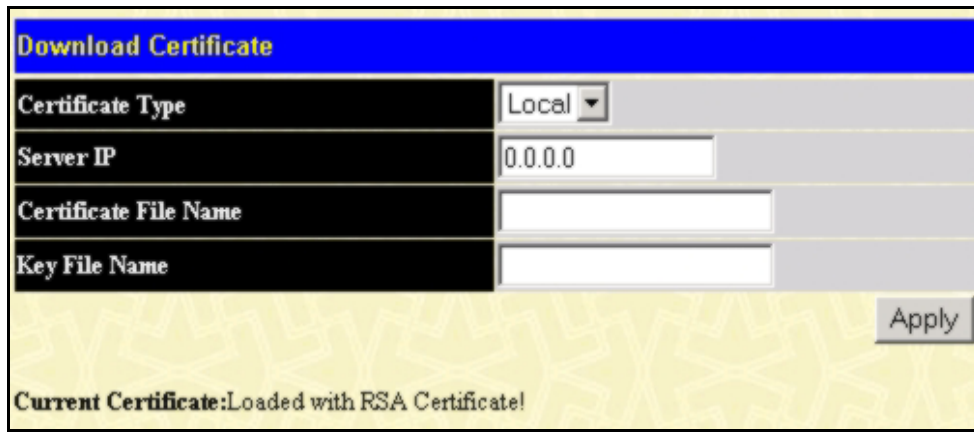
3. **Hash Algorithm:** This part of the ciphersuite allows the user to choose a message digest function which will determine a Message Authentication Code. This Message Authentication Code will be encrypted with a sent message to provide integrity and prevent against replay attacks. The Switch supports two hash algorithms, *MD5* (Message Digest 5) and *SHA* (Secure Hash Algorithm).

These three parameters are uniquely assembled in four choices on the Switch to create a three-layered encryption code for secure communication between the server and the host. The user may implement any one or combination of the ciphersuites available, yet different ciphersuites will affect the security level and the performance of the secured connection. The information included in the ciphersuites is not included with the Switch and requires downloading from a third source in a file form called a *certificate*. This function of the Switch cannot be executed without the presence and implementation of the certificate file and can be downloaded to the Switch by utilizing a TFTP server. The Switch supports SSLv3. Other versions of SSL may not be compatible with this Switch and may cause problems upon authentication and transfer of messages from client to host.

## Download Certificate

This window is used to download a certificate file for the SSL function on the Switch from a TFTP server. The certificate file is a data record used for authenticating devices on the network. It contains information on the owner, keys for authentication and digital signatures. Both the server and the client must have consistent certificate files for optimal use of the SSL function. The Switch only supports certificate files with *.der* file extensions. Currently, all xStack DGS-3400 Series switch come with a certificate pre-loaded though the user may need to download more, depending on user circumstances.

To view the following window, click **Security Management > SSL** at the top of the window:



**Figure 8- 25. Download Certificate menu**

To download certificates, set the following parameters and click **Apply**.

Parameter	Description
<b>Certificate Type</b>	Select Local or ??????????? to specify certificate type.
<b>Server IP</b>	Enter the IP address of the TFTP server where the certificate files are located.
<b>Certificate File Name</b>	Enter the path and the filename of the certificate file to download. This file must have a .der extension. (Ex. c:/cert.der)
<b>Key File Name</b>	Enter the path and the filename of the key file to download. This file must have a .der extension (Ex. c:/pkey.der)

Click **Apply** to implement changes made.

## SSL Configuration

This screen will allow the user to enable SSL on the Switch and implement any one or combination of listed ciphersuites on the Switch. A *ciphersuite* is a security string that determines the exact cryptographic parameters, specific encryption algorithms and key sizes to be used for an authentication session. The Switch possesses four possible ciphersuites for the SSL function, which are all enabled by default. To utilize a particular ciphersuite, disable the unwanted ciphersuites, leaving the desired one for authentication.

When the SSL function has been enabled, the web will become disabled. To manage the Switch through the web based management while utilizing the SSL function, the web browser must support SSL encryption and the header of the URL must begin with https://. (Ex. https://xx.xx.xx.xx) Any other method will result in an error and no access can be authorized for the web-based management.

To view the following window, click **Security > SSL**:

Configuration	
SSL Status	Disabled
Cache Timeout(60-86400 sec)	600
Ciphersuite	
RSA with RC4 128 MD5	Enabled 0x0004
RSA with 3DES EDE CBC SHA	Enabled 0x000a
DHE DSS with 3DES EDE CBC SHA	Enabled 0x0013
RSA EXPORT with RC4 40 MD5	Enabled 0x0003

**Figure 8- 26. SSL Configuration and Ciphersuite menu**

To set up the SSL function on the Switch, configure the following parameters and click **Apply**.

Parameter	Description
<b>SL Configuration</b>	
<b>SSL Status</b>	Use the pull down menu to enable or disable the SSL status on the switch. The default is <i>Disabled</i> .
<b>Cache Timeout (60-86400)</b>	This field will set the time between a new key exchange between a client and a host using the SSL function. A new SSL session is established every time the client and host go through a key exchange. Specifying a longer timeout will allow the SSL session to reuse the master key on future connections with that particular host, therefore speeding up the negotiation process. The default setting is 600 seconds.
<b>SSL Ciphersuite</b>	
<b>RSA with RC4 128 MD5</b>	This ciphersuite combines the RSA key exchange, stream cipher RC4 encryption with 128-bit keys and the MD5 Hash Algorithm. Use the pull down menu to enable or disable this ciphersuite. This field is <i>Enabled</i> by default.
<b>RSA with 3DES EDE CBC SHA</b>	This ciphersuite combines the RSA key exchange, CBC Block Cipher 3DES_EDE encryption and the SHA Hash Algorithm. Use the pull down menu to enable or disable this ciphersuite. This field is <i>Enabled</i> by default.
<b>DHS DSS with 3DES EDE CBC SHA</b>	This ciphersuite combines the DSA Diffie Hellman key exchange, CBC Block Cipher 3DES_EDE encryption and SHA Hash Algorithm. Use the pull down menu to enable or disable this ciphersuite. This field is <i>Enabled</i> by default.
<b>RSA EXPORT with RC4 40 MD5</b>	This ciphersuite combines the RSA Export key exchange and stream cipher RC4 encryption with 40-bit keys. Use the pull down menu to enable or disable this ciphersuite. This field is <i>Enabled</i> by default.



**NOTE:** Certain implementations concerning the function and configuration of SSL are not available on the web-based management of this Switch and need to be configured using the command line interface.



**NOTE:** Enabling the SSL command will disable the web-based switch management. To log on to the Switch again, the header of the URL must begin with `https://`. Entering anything else into the address field of the web browser will result in an error and no authentication will be granted.

## Secure Shell (SSH)

SSH is an abbreviation of *Secure Shell*, which is a program allowing secure remote login and secure network services over an insecure network. It allows a secure login to remote host computers, a safe method of executing commands on a remote end node, and will provide secure encrypted and authenticated communication between two non-trusted hosts. SSH, with its array of unmatched security features is an essential tool in today's networking environment. It is a powerful guardian against numerous existing security hazards that now threaten network communications.

The steps required to use the SSH protocol for secure communication between a remote PC (the SSH client) and the Switch (the SSH server) are as follows:

1. Create a user account with admin-level access using the User Accounts window in the **Security Management** folder. This is identical to creating any other admin-level User Account on the Switch, including specifying a password. This password is used to logon to the Switch, once a secure communication path has been established using the SSH protocol.
2. Configure the User Account to use a specified authorization method to identify users that are allowed to establish SSH connections with the Switch using the **SSH User Authentication** window. There are three choices as to the method SSH will use to authorize the user, which are **Host Based**, **Password** and **Public Key**.
3. Configure the encryption algorithm that SSH will use to encrypt and decrypt messages sent between the SSH client and the SSH server, using the **SSH Algorithm** window.
4. Finally, enable SSH on the Switch using the **SSH Configuration** window.

After completing the preceding steps, a SSH Client on a remote PC can be configured to manage the Switch using a secure, in band connection.

## SSH Configuration

The following window is used to configure and view settings for the SSH server and can be opened by clicking **Security Management > Secure Shell (SSH) > SSH Configuration**:

SSH Server Configuration	
SSH Server Status	Disabled
Max Session	8
Connection Time Out	120
Auth. Fail	2
Session Rekeying	Never
Listened Port Number	22

SSH Server Configuration Settings	
SSH Server Status	Disabled ▾
Max Session(1-8)	8
Connection Time Out(120-600)	120
Auth. Fail(2-20)	2
Session Rekeying	Never ▾

Apply

Figure 8- 27. Current SSH Configuration and SSH Seerver Configuration Settings menu

To configure the SSH server on the Switch, modify the following parameters and click **Apply**:

Parameter	Description
<b>SSH Server Status</b>	Use the pull-down menu to enable or disable SSH on the Switch. The default is <i>Disabled</i> .
<b>Max Session (1-8)</b>	Enter a value between 1 and 8 to set the number of users that may simultaneously access the Switch. The default setting is 8.
<b>Connection TimeOut (120-600)</b>	Allows the user to set the connection timeout. The use may set a time between 120 and 600 seconds. The default setting is 120 seconds.
<b>Auth. Fail (2-20)</b>	Allows the Administrator to set the maximum number of attempts that a user may try to log on to the SSH Server utilizing the SSH authentication. After the maximum number of attempts has been exceeded, the Switch will be disconnected and the user must reconnect to the Switch to attempt another login. The number of maximum attempts may be set between 2 and 20. The default setting is 2.
<b>Session Rekeying</b>	This field is used to set the time period that the Switch will change the security shell encryptions by using the pull-down menu. The available options are <i>Never, 10 min, 30 min, and 60 min</i> . The default setting is <i>Never</i> .
<b>Port</b>	Enter the virtual port number to be used with this feature. The common port number for SSH is 22.

## SSH Algorithm

The SSH Algorithm window allows the configuration of the desired types of SSH algorithms used for authentication encryption. There are three categories of algorithms listed and specific algorithms of each may be enabled or disabled by using their corresponding pull-down menus. All algorithms are enabled by default. To open the following window, click **Security > SSH > SSH Authentication Mode and Algorithm Settings**:

SSH Authentication Mode and Algorithm Settings	
Password	Enabled
Publickey	Enabled
Host-based	Enabled
Encryption Algorithm	
3DES-CBC	Enabled
Blow-fish-CBC	Enabled
AES128-CBC	Enabled
AES192-CBC	Enabled
AES256-CBC	Enabled
ARC4	Enabled
Cast128-CBC	Enabled
Twofish128	Enabled
Twofish192	Enabled
Twofish256	Enabled
Data Integrity Algorithm	
HMAC-SHA1	Enabled
HMAC-MD5	Enabled
Public Key Algorithm	
HMAC-RSA	Enabled
HMAC-DSA	Enabled
Apply	

**Figure 8- 28. SSH Algorithms window**

The following algorithms may be set:

Parameter	Description
<b>Authentication Algorithm</b>	
<b>Password</b>	This field may be enabled or disabled to choose if the administrator wishes to use a locally configured password for authentication on the Switch. This field is <i>Enabled</i> by default.
<b>Public Key</b>	This field may be enabled or disabled to choose if the administrator wishes to use a publickey configuration set on a SSH server, for authentication. This field is <i>Enabled</i> by default.
<b>Host-based</b>	This field may be enabled or disabled to choose if the administrator wishes to use a host computer for authentication. This parameter is intended for Linux users requiring SSH authentication techniques and the host computer is running the Linux operating system with a SSH program previously installed. This field is <i>Enabled</i> by default.
<b>Encryption Algorithm</b>	
<b>3DES-CBC</b>	Use the pull-down to enable or disable the Triple Data Encryption Standard encryption algorithm with Cipher Block Chaining. The default is <i>Enabled</i> .
<b>Blow-fish CBC</b>	Use the pull-down to enable or disable the Blowfish encryption algorithm with Cipher Block Chaining. The default is <i>Enabled</i> .
<b>AES128-CBC</b>	Use the pull-down to enable or disable the Advanced Encryption Standard AES128 encryption algorithm with Cipher Block Chaining. The default is <i>Enabled</i> .
<b>AES192-CBC</b>	Use the pull-down to enable or disable the Advanced Encryption Standard AES192 encryption algorithm with Cipher Block Chaining. The default is <i>Enabled</i> .
<b>AES256-CBC</b>	Use the pull-down to enable or disable the Advanced Encryption Standard AES-256 encryption algorithm with Cipher Block Chaining. The default is <i>Enabled</i> .
<b>ARC4</b>	Use the pull-down to enable or disable the Arcfour encryption algorithm with Cipher Block Chaining. The default is <i>Enabled</i> .
<b>Cast128-CBC</b>	Use the pull-down to enable or disable the Cast128 encryption algorithm with Cipher Block Chaining. The default is <i>Enabled</i> .
<b>Twofish128</b>	Use the pull-down to enable or disable the twofish128 encryption algorithm. The default is <i>Enabled</i> .
<b>Twofish192</b>	Use the pull-down to enable or disable the twofish192 encryption algorithm. The default is <i>Enabled</i> .
<b>Twofish256</b>	Use the pull-down to enable or disable the twofish256 encryption algorithm. The default is <i>Enabled</i> .
<b>Data Integrity Algorithm</b>	
<b>HMAC-RSA</b>	Use the pull-down to enable or disable the HMAC (Hash for Message Authentication Code) mechanism utilizing the RSA encryption algorithm. The default is <i>Enabled</i> .
<b>HMAC-DSA</b>	Use the pull-down to enable or disable the HMAC (Hash for Message Authentication Code) mechanism utilizing the Digital Signature Algorithm (DSA) encryption. The default is <i>Enabled</i> .

Click **Apply** to implement changes made.

## SSH User Authentication Mode

The following windows are used to configure parameters for users attempting to access the Switch through SSH. To access the following window, click **Security Management > Secure Shell > SSH User Authentication**.

Current Accounts			
User Name	Auth. Mode	Host Name	Host IP
<a href="#">Darren</a>	Password		

**Figure 8- 29. Current Accounts window**

In the example screen above, the User Account “Darren” has been previously set using the User Accounts window in the **Security Management** folder. A User Account **MUST** be set in order to set the parameters for the SSH user. To configure the parameters for a SSH user, click on the hyperlinked **User Name** in the **Current Accounts** window, which will reveal the following window to configure.

User Name	<input type="text" value="Darren"/>
Auth. Mode	<input type="text" value="Password"/>
Host Name	<input type="text"/>
Host IP	<input type="checkbox"/> <input type="text" value="0.0.0.0"/>
<input type="button" value="Apply"/>	
<a href="#">Show All User Authentication Entries</a>	



**NOTE:** To set the **SSH User Authentication** parameters on the Switch, a User Account must be previously configured.

**Figure 8- 30. SSH User menu**

The user may set the following parameters:

Parameter	Description
User Name	Enter a User Name of no more than 15 characters to identify the SSH user. This User Name must be a previously configured user account on the Switch.
Auth. Mode	The administrator may choose one of the following to set the authorization for users attempting to access the Switch.  <i>Host Based</i> – This parameter should be chosen if the administrator wishes to use a remote SSH server for authentication purposes. Choosing this parameter requires the user to input the following information to identify the SSH user. <i>Host Name</i> – Enter an alphanumeric string of no more than 32 characters to identify the remote SSH user. <i>Host IP</i> – Enter the corresponding IP address of the SSH user. <i>Password</i> – This parameter should be chosen if the administrator wishes to use an administrator-defined password for authentication. Upon entry of this parameter, the Switch will prompt the administrator for a password, and then to re-type the password for confirmation. <i>Public Key</i> – This parameter should be chosen if the administrator wishes to use the publickey on a SSH server for authentication.
Host Name	Enter an alphanumeric string of no more than 32 characters to identify the remote SSH user. This parameter is only used in conjunction with the <i>Host Based</i> choice in the Auth. Mode field.
Host IP	Enter the corresponding IP address of the SSH user. This parameter is only used in conjunction with the <i>Host Based</i> choice in the Auth. Mode field.

Click **Apply** to implement changes made.



# Save, Reset and Reboot

*Saving Changes*

*Reboot System*

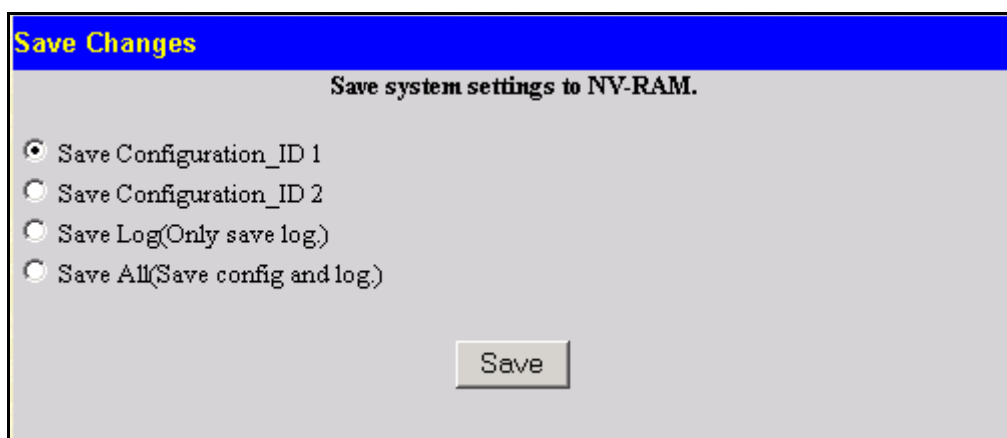
*Reset Configuration*

## Save Changes

The Switch has two levels of memory, normal RAM and non-volatile or NV-RAM. Configuration changes are made effective clicking the **Save** button. When this is done, the settings will be immediately applied to the switching software in RAM, and will immediately take effect.

Some settings, though, 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 NV-RAM. Thus, it is necessary to save all setting changes to NV-RAM before rebooting the switch.

To retain any configuration changes permanently, click on the **Save** button in the **Save Changes** menu. The save options allow one alternative configuration image to be stored.



**Figure 9- 1. Save Changes menu**

The Save Changes options include:

- **Save Configuration\_ID\_1** to save the configuration file indexed as Image file 1. To use this file for configuration it must be designated as the *Boot* configuration using the **Config Currnet Setting** menu (**Save Services > Config Current Setting**)
- **Save Configuration\_ID\_2** to save the configuration file indexed as Image file 2. To use this file for configuration it must be designated as the *Boot* configuration using the **Config Currnet Setting** menu (**Save Services > Config Current Setting**)
- **Save Log** to save only the current log.
- **Save All** to save the current configuration file indexed as Image file 1 and save the current log.



## Reset

The **Reset** function has several options when resetting the Switch. Some of the current configuration parameters can be retained while resetting all other configuration parameters to their factory defaults.



**NOTE:** Only the **Reset System** option will enter the factory default parameters into the Switch's non-volatile RAM, and then restart the Switch. All other options enter the factory defaults into the current configuration, but do not save this configuration. **Reset System** will return the Switch's configuration to the state it was when it left the factory

Reset	
<input checked="" type="radio"/> <b>Reset</b>	Proceed with system reset except IP address, log, user account and banner.
<input type="radio"/> <b>Reset Config</b>	Proceed with system reset.
<input type="radio"/> <b>Reset System</b>	Proceed with system reset (reset all, save, reboot).

Apply

Figure 9- 2. Reset options

## Reboot System

The following menu is used to restart the Switch.

**Reboot 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

Restart

Figure 9- 3. Reboot System

Clicking the **Yes** click-box will instruct the Switch to save the current configuration to non-volatile RAM before restarting the Switch.

Clicking the **No** click-box instructs the Switch not to save the current configuration before restarting the Switch. All of the configuration information entered from the last time **Save Changes** was executed, will be lost.

Click the **Restart** button to restart the Switch.

## Logout

Use the **Logout** page to logout of the Switch's Web-based management agent by clicking on the **Log Out** button.

# Monitoring

*Device Status*

*Module Information*

*CPU Utilization*

*Port Utilization*

*Packets*

*Errors*

*Packet Size*

*Browse Router Port*

*VLAN Status*

*Port Access Control*

*MAC Address Table*

*Switch Log*

*IGMP Snooping Group*

*IGMP Snooping Forward*

*Browse ARP Table*

*Session Table*

## Device Status

The **Device Status** window can be found in the **Monitoring** menu by clicking the **Device Status** link. This window shows the status of the physical attributes of the Switch, including power sources and fans.

Device Status			
Internal Power	External Power	Side Fan	Back Fan
Active	Fail	Fail	---

**Figure 10- 1. Device Status window**

The following fields may be viewed in this window:

Parameter	Description
Internal Power	Displays Active if the internal power supply is powering the system.
External Power (RPS)	Displays Active if the RPS is powering the system.
Side Fan	Indicates fan status.
Back Fan	Indicates fan status.

## Module Information

The **Module Information** display in the **Monitoring** menu shows information about any installed modules.

Module Information				
ID	Module Name	Rev. No.	Serial	Description
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-

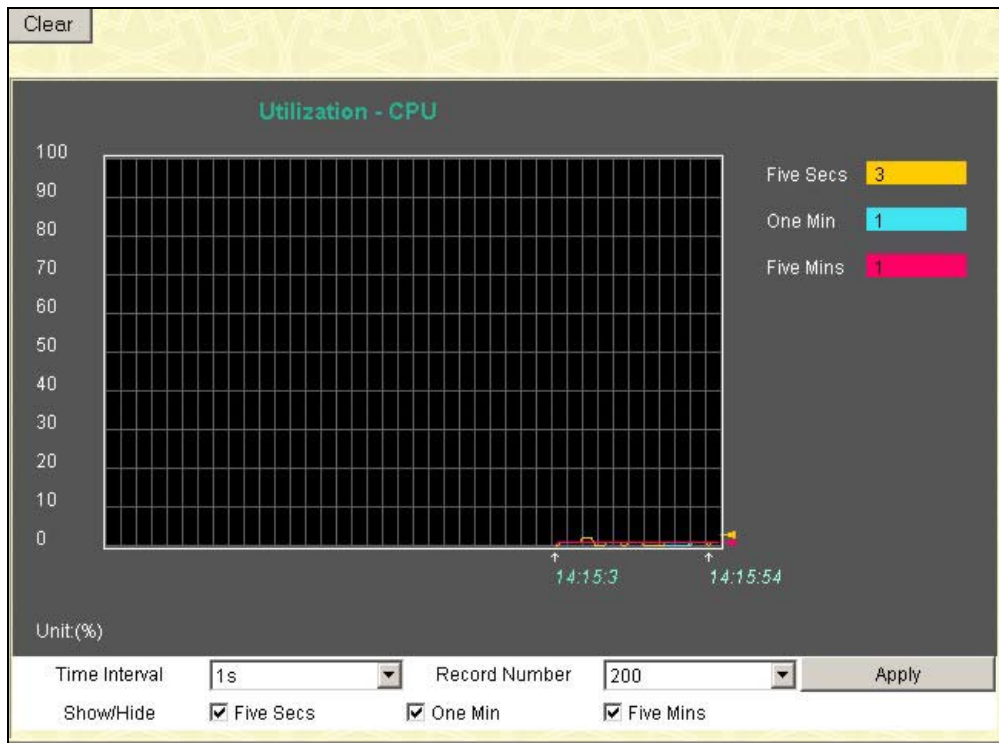
**Figure 10- 2. Module Information**

Module information displayed:

Parameter	Description
ID	The slot number where the module is installed.
Module Name	The full name of the module installed.
Rev. No.	The version of the installed module.
Serial	The serial number of the module.
Description	A brief description of the type of module.

## CPU Utilization

The **CPU Utilization** displays the percentage of the CPU being used, expressed as an integer percentage and calculated as a simple average by time interval. To view the **CPU Utilization** window, open the **Monitoring** folder and click the **CPU Utilization** link.



**Figure 10- 3. CPU Utilization graph**

To view the CPU utilization by port, use the real-time graphic of the Switch and/or switch stack at the top of the web page by simply clicking on a port. Click **Apply** to implement the configured settings. The window will automatically refresh with new updated statistics.

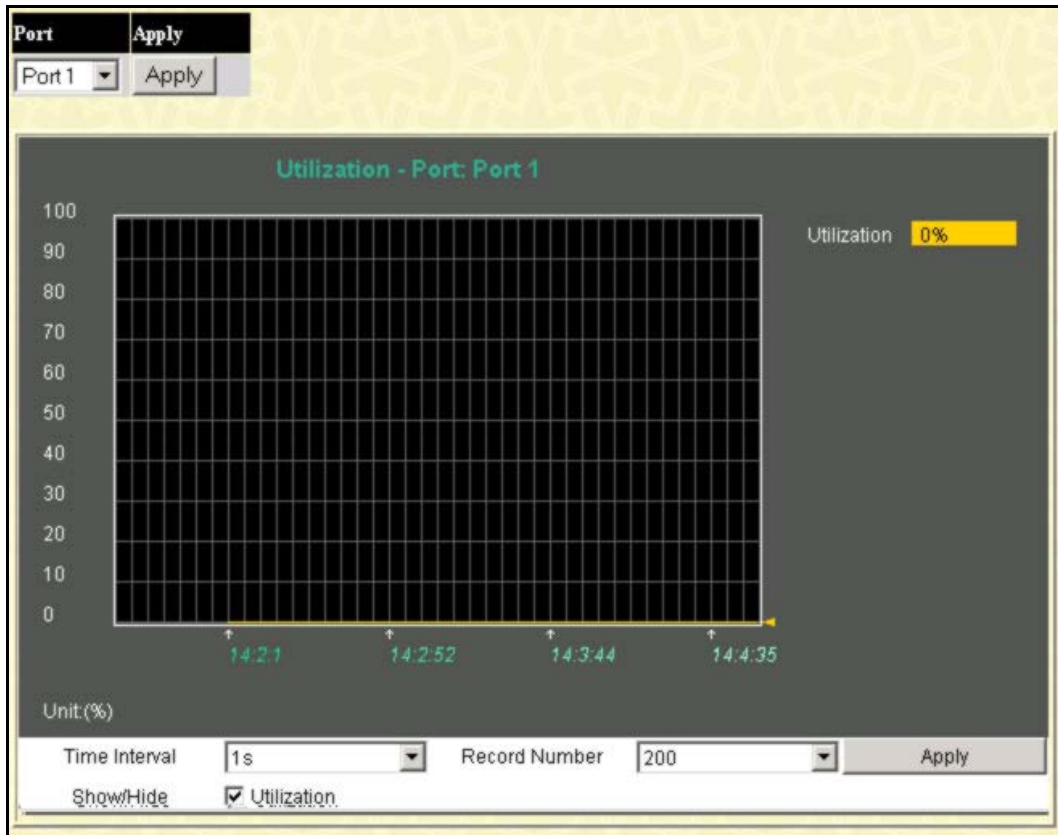
Change the view parameters as follows:

Parameter	Description
<b>Time Interval [1s ]</b>	Select the desired setting between 1s and 60s, where "s" stands for seconds. The default value is one second.
<b>Record Number [200]</b>	Select number of times the Switch will be polled between 20 and 200. The default value is 200.

## Port Utilization

The **Port Utilization** page displays the percentage of the total available bandwidth being used on the port.

To view the port utilization, open the **Monitoring** folder and then the **Port Utilization** link:



**Figure 10- 4. Port Utilization window**

To select a port to view these statistics for, first select the line card slot in the chassis switch by using the **Unit** pull-down menu and then select the port by using the **Port** pull down menu. The user may also use the real-time graphic of the Switch and/or switch stack at the top of the web page by simply clicking on a port.

Change the view parameters as follows:

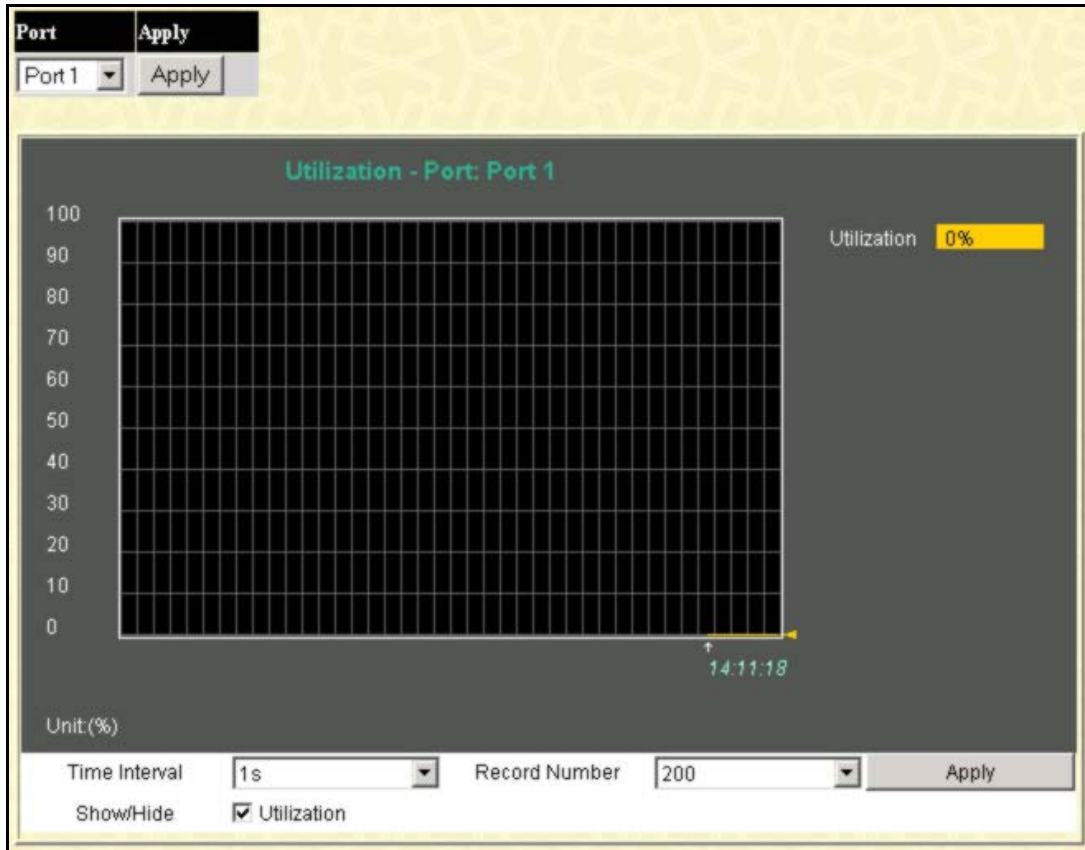
Parameter	Description
<b>Time Interval [1s ]</b>	Select the desired setting between 1s and 60s, where "s" stands for seconds. The default value is one second.
<b>Record Number [200]</b>	Select number of times the Switch will be polled between 20 and 200. The default value is 200.

## Packets Statistics

The Web Manager allows various packet statistics to be viewed as either a line graph or a table. Six windows are offered.

### Received (RX)

Click the **Received (RX)** link in the **Packets** folder of the **Monitoring** menu to view the following graph of packets received on the Switch. Select the port by using the **Port** pull down menu. The user may also use the real-time graphic of the Switch and/or switch stack at the top of the web page by simply clicking on a port.



### Rx Packets Analysis (line graph for Bytes and Packets)

To view the **Received Packets Table**, click the link [View Table](#).

## UMB Cast (RX)

Click the **UMB Cast (RX)** link in the **Packets** folder of the **Monitoring** menu to view the following graph of UMB cast packets received on the Switch. To select a port to view these statistics for, first select the Switch in the switch stack by using the **Unit** pull-down menu and then select the port by using the **Port** pull down menu. The user may also use the real-time graphic of the Switch and/or switch stack at the top of the web page by simply clicking on a port.

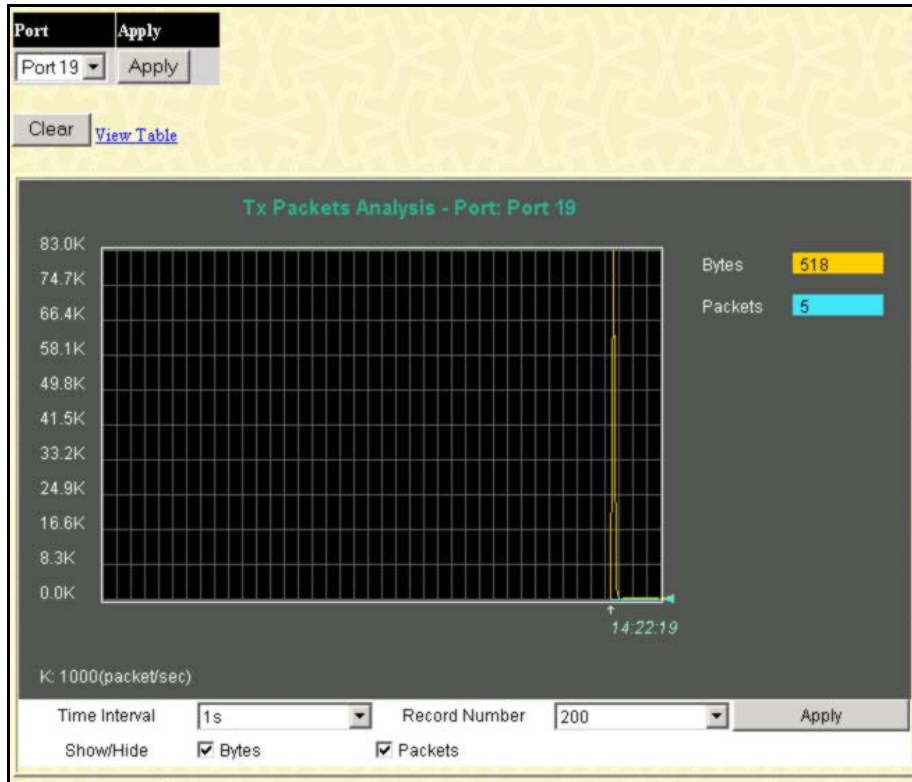


**Figure 10- 5. Packets Analysis (line graph for Unicast, Multicast, and Broadcast Packets)**

To view the UMB Cast Table, click the [View Table](#) link.

## Transmitted (TX)

Click the **Transmitted (TX)** link in the **Packets** folder of the **Monitoring** menu to view the following graph of packets transmitted from the Switch. To select a port to view these statistics for, first select the Switch in the switch stack by using the **Unit** pull-down menu and then select the port by using the Port pull down menu. The user may also use the real-time graphic of the Switch and/or switch stack at the top of the web page by simply clicking on a port.



**Figure 10- 6. Tx Packets Analysis window (line graph for Bytes and Packets)**

To view the **Transmitted (TX) Table**, click the link [View Table](#).

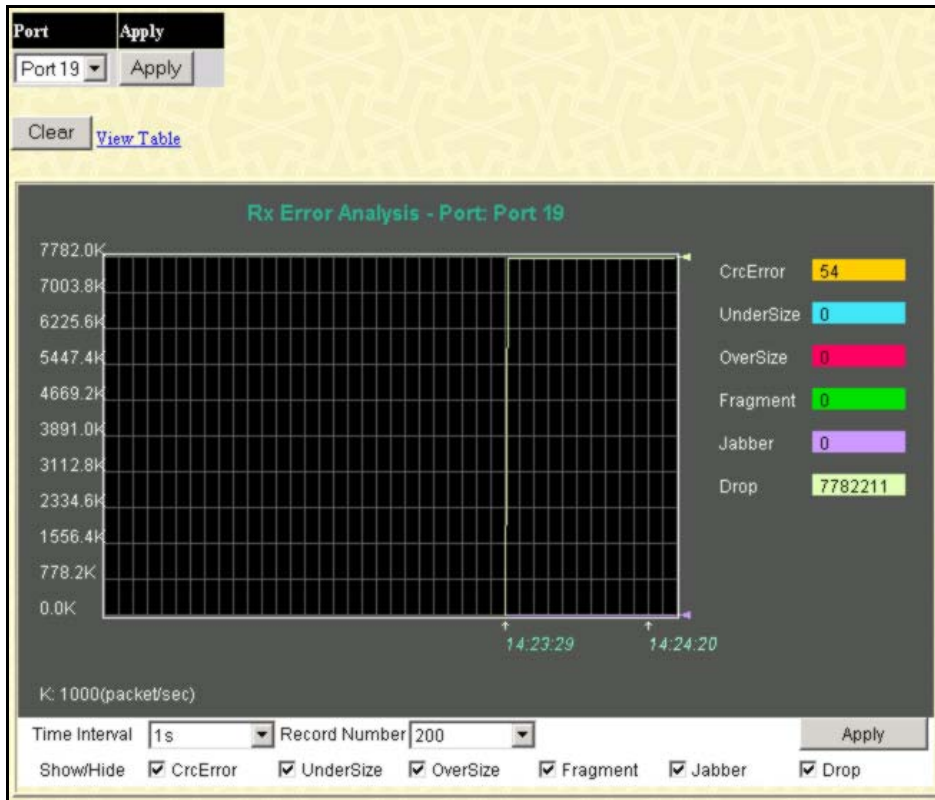
## Packet Errors

The Web Manager allows port error statistics compiled by the Switch's management agent to be viewed as either a line graph or a table. Four windows are offered.

### Received (RX)

Click the **Received (RX)** link in the **Error** folder of the **Monitoring** menu to view the following graph of error packets received on the Switch. To select a port to view these statistics for, first select the Switch in the switch stack by using the **Unit** pull-down menu and then select the port by using the **Port** pull down menu. The user may also use the real-time graphic of the Switch and/or switch stack at the top of the web page by simply clicking on a port.



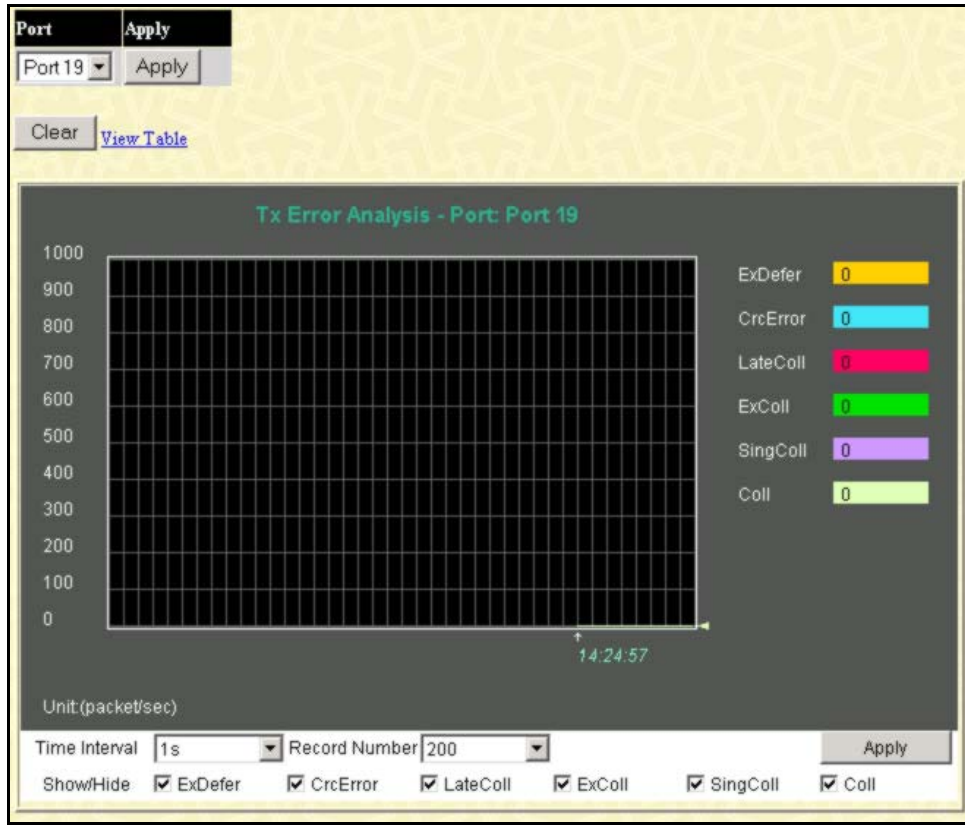


**Figure 10- 7. Rx Error Analysis window (line graph)**

To view the **Received Error Packets Table**, click the link **View Table**, which will show the following table:

## Transmitted (TX)

Click the Transmitted (TX) link in the Error folder of the Monitoring menu to view the following graph of error packets received on the Switch. To select a port to view these statistics for, first select the Switch in the switch stack by using the **Unit** pull-down menu and then select the port by using the **Port** pull down menu. The user may also use the real-time graphic of the Switch and/or switch stack at the top of the web page by simply clicking on a port.

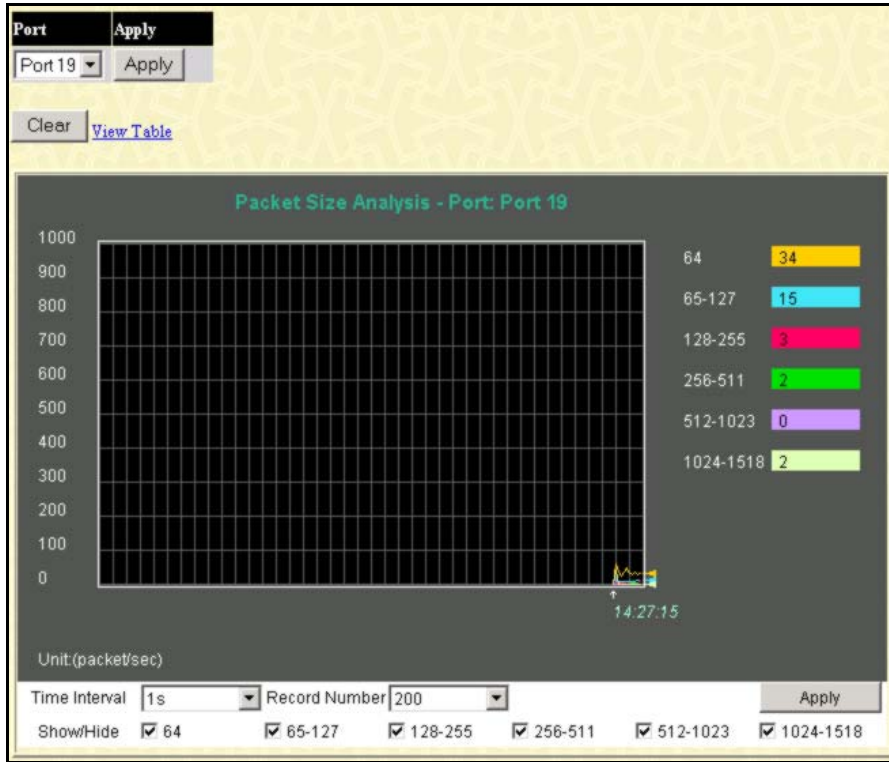


**Figure 10- 8. Tx Error Analysis (line graph)**

To view the **Transmitted Error Packets Table**, click the link [View Table](#), which will show the following table:

## Packet Size

The Web Manager allows packets received by the Switch, arranged in six groups and classed by size, to be viewed as either a line graph or a table. Two windows are offered. To select a port to view these statistics for, first select the Switch in the switch stack by using the **Unit** pull-down menu and then select the port by using the **Port** pull down menu. The user may also use the real-time graphic of the Switch and/or switch stack at the top of the web page by simply clicking on a port.



**Figure 10- 9. Rx Size Analysis window (line graph)**

To view the **Packet Size Analysis Table**, click the link [View Table](#), which will show the following table:

## Browse Router Port

This displays which of the Switch's ports are currently configured as router ports. A router port configured by a user (using the console or Web-based management interfaces) is displayed as a static router port, designated by **S**. A router port that is dynamically configured by the Switch is designated by **D** and a Forbidden port is designated by **F**.

Browse Router Port																								
VLAN ID												VLAN Name												
1												default												
Ports																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50

Figure 10- 10. Browse Router Port

## VLAN Status

Total VLAN Entries: 1																												
VLAN Status																												
VLAN ID												VLAN Name													Status		Advertisement	
1												default													static		Enabled	
Ports																												
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25				
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50				
E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E				
E	E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				

Figure 10- 11. VLAN Status

## MAC Address Table

This allows the Switch's dynamic MAC address forwarding table to be viewed. When the Switch learns an association between a MAC address and a port number, it makes an entry into its forwarding table. These entries are then used to forward packets through the Switch.

To view the MAC Address forwarding table, from the **Monitoring** menu, click the **MAC Address** link:

The screenshot shows a web interface for viewing the MAC Address Table. At the top, there are three search filters: VLAN Name (with a 'Find' button), MAC Address (with a 'Find' button), and Port (with a dropdown menu set to 'Port 1' and a 'Find' button). To the right of each filter is a 'Clear Dynamic Entry' button. Below the filters are 'View All Entry' and 'Clear All Entry' buttons. The main area contains a table titled 'MAC Address Table' with the following data:

VID	VLAN Name	MAC Address	Port	Type
1	default	00-00-01-02-03-a2	19	Dynamic
1	default	00-00-55-03-01-00	19	Dynamic
1	default	00-00-55-47-03-01	19	Dynamic
1	default	00-00-81-9a-99-4f	19	Dynamic
1	default	00-00-aa-aa-aa-aa	19	Dynamic
1	default	00-00-e2-2f-44-ec	19	Dynamic
1	default	00-00-e2-4f-4e-42	19	Dynamic
1	default	00-00-e2-64-e3-3e	19	Dynamic
1	default	00-01-02-03-04-01	19	Dynamic
1	default	00-01-06-30-10-63	19	Dynamic
1	default	00-01-30-12-13-02	19	Dynamic
1	default	00-03-09-18-10-01	19	Dynamic
1	default	00-03-47-91-4a-1c	19	Dynamic
1	default	00-04-96-26-61-de	19	Dynamic
1	default	00-05-5d-00-00-41	19	Dynamic
1	default	00-05-5d-0d-34-24	19	Dynamic
1	default	00-05-5d-16-94-80	19	Dynamic
1	default	00-05-5d-64-96-97	19	Dynamic
1	default	00-05-5d-99-e2-a4	19	Dynamic

Figure 10- 12. MAC Address Table

The functions are used in the MAC address table:

Parameter	Description
<b>VLAN Name</b>	Enter a VLAN Name for the forwarding table to be browsed by.
<b>MAC Address</b>	Enter a MAC address for the forwarding table to be browsed by.
<b>Find</b>	Allows the user to move to a sector of the database corresponding to a user defined port, VLAN, or MAC address.
<b>VID</b>	The VLAN ID of the VLAN of which the port is a member.
<b>VLAN Name</b>	The VLAN Name of the VLAN of which the port is a member.
<b>MAC Address</b>	The MAC address entered into the address table.
<b>Port</b>	The port to which the MAC address above corresponds.
<b>Type</b>	Describes the method which the Switch discovered the MAC address. The possible entries are Dynamic, Self, and Static.
<b>Next</b>	Click this button to view the next page of the address table.
<b>View All Entry</b>	Clicking this button will allow the user to view all entries of the address table.
<b>Delete All Entry</b>	Clicking this button will allow the user to delete all entries of the address table.

## Switch History Log

The Web manager allows the Switch's history log, as compiled by the Switch's management agent, to be viewed. To view the Switch history log, open the **Maintenance** folder and click the **Switch History Log** link.

Switch History Log		
Sequence	Time	Log Text
20	2005-12-15, 12:47:43	Successful login through Web (Username: Anonymous)
19	2005-12-15, 12:32:51	SSH server is enabled
18	2005-12-15, 12:16:40	Successful login through Web (Username: Anonymous)
17	2005-12-15, 12:03:49	Successful login through Web (Username: Anonymous)
16	2005-12-15, 11:42:55	Successful login through Web (Username: Anonymous)
15	2005-12-15, 11:40:58	Port 19 link up, 100Mbps FULL duplex
14	2005-12-15, 11:40:58	System started up
13	2005-12-12, 11:53:30	Configuration and log saved to flash (Username: Anonymous)
12	2005-12-12, 11:50:44	Firmware upgraded successfully (Username: Anonymous)
11	2005-12-12, 11:48:31	Successful login through Web (Username: Anonymous)
10	2005-12-12, 11:46:42	Port 19 link up, 100Mbps FULL duplex
9	2005-12-12, 11:46:42	System started up
8	2005-12-09, 11:17:12	Configuration and log saved to flash (Username: Anonymous)
7	2005-12-09, 11:15:50	Firmware upgrade was unsuccessful! (Username: Anonymous)
6	2005-12-09, 11:12:47	Successful login through Web (Username: Anonymous)
5	2005-12-09, 11:09:39	Successful login through Console (Username: Anonymous)
4	2005-12-09, 11:07:54	Port 19 link up, 100Mbps FULL duplex
3	2005-12-09, 11:01:18	System started up
2	2000-01-13, 05:35:11	Port 3 link down
1	2000-01-13, 05:35:11	Configuration and log saved to flash (Username: Anonymous)
Clear		

**Figure 10- 13. Switch History Log window**

The Switch can record event information in its own logs, to designated SNMP trap receiving stations, and to the PC connected to the console manager. Click **Next** to go to the next page of the **Switch History Log**. Clicking **Clear** will allow the user to clear the **Switch History Log**.

The information in the table is categorized as:

Parameter	Description
<b>Sequence</b>	A counter incremented whenever an entry to the Switch's history log is made. The table displays the last entry (highest sequence number) first.
<b>Time</b>	Displays the time in days, hours, and minutes since the Switch was last restarted.
<b>Log Text</b>	Displays text describing the event that triggered the history log entry.



## IGMP Snooping Group

This window allows the Switch's **IGMP Snooping Group Table** to be viewed. IGMP Snooping allows the Switch to read the Multicast Group IP address and the corresponding MAC address from IGMP packets that pass through the Switch. The number of IGMP reports that were snooped is displayed in the **Reports** field.

To view the **IGMP Snooping Group Table**, click **IGMP Snooping Group** on the **Monitoring** menu:

VLAN Name :		<input type="text"/>	Search																						
Total Entries : 0																									
<b>IGMP Snooping Group Table</b>																									
VLAN Name	Multicast Group	MAC Address	Reports																						
	0.0.0.0	00:00:00:00:00:00	0																						
<b>Port Member</b>																									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	

**Figure 10- 14. IGMP Snooping Group Table**

The user may search the **IGMP Snooping Group Table** by VID by entering it in the top left hand corner and clicking **Search**.

The following field can be viewed:

Parameter	Description
<b>VLAN Name</b>	The VLAN ID of the multicast group.
<b>Multicast Group</b>	The IP address of the multicast group.
<b>MAC Address</b>	The MAC address of the multicast group.
<b>Reports</b>	The total number of reports received for this group.



**NOTE:** To configure IGMP snooping for the xStack DGS-3400 Series switch, go to the **Configuration** folder and select **IGMP Snooping**. Configuration and other information concerning IGMP snooping may be found in Section 6 of this manual under **IGMP Snooping**.

## Port Access Control Information

The following screens are used to monitor 802.1x statistics of the Switch, on a per port basis. To view the **Port Access Control** screens, open the monitoring folder and click the **Port Access Control** folder. There are six screens to monitor.

### RADIUS Account Client

This window shows managed objects used for managing RADIUS accounting clients, and the current statistics associated with them. To view the **RADIUS Accounting**, click **Monitoring > Port Access Control > RADIUS Account Client**.

ServerIndex	InvalidServerAddr	Identifier	ServerAddr	ServerPortNumber	RoundTripTime	Requests	Retransmission
1	0	D-Link	0.0.0.0	0	0	0	0
2	0	D-Link	0.0.0.0	0	0	0	0
3	0	D-Link	0.0.0.0	0	0	0	0

**Figure 10- 15. RADIUS Account Client information**

The user may also select the desired time interval to update the statistics, between *1s* and *60s*, where “s” stands for seconds. The default value is one second. To clear the current statistics shown, click the *Clear* button in the top left hand corner.



The following information is displayed:

<b>Parameter</b>	<b>Description</b>
<b>ClientInvalidServerAddresses</b>	The number of RADIUS Accounting-Response packets received from unknown addresses.
<b>ClientIdentifier</b>	The NAS-Identifier of the RADIUS accounting client. (This is not necessarily the same as sysName in MIB II.)
<b>ServerIndex</b>	The identification number assigned to each RADIUS Accounting server that the client shares a secret with.
<b>ServerAddress</b>	The (conceptual) table listing the RADIUS accounting servers with which the client shares a secret.
<b>ServerPortNumber</b>	The UDP port the client is using to send requests to this server.
<b>ClientRoundTripTime</b>	The time interval between the most recent Accounting-Response and the Accounting-Request that matched it from this RADIUS accounting server.
<b>ClientRequests</b>	The number of RADIUS Accounting-Request packets sent. This does not include retransmissions.
<b>ClientRetransmissions</b>	The number of RADIUS Accounting-Request packets retransmitted to this RADIUS accounting server. Retransmissions include retries where the Identifier and Acct-Delay have been updated, as well as those in which they remain the same.
<b>ClientResponses</b>	The number of RADIUS packets received on the accounting port from this server.
<b>ClientMalformedResponses</b>	The number of malformed RADIUS Accounting-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators and unknown types are not included as malformed accounting responses.
<b>ClientBadAuthenticators</b>	The number of RADIUS Accounting-Response packets, which contained invalid authenticators, received from this server.
<b>ClientPendingRequests</b>	The number of RADIUS Accounting-Request packets sent to this server that have not yet timed out or received a response. This variable is incremented when an Accounting-Request is sent and decremented due to receipt of an Accounting-Response, a timeout or a retransmission.
<b>ClientTimeouts</b>	The number of accounting timeouts to this server. After a timeout the client may retry to the same server, send to a different server, or give up. A retry to the same server is counted as a retransmit as well as a timeout. A send to a different server is counted as an Accounting-Request as well as a timeout.
<b>ClientUnknownTypes</b>	The number of RADIUS packets of unknown type which were received from this server on the accounting port.
<b>ClientPacketsDropped</b>	The number of RADIUS packets, which were received from this server on the accounting port and dropped for some other reason.



**Note:** To configure 802.1x features for the xStack switch, go to the **Administration** folder and select **Port Access Entity**.

## RADIUS Auth Client

This table contains information concerning the activity of the RADIUS authentication client on the client side of the RADIUS authentication protocol. To view the **RADIUS Authentication**, click **Monitoring > Port Access Control > RADIUS Auth Client**.

RADIUS Authentication								
ServerIndex	InvalidServerAddr	Identifier	AuthServerAddr	ServerPortNumber	RoundTripTime	AccessRequests	AccessRetrans	AccessAccept
1	0	D-Link	0.0.0.0	0	0	0	0	0
2	0	D-Link	0.0.0.0	0	0	0	0	0
3	0	D-Link	0.0.0.0	0	0	0	0	0

**Figure 10- 16. RADIUS Authentication information**

The user may also select the desired time interval to update the statistics, between *1s* and *60s*, where “s” stands for seconds. The default value is one second. To clear the current statistics shown, click the *Clear* button in the top left hand corner.

The following information is displayed:

<b>Parameter</b>	<b>Description</b>
<b>InvalidServerAddresses</b>	The number of RADIUS Access-Response packets received from unknown addresses.
<b>Identifier</b>	The NAS-Identifier of the RADIUS authentication client. (This is not necessarily the same as sysName in MIB II.)
<b>ServerIndex</b>	The identification number assigned to each RADIUS Authentication server that the client shares a secret with.
<b>AuthServerAddress</b>	The (conceptual) table listing the RADIUS authentication servers with which the client shares a secret.
<b>ServerPortNumber</b>	The UDP port the client is using to send requests to this server.
<b>RoundTripTime</b>	The time interval (in hundredths of a second) between the most recent Access-Reply/Access-Challenge and the Access-Request that matched it from this RADIUS authentication server.
<b>AccessRequests</b>	The number of RADIUS Access-Request packets sent to this server. This does not include retransmissions.
<b>AccessRetransmissions</b>	The number of RADIUS Access-Request packets retransmitted to this RADIUS authentication server.
<b>AccessAccepts</b>	The number of RADIUS Access-Accept packets (valid or invalid) received from this server.
<b>AccessRejects</b>	The number of RADIUS Access-Reject packets (valid or invalid) received from this server.
<b>AccessChallenges</b>	The number of RADIUS Access-Challenge packets (valid or invalid) received from this server.
<b>AccessResponses</b>	The number of malformed RADIUS Access-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or Signature attributes or known types are not included as malformed access responses.
<b>BadAuthenticators</b>	The number of RADIUS Access-Response packets containing invalid authenticators or Signature attributes received from this server.
<b>PendingRequests</b>	The number of RADIUS Access-Request packets destined for this server that have not yet timed out or received a response. This variable is incremented when an Access-Request is sent and decremented due to receipt of an Access-Accept, Access-Reject or Access-Challenge, a timeout or retransmission.
<b>Timeouts</b>	The number of authentication timeouts to this server. After a timeout the client may retry to the same server, send to a different server, or give up. A retry to the same server is counted as a retransmit as well as a timeout. A send to a different server is counted as a Request as well as a timeout.
<b>UnknownTypes</b>	The number of RADIUS packets of unknown type which were received from this server on the authentication port
<b>PacketsDropped</b>	The number of RADIUS packets of which were received from this server on the authentication port and dropped for some other reason.

## Browse ARP Table

The **Browse ARP Table** window may be found in the **Monitoring** menu in the **Layer 3 Feature** folder. This window will show current ARP entries on the Switch. To search a specific ARP entry, enter an interface name into the **Interface Name** or an **IP address** and click **Find**. To clear the **ARP Table**, click **Clear All**.

<b>Interface Name</b>	<input type="text"/>		
<b>IP Address</b>	<input type="text" value="0.0.0.0"/>	<input type="button" value="Find"/>	<input type="button" value="Clear All"/>
<b>ARP Table</b>			
Interface Name	IP Address	MAC Address	Type
System	10.0.0.0	ff-ff-ff-ff-ff-ff	Local/Broadcast
System	10.0.0.107	00-80-c8-34-56-79	Dynamic
System	10.0.46.1	00-80-c8-91-15-eb	Dynamic
System	10.0.51.12	00-50-ba-da-00-1d	Dynamic
System	10.1.1.2	00-05-5d-19-a5-ab	Static
System	10.1.1.101	00-50-ba-15-48-56	Dynamic
System	10.1.1.102	00-50-ba-97-d7-c0	Dynamic
System	10.1.1.151	00-50-ba-70-d6-d0	Dynamic
System	10.1.1.152	00-13-00-00-00-01	Dynamic
System	10.1.1.154	00-50-ba-97-d9-56	Dynamic
System	10.1.1.157	00-50-ba-71-20-d6	Dynamic
System	10.1.1.161	00-50-ba-70-e4-89	Dynamic
System	10.1.1.166	00-50-ba-70-e4-58	Dynamic
System	10.1.1.167	00-50-ba-70-e4-45	Dynamic
System	10.1.1.168	00-50-ba-70-e4-57	Dynamic
System	10.1.1.169	00-50-ba-70-e4-4e	Dynamic
System	10.1.1.170	00-50-ba-70-e4-7a	Dynamic
System	10.1.1.171	00-50-ba-70-cc-19	Dynamic
System	10.1.1.172	00-50-ba-70-e4-49	Dynamic
System	10.1.1.173	00-50-ba-70-e4-6e	Dynamic
<b>Total Entries: 306</b>			<input type="button" value="Next"/>

**Browse ARP Table window**

# Technical Specifications

Specifications listed here apply to all Switches in the DGS-3400 series except where otherwise noted.

General	
<b>Standards</b>	IEEE 802.3 10BASE-T Ethernet IEEE 802.3u 100BASE-TX Fast Ethernet IEEE 802.3ab 1000BASE-T Gigabit Ethernet IEEE 802.3z 1000BASE-T (SFP “Mini GBIC”) IEEE 802.3ae (10G Optional Modules) IEEE 802.1D Spanning Tree IEEE 802.1W Rapid Spanning Tree IEEE 802.1 P/Q VLAN IEEE 802.1p Priority Queues IEEE 802.3ad Link Aggregation Control IEEE 802.3x Full-duplex Flow Control IEEE 802.3 Nway auto-negotiation IEEE 802.3af Power over Ethernet
<b>Protocols</b>	CSMA/CD
<b>Data Transfer Rates:</b>	Half-duplex      Full-duplex
<b>Ethernet</b>	10 Mbps          20Mbps
<b>Fast Ethernet</b>	100Mbps          200Mbps
<b>Gigabit Ethernet</b>	n/a                  2000Mbps
<b>Fiber Optic</b>	SFP (Mini GBIC) Support IEEE 802.3z 1000BASE-LX (DEM-310GT transceiver) IEEE 802.3z 1000BASE-SX (DEM-311GT transceiver) IEEE 802.3z 1000BASE-LH (DEM-314GT transceiver) IEEE 802.3z 1000BASE-ZX (DEM-315GT transceiver)
<b>Topology</b>	Star
<b>Network Cables</b>	Cat.5 Enhanced for 1000BASE-T UTP Cat.5, Cat. 5 Enhanced for 100BASE-TX UTP Cat.3, 4, 5 for 10BASE-T EIA/TIA-568 100-ohm screened twisted-pair (STP)(100m)

<b>Physical and Environmental</b>									
<b>Internal power supply Redundant Power Supply</b>	AC Input: 100 - 240 VAC, 50-60 Hz								
<b>Power Consumption</b>	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>DGS-3400 Series Switch</b></td> <td style="width: 50%;"><b>Module Inserts</b></td> </tr> <tr> <td>DGS-3426 (70.8 Watts)</td> <td>DEM-410CX (0.015 Watts)</td> </tr> <tr> <td>DGS-3427 (71.6 Watts)</td> <td>DEM-410X (6.16 Watts)</td> </tr> <tr> <td>DGS-3450 (131.34 Watts)</td> <td></td> </tr> </table>	<b>DGS-3400 Series Switch</b>	<b>Module Inserts</b>	DGS-3426 (70.8 Watts)	DEM-410CX (0.015 Watts)	DGS-3427 (71.6 Watts)	DEM-410X (6.16 Watts)	DGS-3450 (131.34 Watts)	
<b>DGS-3400 Series Switch</b>	<b>Module Inserts</b>								
DGS-3426 (70.8 Watts)	DEM-410CX (0.015 Watts)								
DGS-3427 (71.6 Watts)	DEM-410X (6.16 Watts)								
DGS-3450 (131.34 Watts)									
<b>DC fans:</b>	12 v fans								
<b>Operating Temperature</b>	0 - 40°C								
<b>Storage Temperature</b>	-40 - 70°C								
<b>Humidity</b>	5 - 95% non-condensing								
<b>Dimensions</b>	441mm x 389mm x 44mm								
<b>Weight</b>	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>DGS-3400 Series Switch</b></td> <td style="width: 50%;"><b>Module Inserts</b></td> </tr> <tr> <td>DGS-3426 (5.42 kg)</td> <td>DEM-410CX (0.16 kg)</td> </tr> <tr> <td>DGS-3427 (5.51 kg)</td> <td>DEM-410X (0.18 kg)</td> </tr> <tr> <td>DGS-3450 (5.74 kg)</td> <td></td> </tr> </table>	<b>DGS-3400 Series Switch</b>	<b>Module Inserts</b>	DGS-3426 (5.42 kg)	DEM-410CX (0.16 kg)	DGS-3427 (5.51 kg)	DEM-410X (0.18 kg)	DGS-3450 (5.74 kg)	
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DGS-3427 (5.51 kg)	DEM-410X (0.18 kg)								
DGS-3450 (5.74 kg)									
<b>EMI:</b>	CE class A, FCC Class A								
<b>Safety:</b>	CSA International, CB Report								

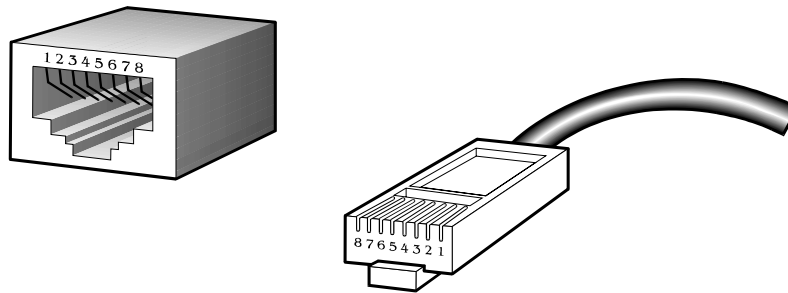
<b>Performance</b>	
<b>Transmission Method</b>	Store-and-forward
<b>Packet Buffer</b>	0.75 MB per device
<b>Packet Filtering / Forwarding Rate</b>	Full-wire speed for all connections 1,488,095 pps per port (for 1000Mbps)
<b>MAC Address Learning</b>	Automatic update. Supports 8K MAC address.
<b>Priority Queues</b>	8 Priority Queues per port.
<b>Forwarding Table Age Time</b>	Max age: 10-1000000 seconds. Default = 300.

# Appendix B

## Cables and Connectors

When connecting the Switch to another switch, a bridge or hub, a normal cable is necessary. Please review these products for matching cable pin assignment.

The following diagrams and tables show the standard RJ-45 receptacle/connector and their pin assignments.



**Appendix 1- 1. The standard RJ-45 port and connector**

RJ-45 Pin Assignments		
Contact	MDI-X Port	MDI-II Port
1	RD+ (receive)	TD+ (transmit)
2	RD- (receive)	TD- (transmit)
3	TD+ (transmit)	RD+ (receive)
4	Not used	Not used
5	Not used	Not used
6	TD- (transmit)	RD- (receive)
7	Not used	Not used
8	Not used	Not used

**Appendix 1- 2. The standard RJ-45 pin assignments**

## Appendix C

### Cable Lengths

Use the following table to as a guide for the maximum cable lengths.

Standard	Media Type	Maximum Distance
Mini-GBIC	1000BASE-LX, Single-mode fiber module	10km
	1000BASE-SX, Multi-mode fiber module	550m
	1000BASE-LHX, Single-mode fiber module	40km
	1000BASE-ZX, Single-mode fiber module	80km
1000BASE-T	Category 5e UTP Cable	100m
	Category 5 UTP Cable (1000 Mbps)	
100BASE-TX	Category 5 UTP Cable (100 Mbps)	100m
10BASE-T	Category 3 UTP Cable (10 Mbps)	100m



# Glossary

**1000BASE-LX:** A short laser wavelength on multimode fiber optic cable for a maximum length of 550 meters

**1000BASE-SX:** A long wavelength for a "long haul" fiber optic cable for a maximum length of 10 kilometers

**100BASE-FX:** 100Mbps Ethernet implementation over fiber.

**100BASE-TX:** 100Mbps Ethernet implementation over Category 5 and Type 1 Twisted Pair cabling.

**10BASE-T:** The IEEE 802.3 specification for Ethernet over Unshielded Twisted Pair (UTP) cabling.

**ageing:** The automatic removal of dynamic entries from the Switch Database which have timed-out and are no longer valid.

**ATM:** Asynchronous Transfer Mode. A connection oriented transmission protocol based on fixed length cells (packets). ATM is designed to carry a complete range of user traffic, including voice, data and video signals.

**auto-negotiation:** A feature on a port which allows it to advertise its capabilities for speed, duplex and flow control. When connected to an end station that also supports auto-negotiation, the link can self-detect its optimum operating setup.

**backbone port:** A port which does not learn device addresses, and which receives all frames with an unknown address. Backbone ports are normally used to connect the Switch to the backbone of your network. Note that backbone ports were formerly known as designated downlink ports.

**backbone:** The part of a network used as the primary path for transporting traffic between network segments.

**bandwidth:** Information capacity, measured in bits per second, that a channel can transmit. The bandwidth of Ethernet is 10Mbps, the bandwidth of Fast Ethernet is 100Mbps.

**baud rate:** The switching speed of a line. Also known as line speed between network segments.

**BOOTP:** The BOOTP protocol allows automatic mapping of an IP address to a given MAC address each time a device is started. In addition, the protocol can assign the subnet mask and default gateway to a device.

**bridge:** A device that interconnects local or remote networks no matter what higher level protocols are involved. Bridges form a single logical network, centralizing network administration.

**broadcast:** A message sent to all destination devices on the network.

**broadcast storm:** Multiple simultaneous broadcasts that typically absorb available network bandwidth and can cause network failure.

**console port:** The port on the Switch accepting a terminal or modem connector. It changes the parallel arrangement of data within computers to the serial form used on data transmission links. This port is most often used for dedicated local management.

**CSMA/CD:** Channel access method used by Ethernet and IEEE 802.3 standards in which devices transmit only after finding the data channel clear for some period of time. When two devices transmit simultaneously, a collision occurs and the colliding devices delay their retransmissions for a random amount of time.

**data center switching:** The point of aggregation within a corporate network where a switch provides high-performance access to server farms, a high-speed backbone connection and a control point for network management and security.

**Ethernet:** A LAN specification developed jointly by Xerox, Intel and Digital Equipment Corporation. Ethernet networks operate at 10Mbps using CSMA/CD to run over cabling.

**Fast Ethernet:** 100Mbps technology based on the Ethernet/CD network access method.

**Flow Control:** (IEEE 802.3z) A means of holding packets back at the transmit port of the connected end station. Prevents packet loss at a congested switch port.

**forwarding:** The process of sending a packet toward its destination by an internetworking device.

**full duplex:** A system that allows packets to be transmitted and received at the same time and, in effect, doubles the potential throughput of a link.

**half duplex:** A system that allows packets to be transmitted and received, but not at the same time. Contrast with full duplex.

**IP address:** Internet Protocol address. A unique identifier for a device attached to a network using TCP/IP. The address is written as four octets separated with full-stops (periods), and is made up of a network section, an optional subnet section and a host section.

**IPX:** Internetwork Packet Exchange. A protocol allowing communication in a NetWare network.

**LAN - Local Area Network:** A network of connected computing resources (such as PCs, printers, servers) covering a relatively small geographic area (usually not larger than a floor or building). Characterized by high data rates and low error rates.

**latency:** The delay between the time a device receives a packet and the time the packet is forwarded out of the destination port.

**line speed:** See baud rate.

**main port:** The port in a resilient link that carries data traffic in normal operating conditions.

**MDI - Medium Dependent Interface:** An Ethernet port connection where the transmitter of one device is connected to the receiver of another device.

**MDI-X - Medium Dependent Interface Cross-over:** An Ethernet port connection where the internal transmit and receive lines are crossed.

**MIB - Management Information Base:** Stores a device's management characteristics and parameters. MIBs are used by the Simple Network Management Protocol (SNMP) to contain attributes of their managed systems. The Switch contains its own internal MIB.

**multicast:** Single packets copied to a specific subset of network addresses. These addresses are specified in the destination-address field of the packet.

**protocol:** A set of rules for communication between devices on a network. The rules dictate format, timing, sequencing and error control.

**resilient link:** A pair of ports that can be configured so that one will take over data transmission should the other fail. See also main port and standby port.

**RJ-45:** Standard 8-wire connectors for IEEE 802.3 10BASE-T networks.

**RMON:** Remote Monitoring. A subset of SNMP MIB II that allows monitoring and management capabilities by addressing up to ten different groups of information.

**RPS - Redundant Power System:** A device that provides a backup source of power when connected to the Switch.

**server farm:** A cluster of servers in a centralized location serving a large user population.

**SLIP - Serial Line Internet Protocol:** A protocol which allows IP to run over a serial line connection.

**SNMP - Simple Network Management Protocol:** A protocol originally designed to be used in managing TCP/IP internets. SNMP is presently implemented on a wide range of computers and networking equipment and may be used to manage many aspects of network and end station operation.

**Spanning Tree Protocol (STP):** A bridge-based system for providing fault tolerance on networks. STP works by allowing the user to implement parallel paths for network traffic, and ensure that redundant paths are disabled when the main paths are operational and enabled if the main paths fail.

**STACK:** A group of network devices that are integrated to form a single logical device.

**standby port:** The port in a resilient link that will take over data transmission if the main port in the link fails.

**switch:** A device which filters, forwards and floods packets based on the packet's destination address. The switch learns the addresses associated with each switch port and builds tables based on this information to be used for the switching decision.

**TCP/IP:** A layered set of communications protocols providing Telnet terminal emulation, FTP file transfer, and other services for communication among a wide range of computer equipment.

**telnet:** A TCP/IP application protocol that provides virtual terminal service, letting a user log in to another computer system and access a host as if the user were connected directly to the host.

**TFTP - Trivial File Transfer Protocol:** Allows the user to transfer files (such as software upgrades) from a remote device using your switch's local management capabilities.

**UDP - User Datagram Protocol:** An Internet standard protocol that allows an application program on one device to send a datagram to an application program on another device.

**VLAN - Virtual LAN:** A group of location- and topology-independent devices that communicate as if they are on a common physical LAN.

**VLT - Virtual LAN Trunk:** A Switch-to-Switch link which carries traffic for all the VLANs on each Switch.

**VT100:** A type of terminal that uses ASCII characters. VT100 screens have a text-based appearance.

# Warrenties/Registration

## LIMITED WARRANTY

D-Link provides this limited warranty for its product only to the person or entity who originally purchased the product from D-Link or its authorized reseller or distributor. D-Link would fulfill the warranty obligation according to the local warranty policy in which you purchased our products.

**Limited Hardware Warranty:** D-Link warrants that the hardware portion of the D-Link products described below (“Hardware”) will be free from material defects in workmanship and materials from the date of original retail purchase of the Hardware, for the period set forth below applicable to the product type (“Warranty Period”) if the Hardware is used and serviced in accordance with applicable documentation; provided that a completed Registration Card is returned to an Authorized D-Link Service Office within ninety (90) days after the date of original retail purchase of the Hardware. If a completed Registration Card is not received by an authorized D-Link Service Office within such ninety (90) period, then the Warranty Period shall be ninety (90) days from the date of purchase.

<i>Product Type</i>	<i>Warranty Period</i>
Product (including Power Supplies and Fans)	One (1) Year
Spare parts and pare kits	Ninety (90) days

D-Link’s sole obligation shall be to repair or replace the defective Hardware at no charge to the original owner. Such repair or replacement will be rendered by D-Link at an Authorized D-Link Service Office. The replacement Hardware need not be new or of an identical make, model or part; D-Link may in its discretion may replace the defective Hardware (or any part thereof) with any reconditioned product that D-Link reasonably determines is substantially equivalent (or superior) in all material respects to the defective Hardware. The Warranty Period shall extend for an additional ninety (90) days after any repaired or replaced Hardware is delivered. If a material defect is incapable of correction, or if D-Link determines in its sole discretion that it is not practical to repair or replace the defective Hardware, the price paid by the original purchaser for the defective Hardware will be refunded by D-Link upon return to D-Link of the defective Hardware. All Hardware (or part thereof) that is replaced by D-Link, or for which the purchase price is refunded, shall become the property of D-Link upon replacement or refund.

**Limited Software Warranty:** D-Link warrants that the software portion of the product (“Software”) will substantially conform to D-Link’s then current functional specifications for the Software, as set forth in the applicable documentation, from the date of original delivery of the Software for a period of ninety (90) days (“Warranty Period”), if the Software is properly installed on approved hardware and operated as contemplated in its documentation. D-Link further warrants that, during the Warranty Period, the magnetic media on which D-Link delivers the Software will be free of physical defects. D-Link’s sole obligation shall be to replace the non-conforming Software (or defective media) with software that substantially conforms to D-Link’s functional specifications for the Software. Except as otherwise agreed by D-Link in writing, the replacement Software is provided only to the original licensee, and is subject to the terms and conditions of the license granted by D-Link for the Software. The Warranty Period shall extend for an additional ninety (90) days after any replacement Software is delivered. If a material non-conformance is incapable of correction, or if D-Link determines in its sole discretion that it is not practical to replace the non-conforming Software, the price paid by the original licensee for the non-conforming Software will be refunded by D-Link; provided that the non-conforming Software (and all copies thereof) is first returned to D-Link. The license granted respecting any Software for which a refund is given automatically terminates.

### ***What You Must Do For Warranty Service:***

Registration Card. The Registration Card provided at the back of this manual must be completed and returned to an Authorized D-Link Service Office for each D-Link product within ninety (90) days after the product is purchased and/or licensed. The

addresses/telephone/fax list of the nearest Authorized D-Link Service Office is provided in the back of this manual. FAILURE TO PROPERLY COMPLETE AND TIMELY RETURN THE REGISTRATION CARD MAY AFFECT THE WARRANTY FOR THIS PRODUCT.

**Submitting A Claim.** Any claim under this limited warranty must be submitted in writing before the end of the Warranty Period to an Authorized D-Link Service Office. The claim must include a written description of the Hardware defect or Software nonconformance in sufficient detail to allow D-Link to confirm the same. The original product owner must obtain a Return Material Authorization (RMA) number from the Authorized D-Link Service Office and, if requested, provide written proof of purchase of the product (such as a copy of the dated purchase invoice for the product) before the warranty service is provided. After an RMA number is issued, the defective product must be packaged securely in the original or other suitable shipping package to ensure that it will not be damaged in transit, and the RMA number must be prominently marked on the outside of the package. The packaged product shall be insured and shipped to Authorized D-Link Service Office with all shipping costs prepaid. D-Link may reject or return any product that is not packaged and shipped in strict compliance with the foregoing requirements, or for which an RMA number is not visible from the outside of the package. The product owner agrees to pay D-Link's reasonable handling and return shipping charges for any product that is not packaged and shipped in accordance with the foregoing requirements, or that is determined by D-Link not to be defective or non-conforming.

***What Is Not Covered:***

This limited warranty provided by D-Link does not cover:

Products that have been subjected to abuse, accident, alteration, modification, tampering, negligence, misuse, faulty installation, lack of reasonable care, repair or service in any way that is not contemplated in the documentation for the product, or if the model or serial number has been altered, tampered with, defaced or removed;

Initial installation, installation and removal of the product for repair, and shipping costs;

Operational adjustments covered in the operating manual for the product, and normal maintenance;

Damage that occurs in shipment, due to act of God, failures due to power surge, and cosmetic damage;

and Any hardware, software, firmware or other products or services provided by anyone other than D-Link.

***Disclaimer of Other Warranties:*** EXCEPT FOR THE LIMITED WARRANTY SPECIFIED HEREIN, THE PRODUCT IS PROVIDED "AS-IS" WITHOUT ANY WARRANTY OF ANY KIND INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT. IF ANY IMPLIED WARRANTY CANNOT BE DISCLAIMED IN ANY TERRITORY WHERE A PRODUCT IS SOLD, THE DURATION OF SUCH IMPLIED WARRANTY SHALL BE LIMITED TO NINETY (90) DAYS. EXCEPT AS EXPRESSLY COVERED UNDER THE LIMITED WARRANTY PROVIDED HEREIN, THE ENTIRE RISK AS TO THE QUALITY, SELECTION AND PERFORMANCE OF THE PRODUCT IS WITH THE PURCHASER OF THE PRODUCT.

***Limitation of Liability:*** TO THE MAXIMUM EXTENT PERMITTED BY LAW, D-LINK IS NOT LIABLE UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR ANY LOSS OF USE OF THE PRODUCT, INCONVENIENCE OR DAMAGES OF ANY CHARACTER, WHETHER DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF GOODWILL, WORK STOPPAGE, COMPUTER FAILURE OR MALFUNCTION, LOSS OF INFORMATION OR DATA CONTAINED IN, STORED ON, OR INTEGRATED WITH ANY PRODUCT RETURNED TO D-LINK FOR WARRANTY SERVICE) RESULTING FROM THE USE OF THE PRODUCT, RELATING TO WARRANTY SERVICE, OR ARISING OUT OF ANY BREACH OF THIS LIMITED WARRANTY, EVEN IF D-LINK HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE SOLE REMEDY FOR A BREACH OF THE FOREGOING LIMITED WARRANTY IS REPAIR, REPLACEMENT OR REFUND OF THE DEFECTIVE OR NON-CONFORMING PRODUCT.

**GOVERNING LAW:** This Limited Warranty shall be governed by the laws of the state of California.

Some states do not allow exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the foregoing limitations and exclusions may not apply. This limited warranty provides specific legal rights and the product owner may also have other rights which vary from state to state.

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Subject to the terms and conditions set forth herein, D-Link Systems, Inc. ("D-Link") provides this Limited Warranty:

- Only to the person or entity that originally purchased the product from D-Link or its authorized reseller or distributor, and
- Only for products purchased and delivered within the fifty states of the United States, the District of Columbia, U.S. Possessions or Protectorates, U.S. Military Installations, or addresses with an APO or FPO.

**Limited Warranty:** D-Link warrants that the hardware portion of the D-Link product described below ("Hardware") will be free from material defects in workmanship and materials under normal use from the date of original retail purchase of the product, for the period set forth below ("Warranty Period"), except as otherwise stated herein.

- Hardware (excluding power supplies and fans): Five (5) Years
- Power supplies and fans: One (1) Year
- Spare parts and spare kits: Ninety (90) days

The customer's sole and exclusive remedy and the entire liability of D-Link and its suppliers under this Limited Warranty will be, at D-Link's option, to repair or replace the defective Hardware during the Warranty Period at no charge to the original owner or to refund the actual purchase price paid. Any repair or replacement will be rendered by D-Link at an Authorized D-Link Service Office. The replacement hardware need not be new or have an identical make, model or part. D-Link may, at its option, replace the defective Hardware or any part thereof with any reconditioned product that D-Link reasonably determines is substantially equivalent (or superior) in all material respects to the defective Hardware. Repaired or replacement hardware will be warranted for the remainder of the original Warranty Period or ninety (90) days, whichever is longer, and is subject to the same limitations and exclusions. If a material defect is incapable of correction, or if D-Link determines that it is not practical to repair or replace the defective Hardware, the actual price paid by the original purchaser for the defective Hardware will be refunded by D-Link upon return to D-Link of the defective Hardware. All Hardware or part thereof that is replaced by D-Link, or for which the purchase price is refunded, shall become the property of D-Link upon replacement or refund.

**Limited Software Warranty:** D-Link warrants that the software portion of the product ("Software") will substantially conform to D-Link's then current functional specifications for the Software, as set forth in the applicable documentation, from the date of original retail purchase of the Software for a period of ninety (90) days ("Software Warranty Period"), provided that the Software is properly installed on approved hardware and operated as contemplated in its documentation. D-Link further warrants that, during the Software Warranty Period, the magnetic media on which D-Link delivers the Software will be free of physical defects. The customer's sole and exclusive remedy and the entire liability of D-Link and its suppliers under this Limited Warranty will be, at D-Link's option, to replace the non-conforming Software (or defective media) with software that substantially conforms to D-Link's functional specifications for the Software or to refund the portion of the actual purchase price paid that is attributable to the Software. Except as otherwise agreed by D-Link in writing, the replacement Software is provided only to the original licensee, and is subject to the terms and conditions of the license granted by D-Link for the Software. Replacement Software will be warranted for the remainder of the original Warranty Period and is subject to the same limitations and exclusions. If a material non-conformance is incapable of correction, or if D-Link determines in its sole discretion that it is not practical to replace the non-conforming Software, the price paid by the original licensee for the non-conforming Software will be refunded by D-Link; provided that the non-conforming Software (and all copies thereof) is first returned to D-Link. The license granted respecting any Software for which a refund is given automatically terminates.

**Non-Applicability of Warranty:** The Limited Warranty provided hereunder for Hardware and Software portions of D-Link's products will not be applied to and does not cover any refurbished product and any product purchased through the inventory clearance or liquidation sale or other sales in which D-Link, the sellers, or the liquidators expressly disclaim their warranty obligation pertaining to the product and in that case, the product is being sold "As-Is" without any warranty whatsoever including, without limitation, the Limited Warranty as described herein, notwithstanding anything stated herein to the contrary.

**Submitting A Claim:** The customer shall return the product to the original purchase point based on its return policy. In case the return policy period has expired and the product is within warranty, the customer shall submit a claim to D-Link as outlined below:

- The customer must submit with the product as part of the claim a written description of the Hardware defect or Software nonconformance in sufficient detail to allow D-Link to confirm the same, along with proof of purchase of the product (such as a copy of the dated purchase invoice for the product) if the product is not registered.
- The customer must obtain a Case ID Number from D-Link Technical Support at 1-877-453-5465, who will attempt to assist the customer in resolving any suspected defects with the product. If the product is considered defective, the customer must obtain a Return Material Authorization ("RMA") number by completing the RMA form and entering the assigned Case ID Number at <https://rma.dlink.com/>.
- After an RMA number is issued, the defective product must be packaged securely in the original or other suitable shipping package to ensure that it will not be damaged in transit, and the RMA number must be prominently marked on the outside of the package. Do not include any manuals or accessories in the shipping package. D-Link will only replace the defective portion of the product and will not ship back any accessories.
- The customer is responsible for all in-bound shipping charges to D-Link. No Cash on Delivery ("COD") is allowed. Products sent COD will either be rejected by D-Link or become the property of D-Link. Products shall be fully insured by the customer and shipped to **D-Link Systems, Inc., 17595 Mt. Herrmann, Fountain Valley, CA 92708**. D-Link will not be held responsible for any packages that are lost in transit to D-Link. The repaired or replaced packages will be shipped to the customer via UPS Ground or any common carrier selected by D-Link. Return shipping charges shall be prepaid by D-Link if you use an address in the United States, otherwise we will ship the product to you freight collect. Expedited shipping is available upon request and provided shipping charges are prepaid by the customer.

D-Link may reject or return any product that is not packaged and shipped in strict compliance with the foregoing requirements, or for which an RMA number is not visible from the outside of the package. The product owner agrees to pay D-Link's reasonable handling and return shipping charges for any product that is not packaged and shipped in accordance with the foregoing requirements, or that is determined by D-Link not to be defective or non-conforming.

**What Is Not Covered:** The Limited Warranty provided herein by D-Link does not cover: Products that, in D-Link's judgment, have been subjected to abuse, accident, alteration, modification, tampering, negligence, misuse, faulty installation, lack of reasonable care, repair or service in any way that is not contemplated in the documentation for the product, or if the model or serial number has been altered, tampered with, defaced or removed; Initial installation, installation and removal of the product for repair, and shipping costs; Operational adjustments covered in the operating manual for the product, and normal maintenance; Damage that occurs in shipment, due to act of God, failures due to power surge, and cosmetic damage; Any hardware, software, firmware or other products or services provided by anyone other than D-Link; and Products that have been purchased from inventory clearance or liquidation sales or other sales in which D-Link, the sellers, or the liquidators expressly disclaim their warranty obligation pertaining to the product. While necessary maintenance or repairs on your Product can be performed by any company, we recommend that you use only an Authorized D-Link Service Office. Improper or incorrectly performed maintenance or repair voids this Limited Warranty.

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**CE Mark Warning:** This is a Class A product. In a residential environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

**FCC Statement:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation. Operation of this equipment in a residential environment is likely to cause harmful interference to radio or television reception. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to 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 receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**For detailed warranty information applicable to products purchased outside the United States, please contact the corresponding local D-Link office.**

*Product Registration:*

Register online your D-Link product at <http://support.dlink.com/register/>

**Product registration is entirely voluntary and failure to complete or return this form will not diminish your warranty rights.**







## **D-Link Europe Limited Lifetime Warranty**

**Dear Customer,**

please read below to understand the details of the warranty coverage you have.

### **Warranty terms for D-LINK xStack products:**

All D-Link xStack products\* are supplied with a 5 year warranty as standard. To enable the Limited Lifetime Warranty on this product you must register the product, within the first three months of purchase\*\*, on the following website:  
<http://www.dlink.biz/productregistration/>

D-Link will then provide you with a Limited Lifetime Warranty reference number for this product. Please retain your original dated proof of purchase with a note of the serial number, and Limited Lifetime Warranty reference number together with this warranty statement and place each document in a safe location. When you make a warranty claim on a defective product, you may be asked to provide this information.

Nothing in this Limited Lifetime Warranty affects your statutory rights as a consumer. The following are special terms applicable to your Limited Lifetime hardware warranty.

### **Warranty beneficiary**

The warranty beneficiary is the original end user. The original end user is defined as the person that purchases the product as the first owner.

### **Duration of Limited Lifetime Warranty**

As long as the original end-user continues to own or use the product with the following conditions:

- fan and power supplies are limited to a five (5) year warranty only
- in the event of discontinuance of product manufacture, D-Link warranty support is limited to five (5) years from the announcement of discontinuance. If a product is no longer available for replacement, D-Link will issue a product comparable or better to the one originally purchased.

### **Replacement, Repair or Refund Procedure for Hardware**

D-Link or its service center will use commercially reasonable efforts to ship a replacement part within ten (10) working days after receipt of the RMA request. Actual delivery times may vary depending on customer location. D-Link reserves the right to refund the purchase price as its exclusive warranty remedy.

To Receive a Return Materials Authorization (RMA) Number, please visit: <http://service.dlink.biz> and for Italy and Spain, please use: <http://rma.dlink.es> or <http://rma.dlink.it>.



### **D-Link Limited Lifetime Warranty**

**Hardware:** D-Link warrants the D-Link hardware named above against defects in materials and workmanship for the period specified above. If D-Link receives notice of such defects during the warranty period, D-Link will, at its option, either repair or replace products proving to be defective. Replacement products may be either new or like-new.

**Software.** D-Link warrants that D-Link software will not fail to execute its programming instructions, for the period specified above, due to defects in material and workmanship when properly installed and used. If D-Link receives notice of such defects during the warranty period, D-Link will replace software media that does not execute its programming instructions due to such defects.

### **Warranty exclusions**

This warranty does not apply if the software, product or any other equipment upon which the software is authorized to be used (a) has been altered, except by D-Link or its authorized representative, (b) has not been installed, operated, repaired, or maintained in accordance with instructions supplied by D-Link (improper use or improper maintenance), (c) has been subjected to abnormal physical or electrical stress, misuse, negligence, or accident; (d) is licensed, for beta, evaluation, testing or demonstration purposes for which D-Link does not charge a purchase price or license fee or (e) defects are caused by force majeure (lightning, floods, war, etc.), soiling, by extraordinary environmental influences or by other circumstances of which D-Link is not responsible.

### **Disclaimer of warranty**

Please note, some countries do not allow the disclaimer of implied terms in contracts with consumers and the disclaimer below may not apply to you.

To the extent allowed by local law, the above warranties are exclusive and no other warranty, condition or other term, whether written or oral, is expressed or implied. D-Link specifically disclaims any implied warranties, conditions and terms of merchantability, satisfactory quality, and fitness for a particular purpose.

To the extent allowed by local law, the remedies in this warranty statement are customer's sole and exclusive remedies. Except as indicated above, in no event will D-Link or its suppliers be liable for loss of data or for indirect, special, incidental, consequential (including lost profit or data), or other damage, whether based in a contract, tort, or otherwise.

To the extent local law mandatorily requires a definition of "Lifetime Warranty" different from that provided here, then the local law definition will supersede and take precedence.

**Valid law**

The warranty is subject to the valid laws in the country of purchase and is to be interpreted in the warranty terms with the said laws. You may have additional legal rights that are not restricted by this warranty. Nothing in this Limited Lifetime Warranty affects your statutory rights as a consumer.

\* DES-6500 series is excluded from the Limited Lifetime Warranty offering and will be supplied with a standard 5 year warranty.

\*\* Failure to register this product within the first three months of purchase [by the first user only] will invalidate the Limited Lifetime Warranty.

# Tech Support

## Technical Support

You can find software updates and user documentation on the D-Link website.

Tech Support for customers within Australia:

***D-Link Technical Support over the Telephone:***

1300-766-868

Monday to Friday 8:00am to 8:00pm EST

Saturday 9:00am to 1:00pm EST

***D-Link Technical Support over the Internet:***

<http://www.dlink.com.au>

email:[support@dlink.com.au](mailto:support@dlink.com.au)

Tech Support for customers within New Zealand:

***D-Link Technical Support over the Telephone:***

0800-900-900

Monday to Friday 8:30am to 8:30pm

Saturday 9:00am to 5:00pm

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## Technical Support

You can find software updates and user documentation on the D-Link website.

Tech Support for customers within South Eastern Asia and Korea:

***D-Link South Eastern Asia and Korea Technical Support over the Telephone:***

+65-6895-5355

Monday to Friday 9:00am to 12:30pm, 2:00pm-6:00pm  
Singapore Time

***D-Link Technical Support over the Internet:***

email:[support@dlink.com.sg](mailto:support@dlink.com.sg)



## Technical Support

You can find software updates and user documentation on the D-Link website.

Tech Support for customers within India  
***D-Link Technical Support over the Telephone:***

+91-22-26526741

+91-22-26526696 –ext 161 to 167

Monday to Friday 9:30AM to 7:00PM

***D-Link Technical Support over the Internet:***

<http://www.dlink.co.in>

<http://www.dlink.co.in/dlink/drivers/support.asp>

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## Technical Support

You can find software updates and user documentation on the D-Link website.

D-Link provides free technical support for customers for the duration of the warranty period on this product.

Customers can contact D-Link technical support through our web site or by phone.

### **Tech Support for customers within the Russia**

#### ***D-Link Technical Support over the Telephone:***

(095) 744-00-99

Monday to Friday 10:00am to 6:30pm





# Technical Support

You can find software updates and user documentation on the D-Link website.

## Tech Support for customers within the U.A.E & North Africa:

***D-Link Technical Support over the Telephone:***

**(971) 4-391-6480 (U.A.E)**

**Sunday to Wednesday 9:00am to 6:00pm GMT+4**

**Thursday 9:00am to 1:00pm GMT+4**

**D-Link Middle East & North Africa**

***D-Link Technical Support over the Internet:***

**<http://support.dlink-me.com>**

**email: [support@dlink-me.com](mailto:support@dlink-me.com)**

## Tech Support for customers within Israel:

***D-Link Technical Support over the Telephone:***

**(972) 971-5701**

**Sunday to Thursday 9:00am to 5:00pm**

***D-Link Technical Support over the Internet:***

**<http://www.dlink.co.il/forum>**

**e-mail: [support@dlink.co.il](mailto:support@dlink.co.il)**

## Tech Support for customers within Turkey:

***D-Link Technical Support over the Telephone:***

**(+90) 212-289 56 59**

**Monday to Friday 9:00am to 6:00pm**

***D-Link Technical Support over the Internet:***

**<http://www.dlink.com.tr>**

**e-mail: [turkiye@dlink-me.com](mailto:turkiye@dlink-me.com)**

## Tech Support for customers within Egypt:

***D-Link Technical Support over the Telephone:***

**(202) 414-4295**

**Sunday to Thursday 9:00am to 5:00pm**

***D-Link Technical Support over the Internet:***

**<http://support.dlink-me.com>**

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## Technical Support

You can find software updates and user documentation on the D-Link website.

Tech Support for customers within South Africa and Sub Sahara Region:

***D-Link South Africa and Sub Sahara Technical Support over the Telephone:***

**+27-12-665-2165**

**08600 DLINK ( For South Africa only )**

**Monday to Friday 8:30am to 9:00pm South Africa Time**

***D-Link Technical Support over the Internet:***

<http://www.d-link.co.za>

[email:support@d-link.co.za](mailto:support@d-link.co.za)

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## Technical Support

You can find updates and user documentation on the D-Link website

Tech Support for Latin America customers:

### ***D-Link Technical Support over the followings Telephones:***

<b>Argentina:</b> 0800-666 1442	Monday to Friday 09:00am to 22:00pm
<b>Chile:</b> 800-214 422	Monday to Friday 08:00am to 21:00pm
<b>Colombia:</b> 01800-700 1588	Monday to Friday 07:00am to 20:00pm
<b>Ecuador:</b> 1800-777 711	Monday to Friday 07:00am to 20:00pm
<b>El Salvador:</b> 800-6137	Monday to Friday 06:00am to 19:00pm
<b>Guatemala:</b> 1800-300 0017	Monday to Friday 06:00am to 19:00pm
<b>Panama:</b> 0800-560 0193	Monday to Friday 07:00am to 20:00pm
<b>Peru:</b> 0800-52049	Monday to Friday 07:00am to 20:00pm
<b>Venezuela:</b> 0800-100 3470	Monday to Friday 08:00am to 21:00pm

### ***D-Link Technical Support over the Internet:***

[www.dlinkla.com](http://www.dlinkla.com)

[www.dlinklatinamerica.com](http://www.dlinklatinamerica.com)

email:[support@dlink.cl](mailto:support@dlink.cl)

Tech Support for customers within Brazil:

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## Техническая поддержка

Обновления программного обеспечения и документация доступны на Интернет-сайте D-Link.

D-Link предоставляет бесплатную поддержку для клиентов в течение гарантийного срока.

Клиенты могут обратиться в группу технической поддержки D-Link по телефону или через Интернет.

### **Техническая поддержка D-Link:**

(095) 744-00-99

### **Техническая поддержка через Интернет**

<http://www.dlink.ru>

email: [support@dlink.ru](mailto:support@dlink.ru)

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## Asistencia Técnica

D-Link Latin América pone a disposición de sus clientes, especificaciones, documentación y software mas reciente a través de nuestro Sitio Web

**[www.dlinklatinamerica.com](http://www.dlinklatinamerica.com)**

El servicio de soporte técnico tiene presencia en numerosos países de la Región Latino América, y presta asistencia gratuita a todos los clientes de D-Link, en forma telefónica e internet, a través de la casilla

**[soporte@dlinkla.com](mailto:soporte@dlinkla.com)**

### **Soporte Técnico Help Desk Argentina:**

**Teléfono:** 0800-6661442 Lunes a Viernes 09:00 am a 22:00 pm

### **Soporte Técnico Help Desk Chile:**

**Teléfono:** 800-214422 Lunes a Viernes 08:00 am a 21:00 pm

### **Soporte Técnico Help Desk Colombia:**

**Teléfono:** 01800-7001588 Lunes a Viernes 07:00 am a 20:00 pm

### **Soporte Técnico Help Desk Ecuador:**

**Teléfono:** 1800-777 711 Lunes a Viernes 07:00 am a 20:00 pm

### **Soporte Técnico Help Desk El Salvador:**

**Teléfono:** 800-6137 Lunes a Viernes 06:00 am a 19:00 pm

### **Soporte Técnico Help Desk Guatemala:**

**Teléfono:** 1800-300 0017 Lunes a Viernes 06:00 am a 19:00 pm

### **Soporte Técnico Help Desk Panamá:**

**Teléfono:** 0800-560 0193 Lunes a Viernes 07:00 am a 20:00 pm

### **Soporte Técnico Help Desk Perú:**

**Teléfono:** 0800-52049 Lunes a Viernes 07:00 am a 20:00 pm

### **Soporte Técnico Help Desk Venezuela:**

**Teléfono:** 0800-1003470 Lunes a Viernes 08:00 am a 21:00 pm

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## Suporte Técnico

Você pode encontrar atualizações de software e documentação de usuário no site da D-Link Brasil  
[www.dlinkbrasil.com.br](http://www.dlinkbrasil.com.br).

A D-Link fornece suporte técnico gratuito para clientes no Brasil durante o período de vigência da garantia deste produto.

### Suporte Técnico para clientes no Brasil:

#### **Telefone**

São Paulo (11) 2185-9301

Segunda à sexta

Das 8h30 às 18h30

Demais Regiões do Brasil 0800 70 14 104

#### **E-mail:**

[email:suporte@dlinkbrasil.com.br](mailto:email:suporte@dlinkbrasil.com.br)



## 友冠技術支援

台灣地區用戶可以透過我們的網站，電子郵件或電話與友冠資訊技術支援人員聯絡。

支援服務時間從  
週一到週五，上午8:30 a.m. 到 7:00 p.m

Web: <http://www.dlinktw.com.tw/>

FAQ: <http://www.dlinktw.com.tw/support.asp>

Email: [dssqa\\_service@dlinktw.com.tw](mailto:dssqa_service@dlinktw.com.tw)

Phone: 0800-002-615

如果您是台灣地區以外的用戶，請參考使用手冊中記載的D-Link 全球各地分公司的聯絡資訊取得支援服務。

產品維修與保固相關資訊，請參考友冠資訊網頁說明：  
<http://www.dlinktw.com.tw/suppQuick.asp>

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## Technical Support

You can find software updates and user documentation on the D-Link website.

D-Link provides free technical support for customers within the United States and within Canada for the duration of the warranty period on this product.

U.S. and Canadian customers can contact D-Link technical support through our website, or by phone.

### Tech Support for customers within the United States:

#### ***D-Link Technical Support over the Telephone:***

(888) 843-6100

Hours of Operation: 8:00AM to 6:00PM PST

#### ***D-Link Technical Support over the Internet:***

<http://support.dlink.com>

[email:support@dlink.com](mailto:support@dlink.com)

### Tech Support for customers within Canada:

#### ***D-Link Technical Support over the Telephone:***

(800) 361-5265

Monday to Friday 7:30am to 12:00am EST

#### ***D-Link Technical Support over the Internet:***





## Technical Support

You can find software updates and user documentation on the D-Link websites.

D-Link provides free technical support for customers within Canada, the United Kingdom, and Ireland.

Customers can contact D-Link technical support through our websites, or by phone.

### For Customers within The United Kingdom & Ireland:

#### ***D-Link UK & Ireland Technical Support over the Telephone:***

08456 12 0003 (United Kingdom)

+44 8456 12 0003 (Ireland)

Lines Open

8.00am-10.00pm Mon-Fri

10.00am-7.00pm Sat & Sun

#### ***D-Link UK & Ireland Technical Support over the Internet:***

<http://www.dlink.co.uk>

<ftp://ftp.dlink.co.uk>

### For Customers within Canada:

#### ***D-Link Canada Technical Support over the Telephone:***

1-800-361-5265 (Canada)

Monday to Friday 7:30 am to 3:00 am ET

Saturday and Sunday 9:00am to 12:00am ET

#### ***D-Link Canada Technical Support over the Internet:***

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## Technische Unterstützung

Aktualisierte Versionen von Software und Benutzerhandbuch finden Sie auf der Website von D-Link.

D-Link bietet kostenfreie technische Unterstützung für Kunden innerhalb Deutschlands, Österreichs, der Schweiz und Osteuropas.

Unsere Kunden können technische Unterstützung über unsere Website, per E-Mail oder telefonisch anfordern.

Web: <http://www.dlink.de>

E-Mail: [support@dlink.de](mailto:support@dlink.de)

Telefon: +49 (1805)2787

0,12 € /Min aus dem Festnetz der Deutschen Telekom.

Telefonische technische Unterstützung erhalten Sie Montags bis Freitags von 09.00 bis 17.30 Uhr.

Unterstützung erhalten Sie auch bei der Premiumhotline für D-Link Produkte unter der Rufnummer 09001-475767

Montag bis Freitag von 6-22 Uhr und am Wochenende von 11-18 Uhr.

1,75€/Min aus dem Festnetz der Deutschen Telekom.

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## Assistance technique

Vous trouverez la documentation et les logiciels les plus récents sur le site web **D-Link**.

Ceux-ci peuvent contacter le service technique de **D-Link** par notre site internet ou par téléphone.

Support technique destiné aux clients établis en France:

**Assistance technique D-Link par téléphone :**

0 820 0803 03

**Assistance technique D-Link sur internet :**

<http://www.dlink.fr>

e-mail : [support@dlink.fr](mailto:support@dlink.fr)

Support technique destiné aux clients établis au  
Canada :

**Assistance technique D-Link par téléphone :**

(800) 361-5265

Lun.-Ven. 7h30 à 21h00 HNE.

**Assistance technique D-Link sur internet :**

<http://support.dlink.ca>

e-mail : [support@dlink.ca](mailto:support@dlink.ca)

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## Asistencia Técnica

Puede encontrar el software más reciente y documentación para el usuario en el sitio web de **D-Link** . **D-Link** ofrece asistencia técnica gratuita para clientes dentro de España durante el periodo de garantía del producto. Los clientes españoles pueden ponerse en contacto con la asistencia técnica de **D-Link** a través de nuestro sitio web o por teléfono.

**Asistencia Técnica de D-Link por teléfono:  
902 304545**

de lunes a viernes desde las 9:00 hasta las 14:00 y de las 15:00 hasta las 18:00

**Asistencia Técnica de D-Link a través de Internet:**

<http://www.dlink.es>

email: [soporte@dlink.es](mailto:soporte@dlink.es)

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## Supporto tecnico

Gli ultimi aggiornamenti e la documentazione sono disponibili sul sito D-Link.

### Supporto tecnico per i clienti residenti in Italia

#### **D-Link Mediterraneo S.r.L.**

Via N. Bonnet 6/B 20154 Milano

Supporto Tecnico dal lunedì al venerdì dalle ore  
9.00 alle ore 19.00 con orario continuato  
Telefono: 02-39607160

URL : <http://www.dlink.it/supporto.html>

Email: [tech@dlink.it](mailto:tech@dlink.it)

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## Technical Support

You can find software updates and user documentation on the D-Link website.

D-Link provides free technical support for customers within Benelux for the duration of the warranty period on this product.

Benelux customers can contact D-Link technical support through our website, or by phone.

### Tech Support for customers within the Netherlands:

***D-Link Technical Support over the Telephone:***

0900 501 2007

Monday to Friday 8:00 am to 10:00 pm

***D-Link Technical Support over the Internet:***

[www.dlink.nl](http://www.dlink.nl)

### Tech Support for customers within Belgium:

***D-Link Technical Support over the Telephone:***

+32(0)2 717 3248

Monday to Friday 8:00 am to 10:00 pm

***D-Link Technical Support over the Internet:***

[www.dlink.be](http://www.dlink.be)

### Tech Support for customers within Luxemburg:

***D-Link Technical Support over the Telephone:***

+352 342 080 82 13

Monday to Friday 8:00 am to 10:00 pm

***D-Link Technical Support over the Internet:***

[www.dlink.be](http://www.dlink.be)

## Pomoc techniczna

Najnowsze wersje oprogramowania i dokumentacji użytkownika można znaleźć w serwisie internetowym firmy D-Link.

D-Link zapewnia bezpłatną pomoc techniczną klientom w Polsce w okresie gwarancyjnym produktu.

Klienci z Polski mogą się kontaktować z działem pomocy technicznej firmy D-Link za pośrednictwem Internetu lub telefonicznie.

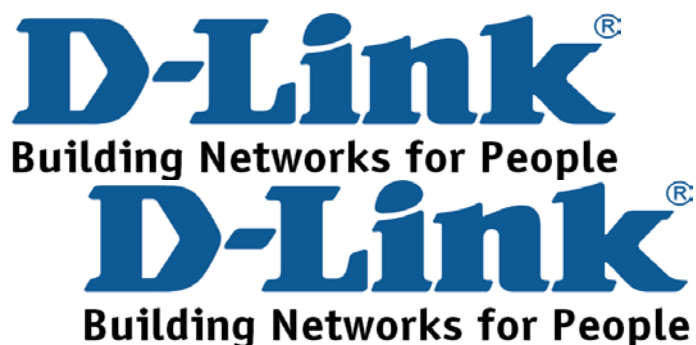
### **Telefoniczna pomoc techniczna firmy D-Link:**

(+48 12) 2-999-333

### **Pomoc techniczna firmy D-Link świadczona przez Internet:**

URL: <http://www.dlink.pl>

e-mail: [dlink@fixit.pl](mailto:dlink@fixit.pl)



## Technická podpora

Aktualizované verze software a uživatelských příruček najdete na webové stránce firmy D-Link.

D-Link poskytuje svým zákazníkům bezplatnou technickou podporu

Zákazníci mohou kontaktovat oddělení technické podpory přes webové stránky, mailem nebo telefonicky

Web: <http://www.dlink.cz/support/>

E-mail: [info@dlink.cz](mailto:info@dlink.cz)

Telefon: 0224247500

Telefonická podpora je v provozu:



## Technikai Támogatás

Meghajtó programokat és frissítéseket a **D-Link** Magyarország weblapjáról tölthet le.  
Telefonon technikai segítséget munkanapokon hétfőtől-csütörtökig 9.00 – 16.00 óráig és pénteken 9.00 – 14.00 óráig kérhet  
a **(1) 461-3001** telefonszámon vagy a **support@dlink.hu** emailcímen.

Magyarországi technikai támogatás :

### D-Link Magyarország

1074 Budapest, Alsóerdősor u. 6. – R70 Irodaház 1 em.

Tel. : 06 1 461-3001

Fax : 06 1 461-3004

email : support@dlink.hu

URL : http://www.dlink.hu

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## **Teknisk Support**

**Du kan finne programvare oppdateringer og bruker dokumentasjon på D-Links web sider.**

**D-Link tilbyr sine kunder gratis teknisk support under produktets garantitid.**

**Kunder kan kontakte D-Links teknisk support via våre hjemmesider, eller på tlf.**

### **Teknisk Support:**

**D-Link Teknisk telefon Support:**

800 10 610

(Hverdager 08:00-20:00)

**D-Link Teknisk Support over Internett:**

<http://www.dlink.no>

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## **Teknisk Support**

**Du finder software opdateringer og bruger-dokumentation på D-Link's hjemmeside.**

**D-Link tilbyder gratis teknisk support til kunder i Danmark i hele produktets garantiperiode.**

**Danske kunder kan kontakte D-Link's tekniske support via vores hjemmeside eller telefonisk.**

**D-Link teknisk support over telefonen:**

**Tlf. 7026 9040**

**Åbningstider: kl. 08:00 – 20:00**

**D-Link teknisk support på Internettet:**

**<http://www.dlink.dk>**

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## Teknisk Support

På vår hemsida kan du hitta mer information om mjukvaru uppdateringar och annan användarinformation.

D-Link tillhandahåller teknisk support till kunder i Sverige under hela garantitiden för denna produkt.

Teknisk Support för kunder i Sverige:

**D-Link Teknisk Support via telefon:**

**0770-33 00 35**

Vardagar 08.00-20.00

**D-Link Teknisk Support via Internet:**

<http://www.dlink.se>

[email:support@dlink.se](mailto:support@dlink.se)

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## **Teknistä tukea asiakkaille Suomessa:**

**D-Link tarjoaa teknistä tukea asiakkailleen.**

**Tuotteen takuun voimassaoloajan.**

**Tekninen tuki palvelee seuraavasti:**

Arkisin klo. 9 - 21  
numerosta  
**0800-114 677**

Internetin kautta  
Ajurit ja lisätietoja tuotteista.  
<http://www.dlink.fi>

Sähköpostin kautta  
voit myös tehdä kyselyitä.

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**Building Networks for People**

## Teknisk Support

På vår hemsida kan du hitta mer information om mjukvaru uppdateringar och annan användarinformation.

D-Link tillhandahåller teknisk support till kunder i Sverige under hela garantitiden för denna produkt.

Teknisk Support för kunder i Sverige:

**D-Link Teknisk Support via telefon:**

**0770-33 00 35**

Vardagar 08.00-20.00

**D-Link Teknisk Support via Internet:**

<http://www.dlink.se>

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## 技术支持

办公地址：北京市朝阳区建国路 71 号惠通时代广场 C1 座  
202 室 邮编: 100025

技术支持中心电话：8008868192/(028)85176977

技术支持中心传真：(028)85176948

维修中心地址：北京市朝阳区建国路 71 号惠通时代广场 C1 座  
202 室 邮编: 100025

维修中心电话：(010) 58635800

维修中心传真：(010) 58635799

网址：<http://www.dlink.com.cn>

办公时间：周一到周五，早09:00到晚18:00

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# Intenational Offices

## U.S.A

17595 Mt. Herrmann Street  
Fountain Valley, CA. 92708  
TEL: 714-885-6000  
Fax 866-743-4905  
URL: www.dlink.com

## Canada

2180 Winston Park Drive  
Oakville, Ontario, L6H 5W1  
Canada  
TEL: 1-905-8295033  
FAX: 1-905-8295223  
URL: www.dlink.ca

## Europe (U. K.)

4th Floor, Merit House  
Edgware Road, Colindale  
London NW9 5AB  
U.K.  
TEL: 44-20-8731-5555  
FAX: 44-20-8731-5511  
URL: www.dlink.co.uk

## Germany

Schwalbacher Strasse 74  
D-65760 Eschborn  
Germany  
TEL: 49-6196-77990  
FAX: 49-6196-7799300  
URL: www.dlink.de

## France

Le Florilege #.2, Allee de la Fresnerie  
78330 Fontenay le Fleury  
France  
TEL: 33-1-30238688  
FAX: 33-1-30238689  
URL: www.dlink-france.fr

## Netherlands

Weena 290  
3012 NJ Rotterdam  
Netherlands  
Tel: +31-10-282-1445  
Fax: +31-10-282-1331  
URL: www.dlink-benelux.com

## Belgium

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B-1000 Brussels  
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Tel: +32(0)2 517 7111  
Fax: +32(0)2 517 6500  
URL: www.dlink-benelux.com

## Italy

Via Nino Bonnet n. 6/b  
20154 – Milano,  
Italy  
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FAX: 39-02-2900-1723  
URL: www.dlink.it

## Sweden

P.O. Box 15036, S-167 15 Bromma  
Sweden  
TEL: 46-(0)8564-61900  
FAX: 46-(0)8564-61901  
URL: www.dlink.se

## Denmark

Naverland 2, DK-2600  
Glostrup, Copenhagen,  
TEL: 45-43-969040  
FAX: 45-43-424347  
URL:www.dlink.dk

## Norway

Karihaugveien 89  
1086 Oslo  
Norway  
TEL: 47-23-897189  
FAX: 47-22-309085  
URL: www.dlink.no

## Iberia

C/Sabino De Arana,  
56 Bajos  
08028 Barcelona  
TEL: 34 93 4090770  
FAX: 34 93 4910795  
URL: www.dlinkiberia.es

## Singapore

1 International Business Park  
#03-12 The Synergy  
Singapore 609917  
TEL: 65-6774-6233  
FAX: 65-6774-6322  
URL: www.dlink-intl.com

## Australia

1 Giffnock Avenue,  
North Ryde, NSW 2113  
Australia  
TEL: 61-2-8899-1800  
FAX: 61-2-8899-1868  
URL: www.dlink.com.au

## India

D-Link House, Kurla Bandra Complex Road,  
Off CST Road, Santacruz (East), Mumbai - 400098.  
India  
TEL: 91-022-26526696/56902210  
FAX: 91-022-26528914  
URL: www.dlink.co.in

## Middle East (Dubai)

P.O.Box: 500376  
Office No.:103, Building:3  
Dubai Internet City  
Dubai, United Arab Emirates  
Tel:+971-4-3916480  
Fax:+971-4-3908881  
URL: www.dlink-me.com

## Turkey

Maslak Ayazaga Yolu  
No: 2 Kat :5  
Ayazaga-Istanbul  
TURKEY  
TEL: 0090 212 289 56 59  
FAX: 0090 212 289 76 06  
URL: www.dlink.com.tr

## Egypt

19 El-Shahed Helmy, El Masri  
Al-Maza, Heliopolis  
Cairo,Egypt.  
TEL:+202 414 4295  
FAX:+202 415 6704  
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## Israel

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P.O.B 2148, Hertzelia-Pituach 46120.  
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FAX: +972-9-9715601  
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## Latin America

Isidora Goyechea 2934 of 702,  
Las Condes  
Santiago – Chile S.A.  
TEL: 56-2-232-3185  
FAX: 56-2-232-0923  
URL: www.dlink.cl

## Brasil

Av das Nacoes Unidas,  
11857 - 14 - andar - cj 141/142  
Brooklin Novo  
Sao Paulo - SP - Brazil  
CEP 04578-000  
TEL: +55 11 55039320  
FAX: +55 11 55039322  
URL: www.dlinkbrasil.com.br

## South Africa

Einstein Park II  
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102-106 Witch-Hazel Avenue  
Highveld Technopark  
Centurion  
Gauteng  
Republic of South Africa  
TEL: 27-12-665-2165  
FAX: 27-12-665-2186  
URL: www.d-link.co.za

## Russia

Grafsky per., 14, floor 6  
Moscow  
129626 Russia  
TEL: 7-095-744-0099  
FAX: 7-095-744-0099 #350  
URL: www.dlink.ru

## China

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FAX: +86-10-58635799  
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## Taiwan

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Taiwan  
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FAX: 886-2-2910-1515  
URL: www.dlinktw.com.tw

## Headquarters

2F, No. 233-2, Pao-Chiao Rd.  
Hsin-Tien, Taipei  
Taiwan  
TEL: 886-2-2916-1600  
FAX: 886-2-2914-6299  
URL:www.dlink.com



# Registration Card

(All Countries and Regions excluding USA)

Print, type or use block letters.

Your name: Mr./Ms. \_\_\_\_\_

Organization: \_\_\_\_\_ Dept. \_\_\_\_\_

Your title at organization: \_\_\_\_\_

Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_

Organization's full address: \_\_\_\_\_

Country: \_\_\_\_\_

Date of purchase (Month/Day/Year): \_\_\_\_\_

Product Model	Product No.	Serial	* Product installed in type of computer (e.g., Compaq 486)	* Product installed in computer serial No.

(\* Applies to adapters only)

Product was purchased from:

Reseller's name: \_\_\_\_\_

Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_

Reseller's full address: \_\_\_\_\_

Answers to the following questions help us to support your product:

1. Where and how will the product primarily be used?

Home Office Travel Company Business Home Business Personal Use

2. How many employees work at installation site?

1 employee 2-9 10-49 50-99 100-499 500-999 1000 or more

3. What network protocol(s) does your organization use ?

XNS/IPX TCP/IP DECnet Others \_\_\_\_\_

4. What network operating system(s) does your organization use ?

D-Link LANsmart Novell NetWare NetWare Lite SCO Unix/Xenix PC NFS 3Com 3+Open  
Banyan Vines Windows NT Windows ME Windows 2000 Windows XP  
Others \_\_\_\_\_

5. What network management program does your organization use ?

D-View HP OpenView/Windows HP OpenView/Unix SunNet Manager Novell NMS  
NetView 6000 Others \_\_\_\_\_

6. What network medium/media does your organization use ?

Fiber-optics Thick coax Ethernet Thin coax Ethernet 10BASE-T UTP/STP  
100BASE-TX 100BASE-T4 100VGAnyLAN Others \_\_\_\_\_

7. What applications are used on your network?

Desktop publishing Spreadsheet Word processing CAD/CAM  
Database management Accounting Others \_\_\_\_\_

8. What category best describes your company?

Aerospace Engineering Education Finance Hospital Legal Insurance/Real Estate Manufacturing  
Retail/Chainstore/Wholesale Government Transportation/Utilities/Communication VAR  
System house/company Other \_\_\_\_\_

9. Would you recommend your D-Link product to a friend?

Yes No Don't know yet

10. Your comments on this product?

PLEASE  
PLACE STAMP  
HERE

**TO:**

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**D-Link<sup>®</sup>**