

**D-Link™ DES-3550**

**Managed Layer 2 Ethernet Switch**

**48-port 10/100Mbps and 2GE ports**

**Release 3.5**

***Manual***



RECYCLABLE

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## Preface

The *DES-3550 Manual* is divided into sections that describe the system installation and operating instructions with examples.

Section 1, “Introduction” – Describes the Switch and its features.

Section 2, “Installation” – Helps you get started with the basic installation of the Switch and also describes the front panel, rear panel, side panels, and LED indicators of the Switch.

Section 3, “Connecting the Switch” – Tells how you can connect the Switch to your Ethernet/Fast Ethernet network.

Section 4, “Introduction to Switch Management” – Introduces basic Switch management features, including password protection, SNMP settings, IP address assignment and connecting devices to the Switch.

Section 5, “Introduction to Web-based Switch Management” – Talks about connecting to and using the Web-based switch management feature on the Switch.

Section 6, “Configuring the Switch” – A detailed discussion about configuring some of the basic functions of the Switch, including accessing the Switch information, using the Switch's utilities and setting up network configurations, such as Quality of Service, The Access Profile Table, port mirroring and configuring the Spanning Tree.

Section 7, “Management” – A discussion of the security features of the Switch, including Security IP, User Accounts, Access Authentication Control, and SNMP.

Section 8, “Monitoring” – Features graphs and screens used in monitoring features and packets on the Switch.

Section 9, “Maintenance” – Features information on Switch utility functions, including TFTP Services, Switch History, Ping Test Save Changes and Rebooting Services.

Section 10, “Single IP Management” – Discussion on the Single IP Management function of the Switch, including functions and features of the Java based user interface and the utilities of the SIM function.

Appendix A, “Technical Specifications” – The technical specifications of the DES-3550

Appendix B, “Cables and Connectors” – Describes the RJ-45 receptacle/connector, straight-through and crossover cables and standard pin assignments.

Appendix C, “Cable Lengths” – Information on cable types and maximum distances.

Glossary - Lists definitions for terms and acronyms used in this document.

## Intended Readers

The *DES-3550 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 your screen. For example: You have mail. Bold font is also used to represent filenames, program names and commands. For example: use the copy command.
<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 filename means that you should type the actual filename 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 you make better use of your device.



A **NOTICE** indicates either potential damage to hardware or loss of data and tells you 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 you need to review and follow.



### 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 your system documentation.
- Opening or removing covers that are marked with the triangular symbol with a lightning bolt may expose you 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:
  - The power cable, extension cable, or plug is damaged.
  - 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 you follow the operating instructions.
- Keep your system away from radiators and heat sources. Also, do not block cooling vents.
- Do not spill food or liquids on your system components, and never operate the product in a wet environment. If the system gets wet, see the appropriate section in your troubleshooting guide or contact your trained service provider.
- Do not push any objects into the openings of your 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 you are not sure of the type of power source required, consult your service provider or local power company.

To help avoid damaging your system, be sure the voltage selection switch (if provided) on the power supply is set to match the power available at your 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 you must use an extension cable, 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 your 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 you are 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 your system. To prevent static damage, discharge static electricity from your body before you touch any of the electronic components, such as the microprocessor. You can do so by periodically touching an unpainted metal surface on the chassis.

You can also take the following steps to 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 you are ready to install the component in your 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.



# Section 1

## Introduction

*Ethernet Technology*

*Switch Description*

*Features*

*Ports*

*Front-Panel Components*

*Side Panel Description*

*Rear Panel Description*

*Gigabit Combo Ports*

*Ethernet Technology*

*Fast Ethernet Technology*

## Fast Ethernet

The growing importance of LANs and the increasing complexity of desktop computing applications are fueling the need for high performance networks. A number of high-speed LAN technologies are proposed to provide greater bandwidth and improve client/server response times. Among them, Fast Ethernet, or 100BASE-T, provides a non-disruptive, smooth evolution from 10BASE-T technology.

100Mbps Fast Ethernet is a standard specified by the IEEE 802.3 LAN committee. It is an extension of the 10Mbps Ethernet standard with the ability to transmit and receive data at 100Mbps, while maintaining the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Ethernet protocol.

## Gigabit Ethernet Technology

Gigabit Ethernet is an extension of IEEE 802.3 Ethernet utilizing the same packet structure, format, and support for CSMA/CD protocol, full duplex, flow control, and management objects, but with a tenfold increase in theoretical throughput over 100Mbps Fast Ethernet and a one hundred-fold increase over 10Mbps Ethernet. Since it is compatible with all 10Mbps and 100Mbps Ethernet environments, Gigabit Ethernet provides a straightforward upgrade without wasting a company's existing investment in hardware, software, and trained personnel.

The increased speed and extra bandwidth offered by Gigabit Ethernet are essential to coping with the network bottlenecks that frequently develop as computers and their busses get faster and more users use applications that generate more traffic. Upgrading key components, such as your backbone and servers to Gigabit Ethernet can greatly improve network response times as well as significantly speed up the traffic between your subnetworks.

Gigabit Ethernet enables fast optical fiber connections to support video conferencing, complex imaging, and similar data-intensive applications. Likewise, since data transfers occur 10 times faster than Fast Ethernet, servers outfitted with Gigabit Ethernet NIC's are able to perform 10 times the number of operations in the same amount of time.

In addition, the phenomenal bandwidth delivered by Gigabit Ethernet is the most cost-effective method to take advantage of today and tomorrow's rapidly improving switching and routing internetworking technologies.

## Switching Technology

Another key development pushing the limits of Ethernet technology is in the field of switching technology. A switch bridges Ethernet packets at the MAC address level of the Ethernet protocol transmitting among connected Ethernet or Fast Ethernet LAN segments.

Switching is a cost-effective way of increasing the total network capacity available to users on a local area network. A switch increases capacity and decreases network loading by making it possible for a local area network to be divided into different segments, which are not competing with each other for network transmission capacity, and therefore decreasing the load on each segment.

The Switch acts as a high-speed selective bridge between the individual segments. Traffic that needs to go from one segment to another (from one port to another) is automatically forwarded by the Switch, without interfering with any other segments (ports). This allows the total network capacity to be multiplied, while still maintaining the same network cabling and adapter cards.

For Fast Ethernet or Gigabit Ethernet networks, a switch is an effective way of eliminating problems of chaining hubs beyond the "two-repeater limit." A switch can be used to split parts of the network into different collision domains, for example, making it possible to expand your Fast Ethernet network beyond the 205-meter network diameter limit for 100BASE-TX networks. Switches supporting both traditional 10Mbps Ethernet and 100Mbps Fast Ethernet are also ideal for bridging between existing 10Mbps networks and new 100Mbps networks.

Switching LAN technology is a marked improvement over the previous generation of network bridges, which were characterized by higher latencies. Routers have also been used to segment local area networks, but the cost of a router and the setup and maintenance required make routers relatively impractical. Today's switches are an ideal solution to most kinds of local area network congestion problems.

## Switch Description

The DES-3550 is equipped with unshielded twisted-pair (UTP) cable ports providing dedicated 10 or 100 Mbps bandwidth. The Switch has 48 UTP ports and Auto MDI-X/MDI-II convertible ports that can be used for uplinking to another switch. These ports can be used for connecting PCs, printers, servers, hubs, routers, switches and other networking devices. The dual speed ports use standard twisted-pair cabling and are ideal for segmenting networks into small, connected subnetworks for superior performance. Each 10/100 port can support up to 200 Mbps of throughput in full-duplex mode.

In addition, the Switch has 2 Mini-GBIC combo ports. These two gigabit combo ports are ideal for connecting to a server or network backbone.

This stand-alone Switch enables the network to use some of the most demanding multimedia and imaging applications concurrently with other user applications without creating bottlenecks. The built-in console interface can be used to configure the Switch's settings for priority queuing, VLANs, and port trunk groups, port monitoring, and port speed.

## Features

- IEEE 802.3 10BASE-T compliant
- IEEE 802.3u 100BASE-TX compliant
- IEEE 802.1p Priority Queues
- IEEE 802.3x flow control in full duplex mode
- 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
- Access Control List (ACL) support
- Single IP Management support
- Access Authentication Control utilizing TACACS, XTACACS and TACACS+
- Dual Image Firmware
- Simple Network Time Protocol support
- MAC Notification support
- Asymmetric VLAN support
- System and Port Utilization support
- System Log Support
- High performance switching engine performs forwarding and filtering at full wire speed, maximum 14, 881 packets/sec on each 10Mbps Ethernet port, and maximum 148,810 packet/sec on 100Mbps Fast Ethernet port.
- Full- and half-duplex for both 10Mbps and 100Mbps connections. 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
- SNMP support
- Secure Sockets Layer (SSL) and Secure Shell (SSH) support
- Port Mirroring support
- MIB support for:

- RFC1213 MIB II
- RFC1493 Bridge
- RFC1757 RMON
- RFC1643 Ether-like MIB
- RFC2233 Interface 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

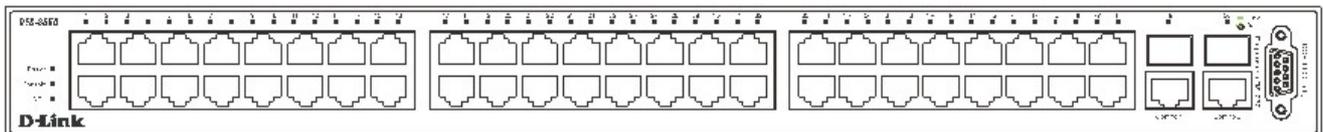
- Forty-eight (48) high-performance (MDI-X/MDI-II) ports for connecting to end stations, servers, hubs and other networking devices.
- All UTP ports can auto-negotiate between 10Mbps and 100Mbps, half-duplex and full duplex, and feature flow control.
- Two 1000BASE-T Mini-GBIC combo ports for connecting to another switch, server, or network backbone.
- RS-232 DCE Diagnostic port (console port) for setting up and managing the Switch via a connection to a console terminal or PC using a terminal emulation program.



**NOTE:** For customers interested in D-View, D-Link Corporation's proprietary SNMP management software, go to the D-Link Website ([www.dlink.com.cn](http://www.dlink.com.cn)) and download the software and manual.

## Front-Panel Components

The front panel of the Switch consists of LED indicators for power and for each 10/100 Mbps twisted-pair ports, and two 1000BASE-T Mini-GBIC ports.



**Figure 1- 1. Front Panel View of the DES-3550 as shipped**

Comprehensive LED indicators display the status of the Switch and the network.

## LED Indicators

The Switch supports LED indicators for Power, Console, RPS and Port LEDs. The following shows the LED indicators for the Switch along with an explanation of each indicator.

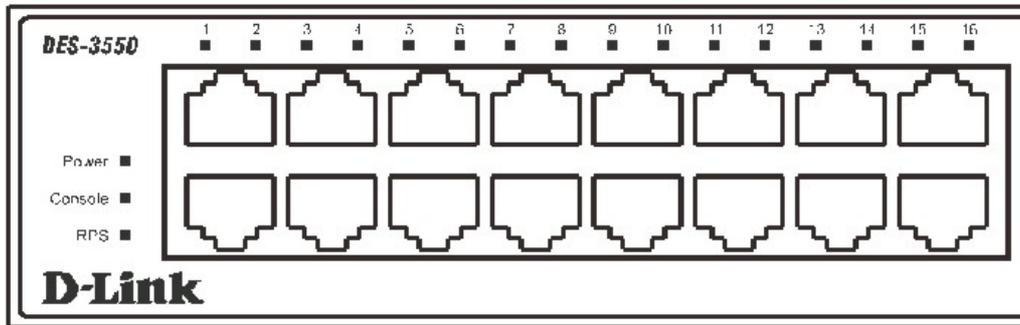
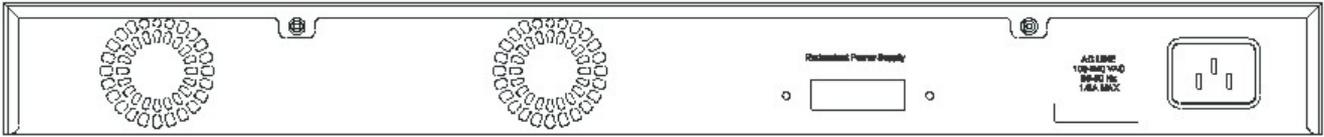


Figure 1- 2. LED Indicators

LED	Description
<b>Power</b>	This LED will light green after the Switch is powered on to indicate the ready state of the device. The indicator is dark when the Switch is powered off.
<b>Console</b>	This LED should blink during the Power-On Self Test (POST). When the POST is finished, the LED goes dark. This indicator is lit solid green when the Switch is being logged into via out-of-band/local console management through the RS-232 console port in the back of the Switch using a straight-through serial cable.
<b>RPS</b>	This LED will be lit when the redundant power supply is present and in use. Otherwise it will remain dark.
<b>Port LEDs</b>	<p>One row of LEDs for each port is located above the ports on the front panel. The first LED is for the top port and the second one is for the bottom ports. These port LEDs will light two different colors for 10M and 100M.</p> <p>Amber - For speeds of 10 Mbps. A solid light denotes activity on the port while a blinking light indicates a valid link.</p> <p>Green - For speeds of 100 Mbps. A solid light denotes activity on the port while a blinking light indicates a valid link.</p>
<b>100M/10M</b>	These LEDs will light steady green to indicate that the port is transferring data at 100Mbps.
<b>Gigabit Ports</b>	<p>The Switch's two Mini GBIC ports have their own corresponding LEDs:</p> <p>Speed - This LED will light solid green when the port is transferring at a rate of 1000Mbps. When dark, the port is transferring at 10/100Mbps.</p> <p>Link/Act - This LED will light solid green when there is a valid link. A blinking LED indicates current activity on the port. A dark LED indicates no activity on the port.</p>

## Rear Panel Description

The rear panel of the Switch contains an AC power connector.



**Figure 1-3. Rear panel view of the Switch**

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 power fails, the optional external RPS will take over all the power immediately and automatically.

## Side Panel Description

The right-hand side panel of the Switch contains a system fan, while the left hand panel includes a system fan and a heat vent.

The system fans are used to dissipate heat. The sides of the system also provide heat vents to serve the same purpose. Do not block these openings, and 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.



**Figure 1-4. Side Panels**

## Gigabit Combo Ports

In addition to the 48 10/100 Mbps ports, the Switch features two Gigabit Ethernet Combo ports. These two ports are 1000BASE-T copper ports (provided) and Mini-GBIC ports (optional). See the diagram below to view the two Mini-GBIC port modules being plugged into the Switch. Please note that although these two front panel modules can be used simultaneously, the ports must be different. The GBIC port will always have the highest priority.

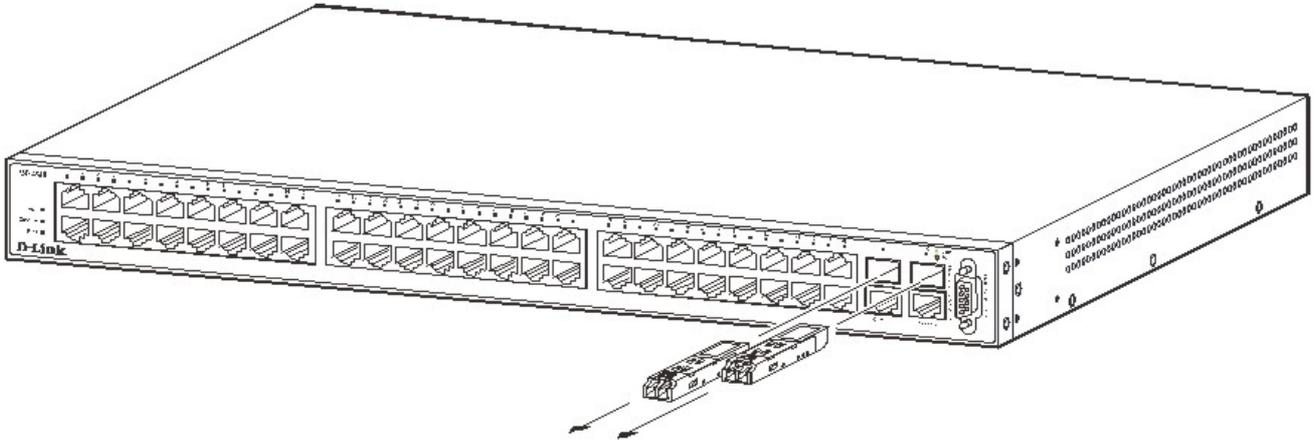


Figure 1- 5. Mini-GBIC modules plug-in to the Switch

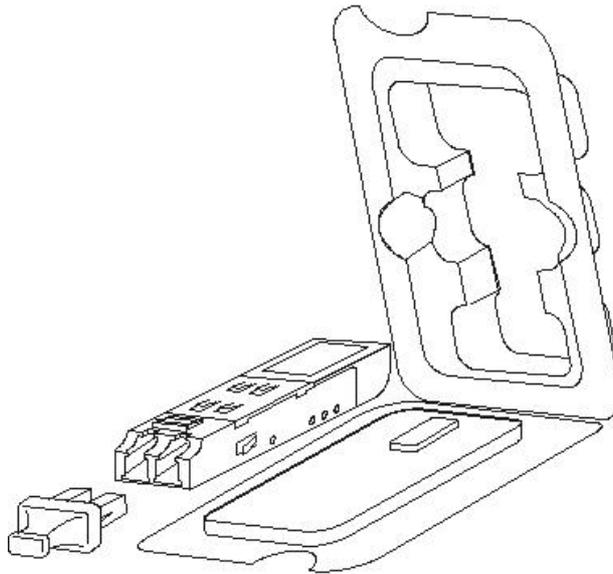


Figure 1- 6. Installing the Mini-GBIC Module

## SECTION 2

# Installation

### *Package Contents*

### *Before You Connect to the Network*

### *Installing the Switch Without the Rack*

### *Rack Installation*

### *Power On*

## Package Contents

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

- One DES-3550 Stand-alone Switch
- One AC power cord
- This Manual
- Registration card
- Mounting kit (two brackets and screws)
- Four rubber feet with adhesive backing
- RS-232 console cable

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

## Before You Connect to the Network

The site where you install the Switch may greatly affect its performance. 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

When installing the Switch on a desktop or shelf, the rubber feet included with the Switch should first be attached. 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.

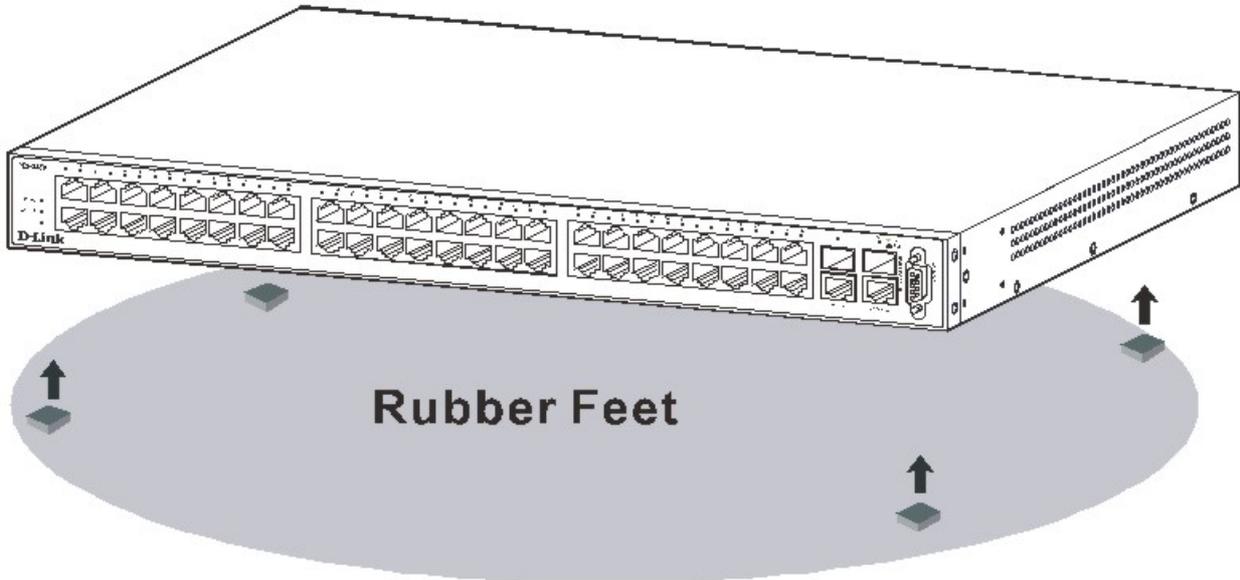


Figure 2- 1. Prepare Switch for installation on a desktop or shelf

## Installing the Switch in a Rack

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

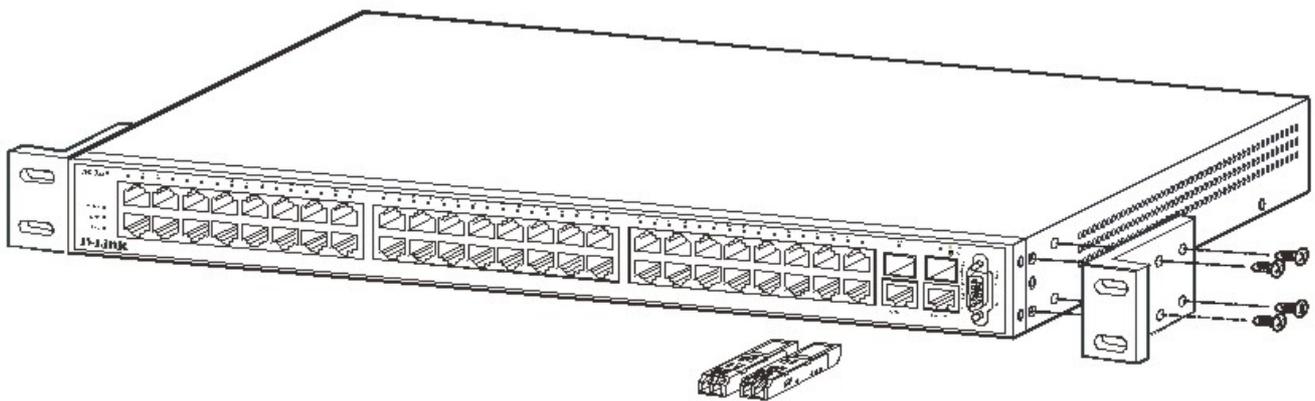


Figure 2- 2. Fasten mounting brackets to Switch

Fasten the mounting brackets to the Switch using the screws provided. With the brackets attached securely, you can mount the Switch in a standard rack as shown in Figure 2-3 on the following page.

## Mounting the Switch in a Standard 19" Rack

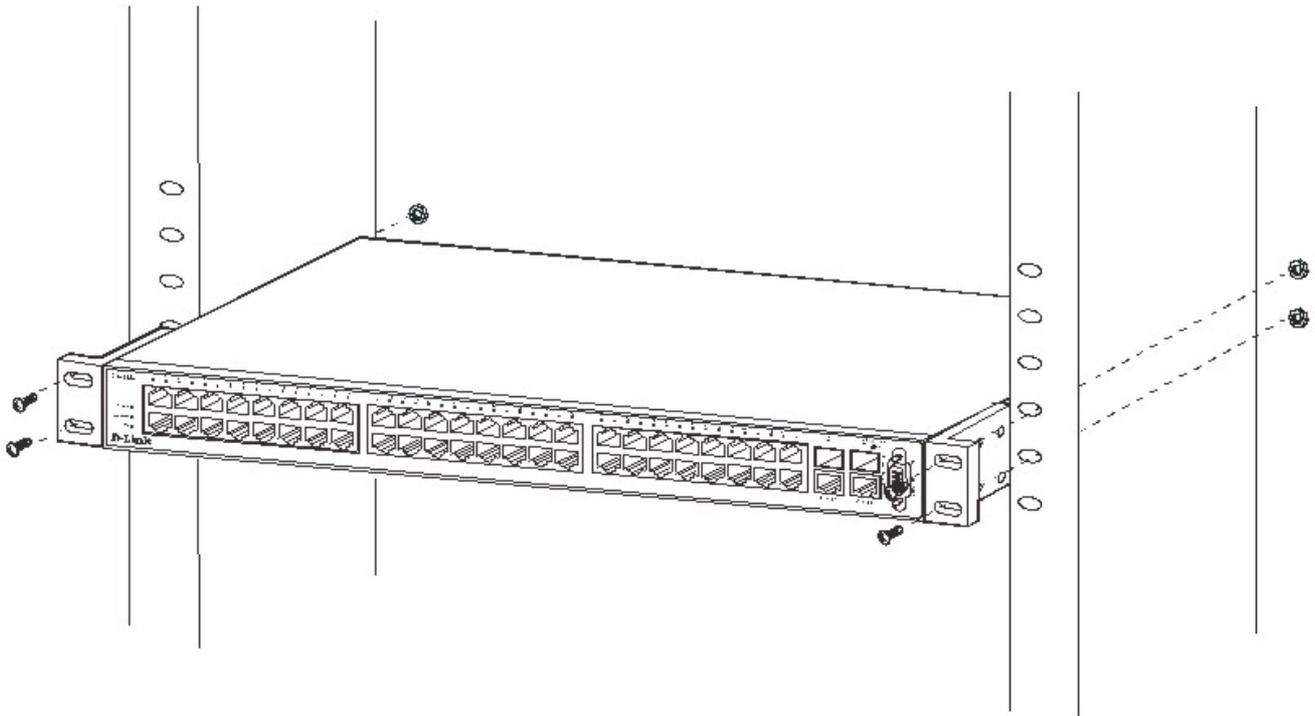


Figure 2- 3. Installing Switch in a rack

### Power On

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.

After the Switch is powered on, 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.

## Section 3

# Connecting The Switch

**Switch to End Node**

**Switch to Hub or Switch**

**Connecting To Network Backbone or Server**

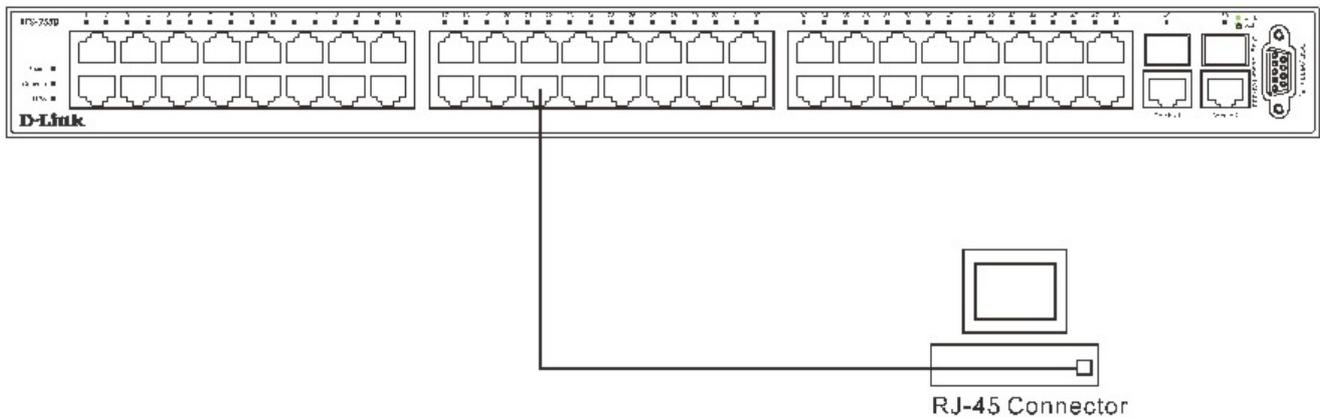


**NOTE:** All 48 high-performance NWay Ethernet ports can support both MDI-II and MDI-X connections.

## Switch to End Node

End nodes include PCs outfitted with a 10, 100 or 1000 Mbps RJ45 Ethernet/Fast Ethernet Network Interface Card (NIC) and most routers.

An end node can be connected to the Switch via a twisted-pair Category 3, 4, or 5 UTP/STP cable. The end node should be connected to any of the ports of the Switch.



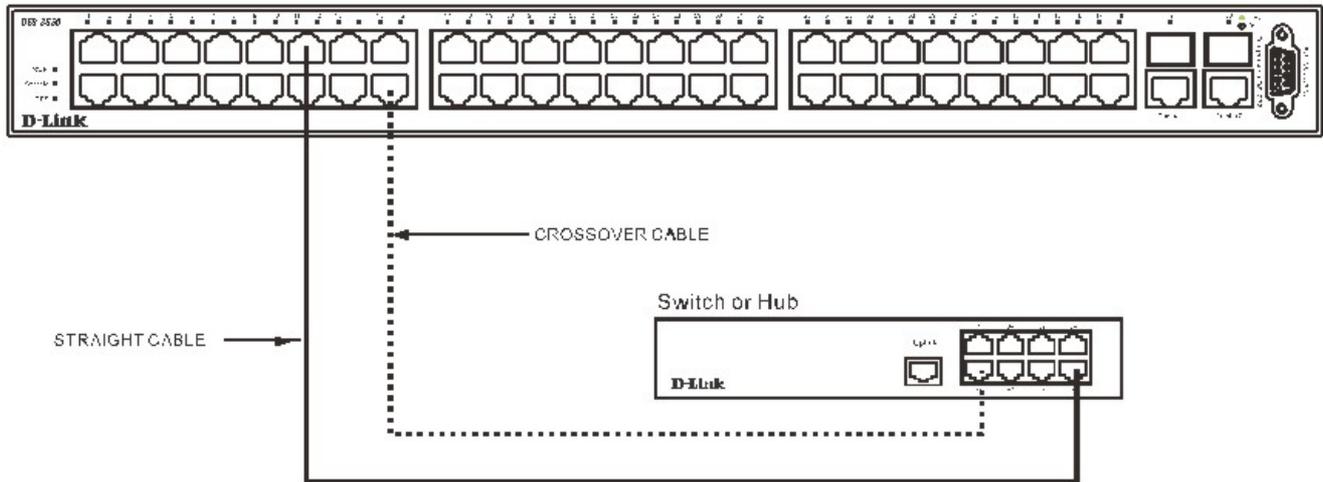
**Figure 3- 1. Switch connected to an end node**

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 Hub or Switch

These connections can be accomplished in a number of ways using a normal cable.

- A 10BASE-T hub or switch can be connected to the Switch via a twisted-pair Category 3, 4 or 5 UTP/STP cable.
- A 100BASE-TX hub or switch can be connected to the Switch via a twisted -pair Category 5 UTP/STP cable.



**Figure 3- 2. Switch connected to a port on a hub or switch using either a straight or crossover cable- any normal cable is fine**

## Connecting to Network Backbone or Server

The two Mini-GBIC combo ports are ideal for uplinking to a network backbone or server. 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.

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

## Section 4

# Introduction to Switch Management

### *Management Options*

### *Web-based Management Interface*

### *SNMP-Based Management*

### *Managing User Accounts*

### *Command Line Console Interface Through The Serial Port*

### *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.

## Web-based Management Interface

After you have successfully installed the Switch, you 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).

## SNMP-Based Management

You can manage the Switch 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.

## Command Line Console Interface through the Serial Port

You 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, you need the following equipment:

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:**

1. Connect the female connector of the RS-232 cable directly to the console port on the Switch, and tighten the captive retaining screws.
2. 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:
3. Select the appropriate serial port (COM port 1 or COM port 2).
4. Set the data rate to 9600 baud.
5. Set the data format to 8 data bits, 1 stop bit, and no parity.
6. Set flow control to none.
7. Under Properties, select VT100 for Emulation mode.
8. Select Terminal keys for Function, Arrow, and Ctrl keys. Ensure that you select Terminal keys (not Windows keys).



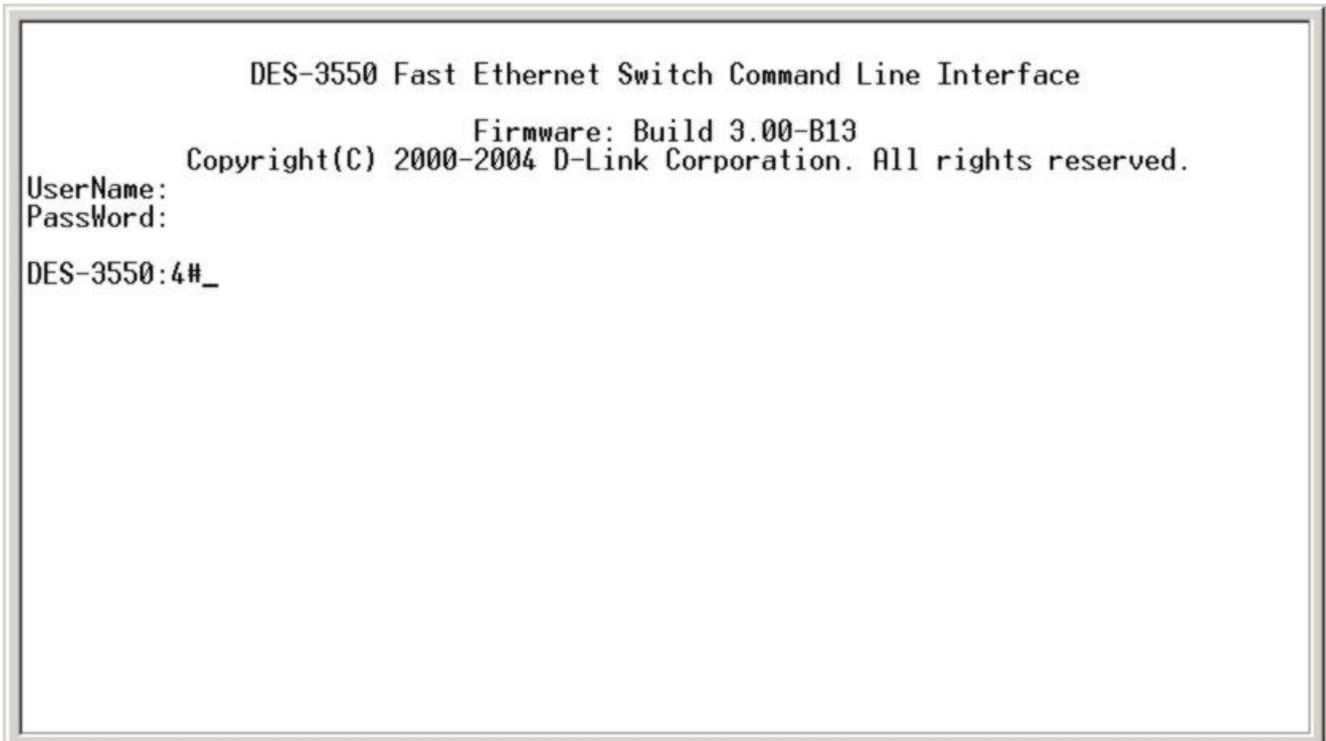
**NOTE:** When you use HyperTerminal with the Microsoft® Windows® 2000 operating system, ensure that you have Windows 2000 Service Pack 2 or later installed. Windows 2000 Service Pack 2 allows you to use arrow keys in HyperTerminal's VT100 emulation. See [www.microsoft.com](http://www.microsoft.com)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

9. 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.
10. After the boot sequence completes, the console login screen displays.
11. If you have 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. User names and passwords must first be created by the administrator. If you have previously set up user accounts, log in and continue to configure the Switch.
12. Enter the commands to complete your desired tasks. Many commands require administrator-level access privileges. Read the next section for more information on setting up user accounts. See the *DES-3550 Command Line Interface Reference Manual* on the documentation CD for a list of all commands and additional information on using the CLI.
13. When you have completed your tasks, exit the session with the logout command or close the emulator program.

Make sure the terminal or PC you are using to make this connection is configured to match these settings.

If you are having problems making this connection on a PC, make sure the emulation is set to VT-100. You will be able to set the emulation by clicking on the **File** menu in your HyperTerminal window, 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 your 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. Initial screen after first connection**

## First Time Connecting to The Switch

The Switch supports user-based security that can allow you to prevent unauthorized users from accessing the Switch or changing its settings. This section tells how to log onto the Switch.



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

When you first connect to the Switch, you will be presented with the first login screen (shown 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.

Press Enter in both the Username and Password fields. You will be given access to the command prompt **DES-3550:4#** shown below:

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

```
DES-3550 Fast Ethernet Switch Command Line Interface
Firmware: Build 3.01-B20
Copyright(C) 2000-2004 D-Link Corporation. All rights reserved.
UserName:
```

**Figure 4- 2. Command Prompt**



**NOTE:** The first user automatically gets Administrator level privileges. It is recommended to create at least one Admin-level user account for the Switch.

## Password Protection

The DES-3550 does not have a default user name and password. One of the first tasks when settings up the Switch is to create user accounts. If you log in using a predefined administrator-level user name, you have privileged access to the Switch's management software.

After your 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:

- At the CLI login prompt, enter create account admin followed by the *<user name>* and press the Enter key.
- You will be asked to provide a password. Type the *<password>* used for the administrator account being created and press the Enter key.
- You will be prompted to enter the same password again to verify it. Type the same password and press the Enter key.
- Successful creation of the new administrator account will be verified by a Success message.



**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".

```
DES-3550:4#create account admin newmanager
Command: create account admin newmanager

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

Success.

DES-3550:4#
```



**NOTICE:** CLI configuration commands only modify the running configuration file and are not saved when the Switch is rebooted. To save all your configuration changes in nonvolatile storage, you must 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 DES-3550 supports SNMP versions 1, 2c, and 3. You can specify which version of SNMP you want 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, you may create a group of SNMP managers that are allowed 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

Management and counter information are stored by the Switch in the Management Information Base (MIB). The Switch uses the standard MIB-II Management Information Base module. Consequently, values for MIB objects can be retrieved from any SNMP-based network management software. In addition to the standard MIB-II, 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

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 10.90.90.90. You can 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       : DES-3550 Fast-Ethernet Switch
Combo Port Type  : 1000Base-T + 1000Base-T
MAC Address      : 00-01-02-03-04-00
IP Address       : 10.20.25.30 (Manual)
VLAN Name        : default
Subnet Mask      : 255.0.0.0
Default Gateway  : 0.0.0.0
Boot PROM Version : Build 3.00.001
Firmware Version : Build 3.01-B20
Hardware Version : 2A1
Device S/N       :
Power Status     : Main - Abnormal, Redundant - Not Present
System Name      : DES-3550
System Location  : BR549
System Contact   : Peter Johnson
Spanning Tree    : Disabled
GVRP             : Disabled
IGMP Snooping   : Disabled
TELNET          : Enabled (TCP 23)
SSH              : Disabled
WEB              : Enabled (TCP 80)
RMON             : Disabled
CTRL+C  ESC  Quit  SPACE  Next Page  ENTER  Next Entry  All

```

**Figure 4-3. Show switch command**

The Switch's MAC address can also be found from the Web management program on the **Switch Information (Basic Settings)** window on the **Configuration** menu.

The IP address for the Switch must be set before it can be managed with 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 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, you 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 that can then be used to connect a management station to the Switch's Telnet or Web-based management agent.

```
DES-3550 Fast Ethernet Switch Command Line Interface
                          Firmware: Build 3.01-B20
                          Copyright(C) 2000-2004 D-Link Corporation. All rights reserved.
UserName:
PassWord:

DES-3550:4#config ipif System ipaddress 10.20.25.30/8
Command: config ipif System ipaddress 10.20.25.30/8

Success.

DES-3550:4#
```

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

In the above example, the Switch was assigned an IP address of 10.20.25.30 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.

## Connecting Devices to the Switch

After you assign IP addresses to the Switch, you can connect devices to the Switch.

To connect a device to an SFP transceiver port:

- Use your cabling requirements to select an appropriate SFP transceiver type.
- Insert the SFP transceiver (sold separately) into the SFP transceiver slot.
- Use the appropriate network cabling to connect a device to the connectors on the SFP transceiver.



**NOTICE:** When the SFP transceiver acquires a link, the associated integrated 10/100/ 1000BASE-T port is disabled.

## Section 5

# Web-based Switch Configuration

*Introduction*

*Login To 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 DES-3550 can be managed, configured and monitored via the embedded web-based (HTML) interface. The Switch can be managed from remote stations anywhere on the network through a standard browser such as Opera, Netscape Navigator/Communicator, or Microsoft Internet Explorer. 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.

## Login to Web Manager

To begin managing your Switch, simply run the browser you have 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:** The Factory default IP address for the Switch is 10.90.90.90.

In the page that opens, click on the **Login** to make a setup button:



**Figure 5- 1. Login Button**

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

Enter Network Password

Please type your user name and password.

Site: 10.41.44.177

Realm: DES-3550

User Name

Password

Save this password in your password list

OK Cancel

**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 windows, allows you to view performance statistics, and permits you to graphically monitor the system status.

### Areas of the User Interface

The figure below shows the user interface. The user interface is divided into three distinct areas as described in the table.

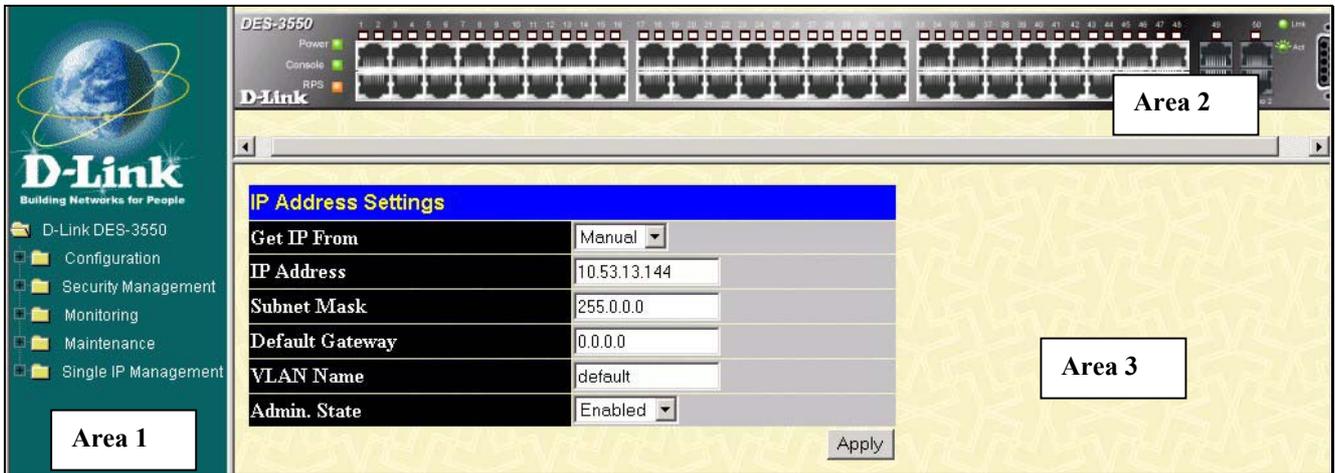


Figure 5- 3. Main Web-Manager window

Area	Function
<b>Area 1</b>	Select the folder or window to be displayed. The folder icons can be opened to display the hyperlinked menu buttons and subfolders contained within them. Click the D-Link logo to go to the D-Link website.
<b>Area 2</b>	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.  Various areas of the graphic can be selected for performing management functions, including port configuration.
<b>Area 3</b>	Presents switch information based on your selection and the entry of configuration data.



**NOTICE:** Any changes made to the Switch configuration during the current session must be saved in the Save Changes web menu (explained below) or use the command line interface (CLI) command save.

## Web Pages

When you connect 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 and description of the main folders available in the web interface:

**Configurations** – Contains windows concerning configurations for IP Address, Switch Information, Advanced Settings, Port Configuration, IGMP, Spanning Tree, Forwarding Filtering, VLANs, Port Bandwidth, SNMP Settings, Port Security, QoS, MAC Notification, LACP, Access Profile Table, System Log Servers, PAE Access Entity, and Layer 3 IP Networking.

**Security Management** – Contains windows concerning configurations for Security IP, User Accounts, Access Authentication Control (TACACS), Secure Sockets Layer (SSL), Secure Shell (SSH) and SNMP V3.

**Monitoring** – Contains windows concerning monitoring the Switch, pertaining to Port Utilization, CPU Utilization, Packets, Errors Size, MAC Address, IGMP Snooping Group, IGMP Snooping Forwarding, VLAN Status, Router Port, Port Access Control and Layer 3 Feature.

**Maintenance** – Contains windows concerning configurations and information about Switch maintenance, including TFTP Services, Switch History, Ping Test, Save Changes, Reboot Services and Logout.

**Single IP Management** – Contains windows concerning information on Single IP Management, including SIM Settings, Topology and Firmware/Configuration downloads.



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

## Section 6

# Configuring The Switch

*Switch Information*

*IP Address*

*Advanced Settings*

*Port Configuration*

*Port Description*

*Port Mirroring*

*Link Aggregation*

*LACP Port Setting*

*MAC Notification*

*IGMP*

*Spanning Tree*

*Forward Filtering*

*VLANs*

*Port Security*

*QoS*

*System Log Servers*

*SNTP Settings*

*Access Profile Table*

*PAE Access Entity*

*Layer 3 IP Networking*

## Switch Information

The subsections below describe how to change some of the basic settings for the Switch such as changing IP settings and assigning user names and passwords for management access privileges, as well as how to save the changes and restart the Switch.

Click the **Switch Information** link in the **Configuration** menu.

Switch Information (Basic Settings)	
Device Type	DES-3550
External Ports	1000TX + 1000TX
MAC Address	00:01:02:03:04:00
Boot PROM Version	3.00.001
Firmware Version	3.01-B20
Hardware Version	2A1
Power Status	Main - Abnormal, Redundant - Not Present
System Name	<input type="text" value="DES-3550"/>
System Location	<input type="text" value="BR549"/>
System Contact	<input type="text" value="Peter Johnson"/>
<input type="button" value="Apply"/>	

**Figure 6- 1. Switch Information (Basic Settings) window**

The **Switch Information (Basic Settings)** 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.

## 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 *DES-3550 Command Line Interface 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 Settings** window located in the **Configuration** folder.

### To configure the Switch's IP address:

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

IP Address Settings	
Get IP From	Manual ▾
IP Address	10.41.44.177
Subnet Mask	255.0.0.0
Default Gateway	0.0.0.0
VLAN Name	default
Admin. State	Enabled ▾
Auto Config State	Disabled ▾
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 you want to access the Switch from a different subnet from the one it is installed on, enter the IP address of the Default Gateway. If you will manage the Switch from the subnet on which it is installed, you can leave the default address (0.0.0.0) in this field.
4. If no VLANs have been previously configured on the Switch, you can use the *default* VLAN Name. The *default VLAN* contains all of the Switch ports as members. If VLANs have been previously configured on the Switch, you 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 10.90.90.90 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 how the Switch will be assigned an IP address on the next reboot.



**NOTE:** If you enable the **AutoConfig**, the **Get IP From** setting will automatically become DHCP.

The IP Address Settings options are:

Parameter	Description
<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.
<b>Admin State</b>	This allows the user to enable or disable the Admin State for the IP interface, by using the pull-down menu. Disabling this feature will render all remote management inoperable, and thus the only way to configure the Switch will be to use the Console port for the Command Line Interface.
<b>Auto Config State</b>	When autoconfig is enabled, the Switch is instructed to get a configuration file via TFTP, and it becomes a DHCP client automatically. The configuration file will be loaded upon booting up. In order to use Auto Config, 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 running and have the requested configuration file stored in its base directory when the request is received from the Switch. Consult the DHCP server and/or TFTP server software instructions for information on loading a configuration file for use by a client. (Also see the section titled Upload Configuration for instructions on uploading a configuration to a TFTP server.  If the Switch is unable to complete the autoconfiguration process the previously saved configuration file present in Switch memory will be loaded.

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

## 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 10.90.90.90. You can change the default Switch IP address to meet the specification of your networking address scheme.

The IP address for the Switch must be set before it can be managed with 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 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, you 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.

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 agent using the above IP address to connect to the Switch.

## Advanced Settings

The **Switch Information (Advanced Settings)** window contains the main settings for all major functions for the Switch. To view this window, click its link in the **Configuration** folder. This will enable the following window to be viewed and configured.

Switch Information (Advanced Settings)	
Serial Port Auto Logout Time	Never <input type="button" value="v"/>
MAC Address Aging Time	300 <input type="text"/>
IGMP Snooping	Disabled <input type="button" value="v"/>
GVRP Status	Disabled <input type="button" value="v"/>
Telnet Status	Enabled <input type="button" value="v"/>
TCP Port Number (1-65535)	23 <input type="text"/>
Web Status	Enabled
Web TCP Port Number	80 <input type="text"/>
Link Aggregation Algorithm	MAC Source <input type="button" value="v"/>
RMON Status	Disabled <input type="button" value="v"/>
802.1x Status	Port Base <input type="button" value="v"/>
802.1x Authentication Protocol	RADIUS EAP <input type="button" value="v"/>
Asymmetric VLAN	Disabled <input type="button" value="v"/>
Syslog Global State	Disabled <input type="button" value="v"/>
<input type="button" value="Apply"/>	

Figure 6- 3. Switch Information (Advanced Settings) window

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>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). The default age-out time for the Switch is <i>300</i> seconds. 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 page under the IGMP folder.
<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>TCP Port Number (1-65535)</b>	The TCP port number. TCP ports are numbered between <i>1</i> and <i>65535</i> . 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</b>	The TCP port number currently being utilized by the Switch to connect to the web interface. The "well-known" TCP port for the Web interface is <i>80</i> .
<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>RMON Status</b>	Remote monitoring (RMON) of the Switch is <i>Enabled</i> or <i>Disabled</i> here.
<b>802.1x Status</b>	The Switch's 802.1x function may be enabled by port or by MAC Address; 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>802.1x 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>Asymmetric VLAN</b>	This field will enable or disable Asymmetric VLANs on the Switch. The default is <i>Disabled</i> .
<b>Syslog Global State</b>	Enables or disables Syslog State; default is <i>Disabled</i> .

Click **Apply** to implement changes made.



**NOTE:** When the Asymmetric VLAN function is Disabled, the user must change the VLAN setting on the Switch to its default configurations.

## Port Configurations

This section contains information for configuring various attributes and properties for individual physical ports, including port speed and flow control. Clicking on **Port Configurations** in the **Configuration** menu will display the following window for the user:

The screenshot shows the 'Port Configuration' window. At the top, there is a configuration form with the following fields: 'From' (Port 1), 'To' (Port 1), 'State' (Disabled), 'Speed/Duplex' (Auto), 'FlowCtrl' (Disabled), 'Learn' (Disabled), and an 'Apply' button. Below the form is a table titled 'The Port Information Table'.

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

Figure 6- 4. Port Configuration 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:

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. <i>Auto</i> denotes auto-negotiation between 10 and 100 Mbps devices, in full- or half-duplex. The <i>Auto</i> 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 <i>Auto</i> , <i>10M/Half</i> , <i>10M/Full</i> , <i>100M/Half</i> and <i>100M/Full</i> . There is no automatic adjustment of port settings with any option other than <i>Auto</i> .
<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 <i>Auto</i> ports use an automatic selection of the two. The default is <i>Disabled</i> .
<b>Learn</b>	Enable or disable MAC address learning for the selected ports. When <i>Enabled</i> , destination and source MAC addresses are automatically listed in the forwarding table. When learning is <i>Disabled</i> , 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 <i>Disabled</i> .

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

## Port Description

The DES-3550 supports a port description feature where the user may name various ports on the Switch. To assign names to various ports, click the **Port Description** on the **Configuration** menu:

From	To	Description	Apply
Port 1	Port 1		Apply

Port Description Table	
Port	Description
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	

**Figure 6- 5. 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.

## 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 **Configuration** folder.

Setup Port Mirroring																									
Source 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"/>																								
Ingress	<input type="radio"/>																								
Egress	<input type="radio"/>																								
Both	<input type="radio"/>																								
Source Port	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
None	<input type="radio"/>																								
Ingress	<input type="radio"/>																								
Egress	<input type="radio"/>																								
Both	<input type="radio"/>																								
Target Port	Port 1																								
Status	Disabled																								
Apply																									
<p><b>Note(1):</b> The "Source Port" and "Target Port" should be different or the setup will be invalid.</p> <p><b>Note(2):</b> The "Target Port" should be a non-trunked port.</p> <p>The Trunking Ports: None</p>																									

Figure 6- 6. Setup Port Mirroring window

### To configure a mirror port:

Select the Source Port from where you want to copy frames and the Target Port, which receives the copies from the source port.

Select the Source Direction, Ingress, Egress, or Both and change the Status drop-down menu to *Enabled*.

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



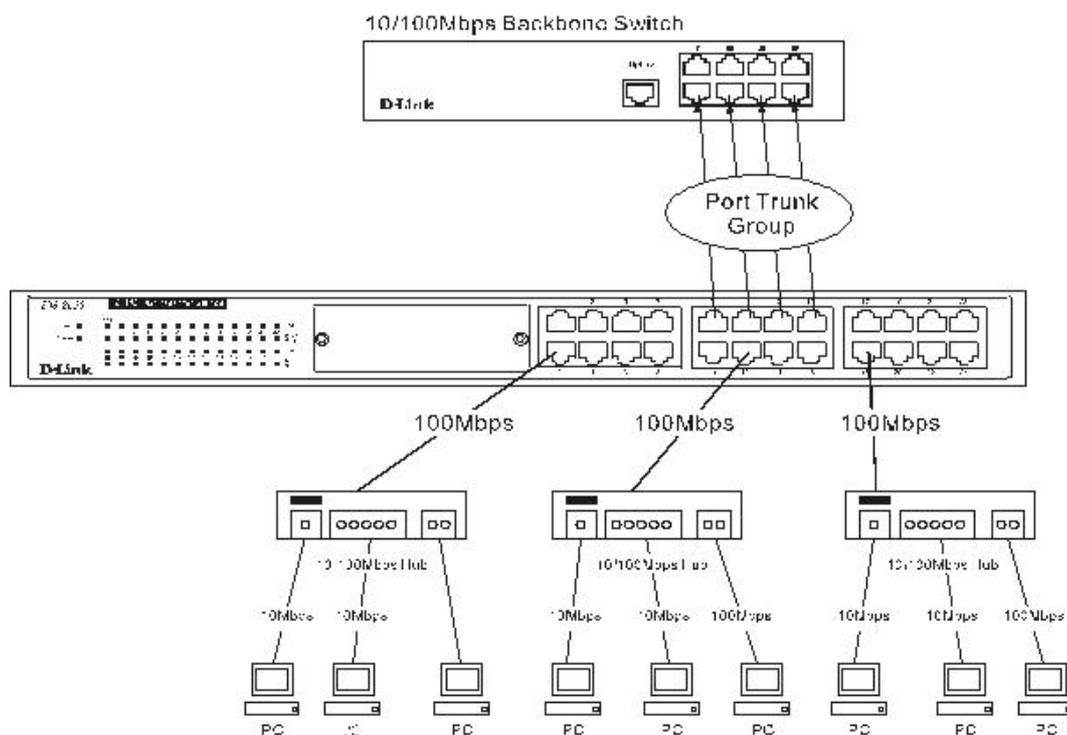
**NOTE:** You cannot mirror a fast port onto a slower port. For example, if you try to mirror the traffic from a 100 Mbps port onto a 10 Mbps port, this can cause throughput problems. The port you are copying frames from should always support an equal or lower speed than the port to which you are sending 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.

# Link Aggregation

## Understanding Port Trunk Groups

Port trunk groups are used to combine a number of ports together to make a single high-bandwidth data pipeline.

The DES-3550 supports up to six port trunk groups with 2 to 8 ports in each group. A potential bit rate of 8000 Mbps can be achieved.



**Figure 6- 7. 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 uplinked 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.

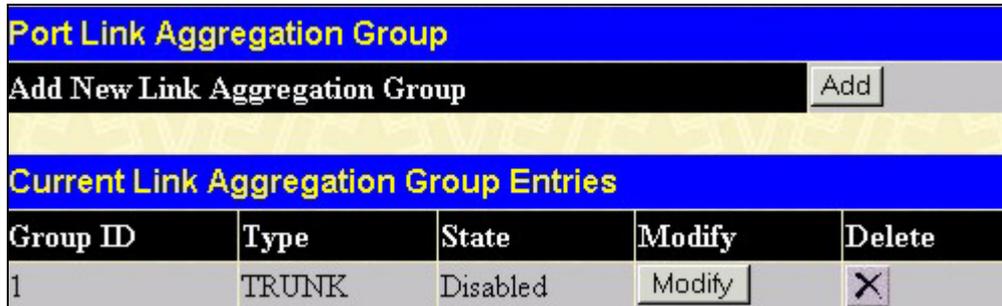
The Switch allows the creation of up to six link aggregation groups, each group consisting of 2 to 8 links (ports). The aggregated links must be contiguous (they must have sequential port numbers) except the two (optional) Gigabit ports, which can only belong to a single link aggregation group. All of 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.

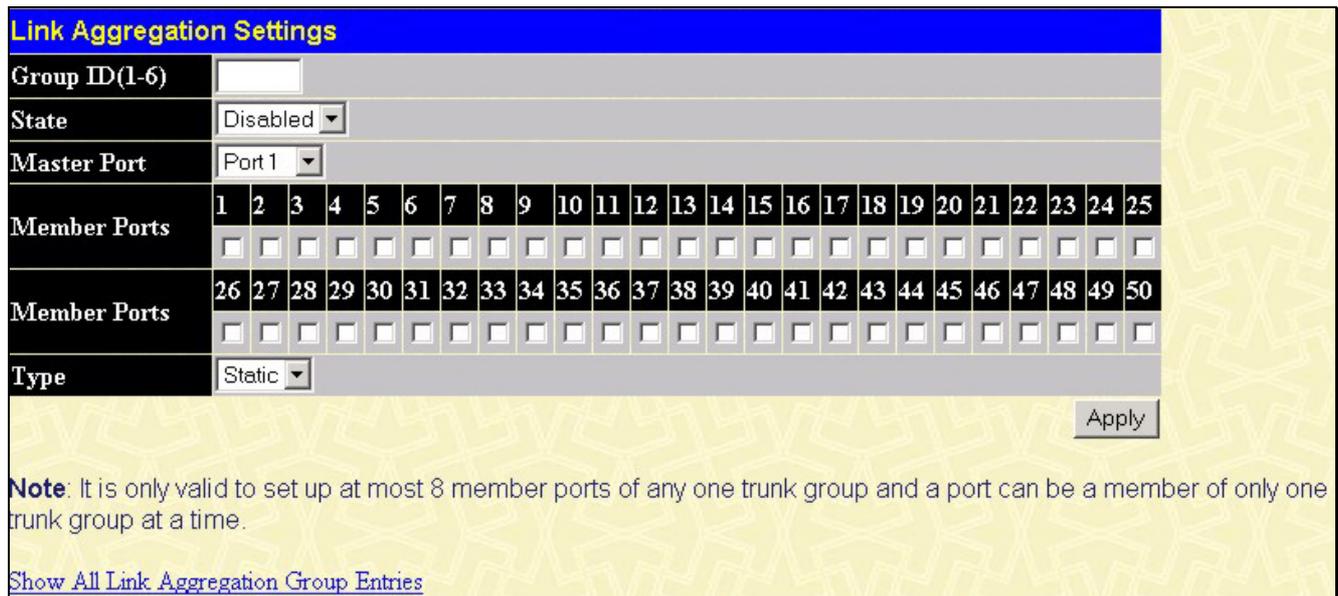
To configure port trunking, click on the **Link Aggregation** hyperlink in the **Configuration** folder to bring up the **Port Link Aggregation Group** window:



Port Link Aggregation Group				
Add New Link Aggregation Group				Add
Current Link Aggregation Group Entries				
Group ID	Type	State	Modify	Delete
1	TRUNK	Disabled	Modify	X

**Figure 6- 8. Port Link Aggregation Group window**

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



**Link Aggregation Settings**

Group ID(1-6)

State

Master Port

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"/>																								
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
<input type="checkbox"/>																								

Type

Apply

**Note:** It is only valid to set up at most 8 member ports of any one trunk group and a port can be a member of only one trunk group at a time.

[Show All Link Aggregation Group Entries](#)

**Figure 6- 9. Link Aggregation Settings window – Add**

Link Aggregation Settings																																																			
Group ID(1-6)	1																																																		
State	Enabled																																																		
Master Port	Port 1																																																		
Member Ports	<table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td> </tr> <tr> <td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td> </tr> </table>	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 checked="" type="checkbox"/>	<input type="checkbox"/> type="checkbox"/>																							
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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>																																								
Member Ports	<table border="1"> <tr> <td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td> </tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td> </tr> </table>	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	<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	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50																											
<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"/>																											
Type	Static																																																		
Active Port	1																																																		
Flooding Port	Port 1																																																		
Apply																																																			

**Note:** It is only valid to set up at most 8 member ports of any one trunk group and a port can be a member of only one trunk group at a time.

[Show All Link Aggregation Group Entries](#)

**Figure 6- 10. Link Aggregation Settings window - Modify**

The user-changeable parameters are as follows:

Parameter	Description
<b>Group ID</b>	Select an ID number for the group, between 1 and 6.
<b>State</b>	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.
<b>Master Port</b>	Choose the Master Port for the trunk group using the pull down menu.
<b>Member Ports</b>	Choose the members of a trunked group. Up to 8 ports per group can be assigned to a group.
<b>Flooding Port</b>	A trunking group must designate one port to allow transmission of broadcasts and unknown unicasts.
<b>Active Port</b>	Shows the port that is currently forwarding packets.
<b>Type</b>	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 as seen in Figure 6-8.

## 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.

From	To	Mode	Apply
Port 1	Port 1	Passive	Apply

LACP Port Table	
Port	Activity
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
15	Passive
16	Passive

Figure 6- 11. LACP Port Settings window

The user may set the following parameters:

Parameter	Description
<b>From/To</b>	A consecutive group of ports may be configured starting with the selected port.
<b>Mode</b>	<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.

## MAC Notification

**MAC Notification** is used to monitor MAC addresses learned and entered into the forwarding database.

### MAC Notification Global Settings

To globally set MAC notification on the Switch, open the following screen by opening the **MAC Notification** folder and clicking the **MAC Notification Global Settings** link:

**Figure 6- 12. MAC Notification Global Setting window**

The following parameters may be modified:

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

### MAC Notification Port Settings

To change MAC notification settings for a port or group of ports on the Switch, click **Port Settings** in the **MAC Notification** folder, which will display the following window:

**Figure 6- 13. MAC Notification Port Settings window**

The following MAC Notification parameters may be set:

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

Click **Apply** to implement changes made.

## 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 **Advanced Settings**). You may then fine-tune the settings for each VLAN using the **IGMP Snooping** link in the **Configuration** 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

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.

Current IGMP Snooping Group Entries				
VLAN ID	VLAN Name	State	Querier State	Modify
1	default	Disabled	Disabled	<input type="button" value="Modify"/>
4094	Trinity	Disabled	Disabled	<input type="button" value="Modify"/>

Figure 6- 14. Current IGMP Snooping Group Entries window

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

IGMP Snooping Settings	
VLAN ID	4094
VLAN Name	Trinity
Query Interval	<input type="text" value="125"/>
Max Response Time	<input type="text" value="10"/>
Robustness Value	<input type="text" value="2"/>
Last Member Query Interval	<input type="text" value="1"/>
Host Timeout(1-16711450)	<input type="text" value="260"/>
Router Timeout(1-16711450)	<input type="text" value="260"/>
Leave Timer(0-16711450)	<input type="text" value="2"/>
Querier State	Disabled ▾
State	Disabled ▾
<input type="button" value="Apply"/>	
<a href="#">Show All IGMP Group Entries</a>	

Figure 6- 15. 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.

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

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 folder** and then click on the **Static Router Ports Entry** link to open the **Current Static Router Ports Entries** window, as shown below.

Current Static Router Ports Entries		
VLAN ID	VLAN Name	Modify
1	default	Modify
4094	Trinity	Modify

Figure 6- 16. Current Static Router Ports Entries window

The **Current Static Router Ports Entries** window (shown above) 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.

Static Router Ports Settings																								
VID	1																							
VLAN Name	default																							
<b>Member Ports</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
<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	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
<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"/>
Apply																								
<a href="#">Show All Static Router Ports Entries</a>																								

Figure 6- 17. 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>	There are the ports on the Switch that will have a multicast router attached to them.

Click **Apply** to implement the new settings, Click the [Show All Static Router Port Entries](#) link to return to the **Current Static Router Port Entries** window.

## 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 either 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. These instances will be classified by an MSTI ID. 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) that 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.

802.1d MSTP	802.1w RSTP	802.1d STP	Forwarding	Learning
Discarding	Discarding	Disabled	No	No
Discarding	Discarding	Blocking	No	No
Discarding	Discarding	Listening	No	No
Learning	Learning	Learning	No	Yes
Forwarding	Forwarding	Forwarding	Yes	Yes

**Table 6- 1. Comparing Port States**

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 **Configuration** menu and click the **STP Bridge Global Settings** link.

STP Bridge Global Settings	
STP Status	Disabled ▾
STP Version	STP ▾
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 ▾
MST Configuration Identification	
Configuration Name	00:80:C8:35:26:A0
Revision Level(0-65535)	0
Apply	

Figure 6- 18. STP Bridge Global Settings window (STP)

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 ▾
MST Configuration Identification	
Configuration Name	00:80:C8:35:26:A0
Revision Level(0-65535)	0
Apply	

Figure 6- 19. STP Bridge Global Settings window - RSTP



**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 = 2 x (Forward Delay - 1 second)

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

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 ▾
MST Configuration Identification	
Configuration Name	00:80:C8:35:26:A0
Revision Level(0-65535)	0
Apply	

Figure 6- 20. STP Bridge Global Settings window

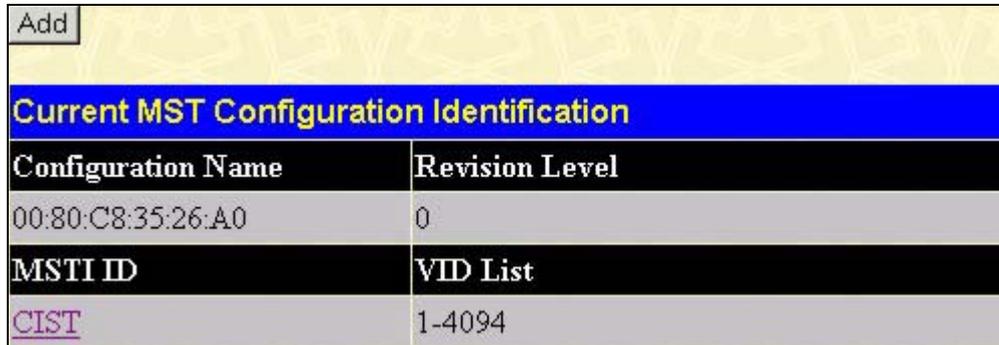
The following parameters can be set:

Parameter	Description
<b>MST Configuration Identification</b>	
<b>STP Status</b>	Use the pull-down menu to enable or disable STP globally on the Switch. The default is <i>Disabled</i> .
<b>STP Version</b>	Use the pull-down menu to choose the desired version of STP to be implemented on the Switch. There are three choices: <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 Enabled.
<b>MST Configuration Identification</b>	
<b>Configuration Name</b>	Enter an alphanumeric string of up to 32 characters to uniquely identify the MSTP region on the Switch. This Configuration Name, along with the Revision Level value will identify the MSTP region configured on the Switch. If no name is entered, the default name will be the MAC address of the device. This field is only valid when MSTP is the version of STP globally set on the Switch.
<b>Revision Level (0-65535)</b>	Enter a number between 0 and 65535 to identify the MSTP region. This value, along with the name will identify the MSTP region configured on the Switch. The default setting is 0. This field is only valid when MSTP is the version of STP globally set on the Switch.

Click **Apply** to implement changes made.

## MST Configuration Table

The following window allows 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 **Configuration > Spanning Tree > MST Configuration Table**:



Current MST Configuration Identification	
Configuration Name	Revision Level
00:80:C8:35:26:A0	0
MSTI ID	VID List
<a href="#">CIST</a>	1-4094

**Figure 6- 21. Current MST Configuration Identification window**

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 <b>STP Bridge Global Settings</b> window.
<b>Revision Level</b>	This value, along with the Configuration Name will identify the MSTP region configured on the Switch. This field can also be set in the <b>STP Bridge Global Settings</b> window.
<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:



Instance ID Settings	
MSTI ID	<input type="text"/>
Type	Create ▾
VID List (1-4094)	<input type="text"/>
Priority (0-61440)	<input type="checkbox"/> <input type="text"/>
<input type="button" value="Apply"/>	
<a href="#">Show MST Configuration Table</a>	

**Figure 6- 22. 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.
<b>Priority (0-61440)</b>	Select a value between 0 and 61440 to specify the priority for a specified MSTI for forwarding packets. The lower the value, the higher the priority. This entry must be divisible by 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:

Instance ID Settings	
MSTI ID	<input type="text" value="0"/>
Type	Set Priority Only ▾
VID List (1-4094)	<input type="text"/>
Priority (0-61440)	<input checked="" type="checkbox"/> <input type="text"/>
<input type="button" value="Apply"/>	
<a href="#">Show MST Configuration Table</a>	

Figure 6- 23. 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>	The type of configuration about to be processed. This window is used to set the priority for the CIST only. All other parameters are permanently set and therefore unchangeable.
<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.
<b>Priority (0-61440)</b>	Select a value between 0 and 61440 to specify the priority for a specified MSTI for forwarding packets. The lower the value, the higher the priority. This entry must be divisible by 4094.

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 6- 24. 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>	<p>This field allows the user to choose a desired method for altering the MSTI settings. The user has 4 choices.</p> <p><i>Add</i> - Select this parameter to add VIDs to the MSTI ID, in conjunction with the VID List parameter.</p> <p><i>Remove</i> - Select this parameter to remove VIDs from the MSTI ID, in conjunction with the VID List parameter.</p> <p><i>Delete</i> - Select this parameter to delete this MSTI ID.</p> <p><i>Set Priority Only</i> - Select this parameter to set the priority for the MSTI ID. This field is used in conjunction with the Priority field.</p>
<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> .
<b>Priority (0-61440)</b>	Select a value between 0 and 61440 to specify the priority for a specified MSTI for forwarding packets. The lower the value, the higher the priority. This entry must be divisible by 4094 and can only be utilized if the Type chosen is <i>Set Priority Only</i> .

Click **Apply** to implement changes made.

## MSTI Settings

This window displays the current MSTI configuration settings 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 **Configuration > Spanning Tree > MSTP Settings**:

Msti	Designated Bridge	Internal PathCost	Prio	Status	Role
<a href="#">0</a>	8000/0050ba7120d6	200000	128	Forwarding	Root
<a href="#">2</a>	1002/0080c83526a0	200000	128	Forwarding	Master

**Figure 6- 25. MSTP Port Information window**

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 6- 26. MSTI Settings window**

Parameter	Description
<b>Instance ID &lt;0&gt;</b>	Displays the MSTI ID of the instance being configured. An entry of <i>0</i> in this field denotes the CIST (default MSTI).
<b>Internal cost (0=Auto) &lt;200000&gt;</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 <i>0</i> (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 1-2000000</i> - Selecting this parameter with a value in the range of <i>1</i> to <i>2000000</i> will set the quickest route when a loop occurs. A lower Internal cost represents a quicker transmission.
<b>Priority &lt;128&gt;</b>	Enter a value between <i>0</i> and <i>240</i> 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 **Configuration > Spanning Tree > STP Instance Settings**:

STP Instance Table		
Instance Type	Instance Status	Instance Priority
<a href="#">CIST</a>	Enabled	32768(bridge priority : 32768, sys ID ext : 0)
<a href="#">MSTI(2)</a>	Enabled	4098(bridge priority : 4096, sys ID ext : 2)

**Figure 6- 27. STP Instance Table window**

The following information is displayed:

Parameter	Description
<b>Instance Type</b>	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.
<b>Instance Status</b>	Displays the current status of the corresponding MSTI ID
<b>Instance Priority</b>	Displays the priority of the corresponding MSTI ID. The lowest priority will be the root bridge.

Click **Apply** to implement changes made.

## MSTP Port Information

STP can be set up on a port per port basis. To view the following window click **Configuration > Spanning Tree > MST Port Information**:

STP Port Settings								
From	To	External Cost(0=Auto)	Hello Time	Migrate	Edge	P2P	Forward BPDU	State
Port 1	Port 1	0		Yes	False	True	False	Disabled
Apply								
MSTP Port Information Table								
Port	External Cost	Hello Time	Edge	P2P	Forward BPDU	Port STP State		
1	AUTO/200000	2/2	No/No	Auto/Yes	False	Enabled		
2	AUTO/200000	2/2	No/No	Auto/Yes	False	Enabled		
3	AUTO/200000	2/2	No/No	Auto/Yes	False	Enabled		
4	AUTO/200000	2/2	No/No	Auto/Yes	False	Enabled		
5	AUTO/200000	2/2	No/No	Auto/Yes	False	Enabled		
6	AUTO/200000	2/2	No/No	Auto/Yes	False	Enabled		

**Figure 6- 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.



**NOTE:** If you want to enable Forwarding BPDU on a per port basis, the following settings must first be in effect: 1. STP must be globally disabled and 2. Forwarding BPDU must be globally enabled. These are the default settings configurable in the **STP Bridge Global Settings** menu discussed previously.

The following STP Port Settings fields can be set:

Parameter	Description
<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> <1>	The time interval between the transmission of configuration messages by the designated port, to other devices on the bridged LAN, thus stating that the Switch is still functioning. 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>	Setting this parameter as "yes" will set the ports to send out BPDU packets to other bridges, requesting information on their STP setting. If the Switch is configured for RSTP, the port will be capable to migrate from 802.1d STP to 802.1w RSTP. If the Switch is configured for MSTP, the port is capable of migrating from 802.1d STP to 802.1s MSTP. RSTP and MSTP can coexist with standard STP, however the benefits of RSTP and MSTP are not realized on a port where an 802.1d network connects to an 802.1w or 802.1s enabled network. Migration should be set as yes on ports connected to network stations or segments that are capable of being upgraded to 802.1w RSTP or 802.1s MSTP on all or some portion of the segment.
<b>Edge</b> <False>	Choosing the <i>True</i> 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 <i>False</i> parameter indicates that the port does not have edge port status.
<b>P2P</b> <True>	Choosing the <i>True</i> 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 <i>False</i> indicates that the port cannot have p2p status. <i>Auto</i> 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 <i>false</i> . The default setting for this parameter is <i>true</i> .
<b>Forward BPDU</b> <False>	<p>Choosing <i>True</i> will allow the forwarding of BPDU packets in the specified ports from other network devices. This will go into effect only if STP is globally disabled AND Forwarding BPDU is globally enabled (See <b>STP Bridge Global Settings</b> above).</p> <p>The default setting <i>False</i>, does not forward BPDU packets when STP is disabled.</p>
<b>State</b> <Disabled>	This drop-down menu allows you to enable or disable STP for the selected group of ports. The default is <i>Enabled</i> .

Click **Apply** to implement changes made.

## Forwarding Filtering

### Unicast Forwarding

Open the **Forwarding Filtering** folder in the **Configuration** menu and click on the **Unicast Forwarding** link. This will open the **Setup Static Unicast Forwarding Table** window, as shown below:

VLAN ID	MAC Address	Allowed to Go Port
1	00:00:00:00:00:00	Port 1

Add/Modify

MAC Address	VID	VLAN Name	Port	Delete
-------------	-----	-----------	------	--------

Figure 6- 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>Allowed to Go Port</b>	Allows the selection of the port number on which the MAC address entered above resides.

Click **Apply** to implement the changes made. To delete an entry in the Static Unicast Forwarding Table, click the corresponding  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 window below:

Add new Multicast Forwarding Settings

VLAN ID	MAC Address	Type	Modify	Delete
---------	-------------	------	--------	--------

Figure 6- 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																									
<input type="text"/>		<input type="text" value="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"/>	<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"/>	<input type="radio"/>	
Port	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		
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"/>	<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"/>	<input type="radio"/>	
<input type="button" value="Apply"/>																											
<a href="#">Show All Multicast Forwarding Entries</a>																											

Figure 6- 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  under the **Delete** heading. Click the **Show All Multicast Forwarding Entries** link to return to the **Static Multicast Forwarding Settings** window.

## Multicast Port Filtering

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 Port Filtering Mode Setup** link to see the entry screen below:

Multicast Port Filtering Mode Setup			
From	To	Mode	Apply
Port 1 ▾	Port 1 ▾	Forward All Groups ▾	Apply

Multicast Port Filtering Mode Table	
Port	Mode
1	Forward Unregistered Groups
2	Forward Unregistered Groups
3	Forward Unregistered Groups
4	Forward Unregistered Groups
5	Forward Unregistered Groups
6	Forward Unregistered Groups
7	Forward Unregistered Groups
8	Forward Unregistered Groups
9	Forward Unregistered Groups
10	Forward Unregistered Groups
11	Forward Unregistered Groups
12	Forward Unregistered Groups
13	Forward Unregistered Groups
14	Forward Unregistered Groups

**Figure 6- 32. Multicast Port Filtering Mode Setup window**

The following parameters can be set:

Parameter	Description
<b>From/To</b>	These two drop-down menus allow you to select a range of ports that the filter settings will be applied to.
<b>Mode</b>	<p>This drop-down menu allows you to select the action the Switch will take when it receives a multicast packet that is to be forwarded to one of the ports in the range specified above.</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>

Click **Apply** to implement changes made.

# 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 1, 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.

A weighted round robin system is 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 1, 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 DES-3550

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 DES-3550 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.

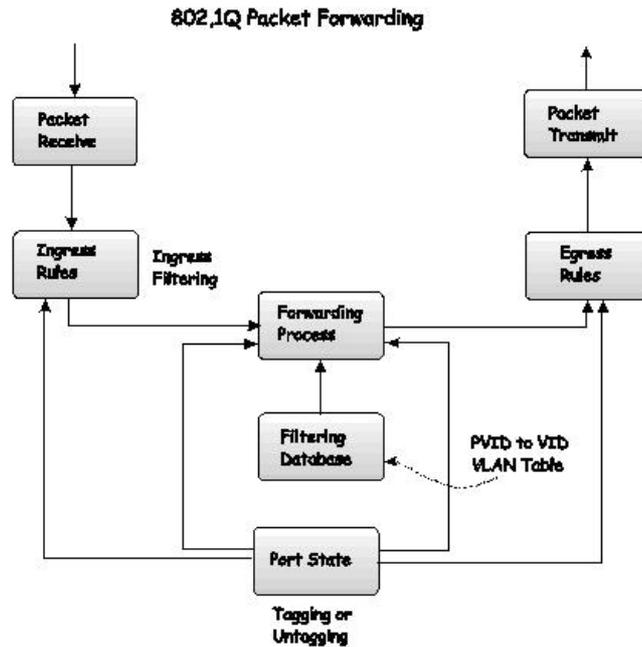


Figure 6- 33. IEEE 802.1Q Packet Forwarding

## 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.

### IEEE 802.1Q Tag

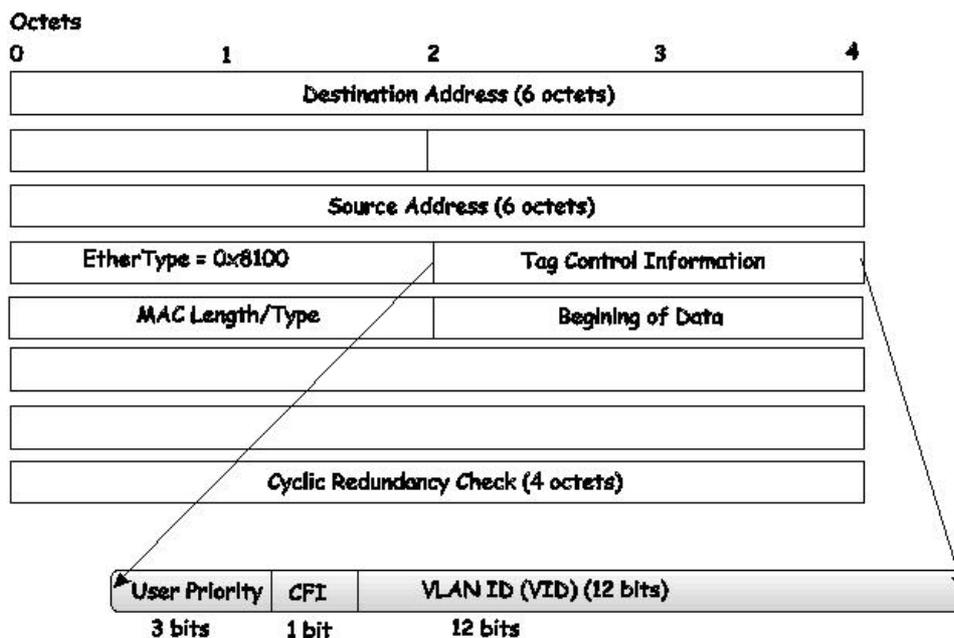
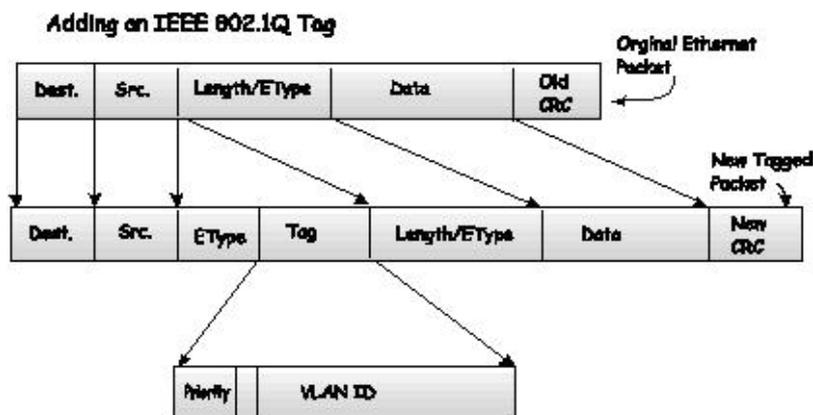


Figure 6- 34. IEEE 802.1Q Tag

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 6- 35. 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. The VLAN information in the tag can then be used by other 802.1Q compliant devices on the network to make packet-forwarding decisions.

Ports with untagging enabled will strip the 802.1Q tag from all packets that flow into and out of those ports. If the packet 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:

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

**Table 6- 2. VLAN Example - Assigned Ports**

## 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 **Configuration** folder, open the **VLAN** folder and click the **Static VLAN Entry** link to open the following window:

802.1Q Static VLANs			
Add new 802.1Q VLAN			Add
Current 802.1Q Static VLANs Entries			
VLAN ID	VLAN name	Modify	Delete
1	default	Modify	X
4094	Trinity	Modify	X

**Figure 6- 36. 802.1Q Static VLANs Entries window**

The **802.1Q Static VLANs** windows lists all previously configured VLANs by VLAN ID and VLAN Name. To delete an existing 802.1Q VLAN, click the corresponding  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 VLAN																									
VID	VLAN Name																								Advertisement
<input type="text"/>	<input type="text"/>																								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"/>																								
None	<input type="checkbox"/>																								
Egress	<input type="checkbox"/>																								
Forbidden	<input type="checkbox"/>																								
Port Settings	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
Tag	<input checked="" type="checkbox"/>																								
None	<input type="checkbox"/>																								
Egress	<input type="checkbox"/>																								
Forbidden	<input type="checkbox"/>																								
<input type="button" value="Apply"/>																									
<a href="#">Show All Static VLAN Entries</a>																									

Figure 6- 37. 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 255 static VLAN entries.

802.1Q Static VLAN																									
VID	VLAN Name															Advertisement									
1	default															Enabled ▾									
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 type="checkbox"/>																								
None	<input type="radio"/>																								
Egress	<input checked="" type="radio"/>																								
Forbidden	<input type="radio"/>																								
Port Settings	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
Tag	<input type="checkbox"/>																								
None	<input type="radio"/>																								
Egress	<input checked="" type="radio"/>																								
Forbidden	<input type="radio"/>																								
Apply																									
<a href="#">Show All Static VLAN Entries</a>																									

Figure 6- 38. 802.1Q Static VLAN window - Modify

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

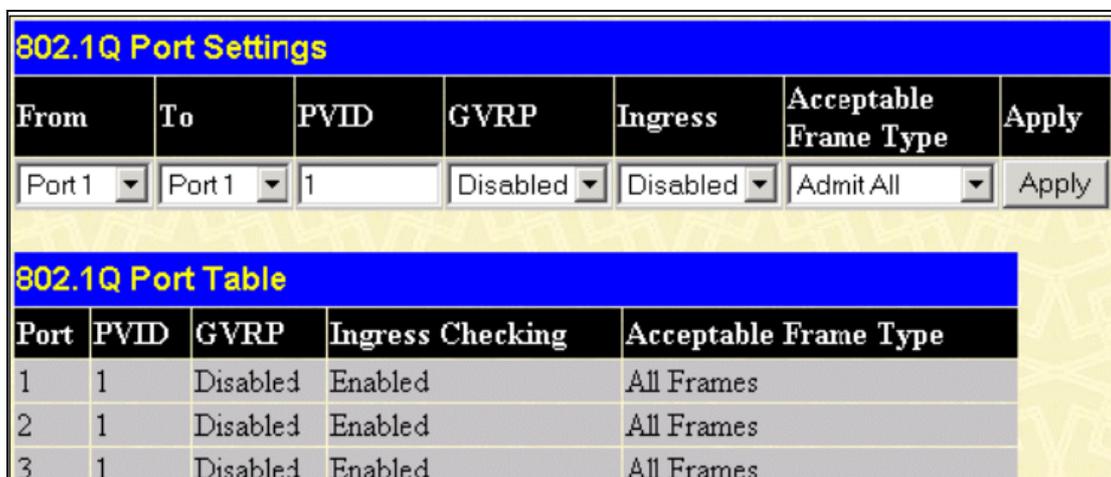
Parameter	Description
<b>VID (VLAN ID)</b>	Allows the entry of a VLAN ID in the <b>Add</b> window, or displays the VLAN ID of an existing VLAN in the <b>Modify</b> window. VLANs can be identified by either the VID or the VLAN name.
<b>VLAN Name</b>	Allows the entry of a name for the new VLAN in the <b>Add</b> window, or for editing the VLAN name in the <b>Modify</b> 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 **Configuration** menu, open the **VLANs** folder and click **GVRP Setting**.

The **802.1Q Port Settings** dialog box, 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.



From	To	PVID	GVRP	Ingress	Acceptable Frame Type	Apply
Port 1	Port 1	1	Disabled	Disabled	Admit All	Apply

Port	PVID	GVRP	Ingress Checking	Acceptable Frame Type
1	1	Disabled	Enabled	All Frames
2	1	Disabled	Enabled	All Frames
3	1	Disabled	Enabled	All Frames

Figure 6- 39. 802.1Q Port Settings window

The following fields can be set:

Parameter	Description
<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 <b>802.1Q Port Settings</b> 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 a packet is received by the port, and Ingress filtering is enabled, the port will compare the VID of the incoming packet to its PVID. If the two are unequal, the port will drop the packet. If the two are equal, the port will receive the packet.
<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</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 means both tagged and untagged frames will be accepted. <i>Admit_All</i> is enabled by default.

Click **Apply** to implement changes made.

## Traffic Control

Use the **Traffic Control Setting** window to enable or disable storm control and adjust the threshold for multicast and broadcast storms, as well as DLF (Destination Look Up Failure). Traffic control settings are applied to individual Switch modules. To view the following window, click **Configuration > VLANs > Traffic Control**:

Traffic Control Setting					
Group	Broadcast Storm	Multicast Storm	Destination Lookup Fail	Threshold	Apply
1 ▾	Disabled ▾	Enabled ▾	Enabled ▾	128	Apply

Traffic Control Information Table				
Group[ports]	Broadcast Storm	Multicast Storm	Destination Lookup Fail	Threshold
1[1-8]	Disabled	Disabled	Disabled	128
2[9-16]	Disabled	Disabled	Disabled	128
3[17-24]	Disabled	Disabled	Disabled	128
4[25-32]	Disabled	Disabled	Disabled	128
5[33-40]	Disabled	Disabled	Disabled	128
6[41-48]	Disabled	Disabled	Disabled	128
7[49]	Disabled	Disabled	Disabled	128
8[50]	Disabled	Disabled	Disabled	128

**Figure 6- 40. Traffic Control Setting window**

Traffic or storm control is used to stop broadcast, multicast or ARP request storms that may result when a loop is created. The Destination Look Up Failure control is a method of shutting down a loop when a storm is formed because a MAC address cannot be located in the Switch's forwarding database and it must send a packet to all ports or all ports on a VLAN.

To configure Traffic Control, first select a group of ports by using the Group pull-down menu. As seen in the figure above, this section is set by 5 specified groups of ports on the Switch.

- Group 1 refers to ports 1 through 8;
- Group 2 refers to ports 9 through 16;
- Group 3 refers to ports 17 through 24;
- Group 4 refers to ports 25 through 32;
- Group 5 refers to ports 33 through 40;
- Group 6 refers to ports 41 through 48;
- Group 7 refers to mini GBIC port 49;
- Group 8 refers to mini GBIC port 50.

Broadcast Storm, Multicast Storm and Destination Unknown may be *Enabled* or *Disabled* for either group.

The Threshold value is the upper threshold at which the specified traffic control is switched on. This is the number of Broadcast, Multicast or DLF packets, in Kpps, received by the Switch that will trigger the storm traffic control measures. The Threshold value can be set from 0 to 255 kilo packets. The default setting is 128. The settings of each port may be viewed in the Traffic Control Table in the same window.

Click **Apply** to implement changes made.

## Port Security

A given port's (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.

Port Security Settings					
From	To	Admin State	Max. Learning Addr (0-20)	Lock Address Mode	Apply
Port 1	Port 1	Disabled	1	Delete On Reset	Apply

Port Security Table			
Port	Admin State	Max. Learning Addr.	Lock Address Mode
1	Disabled	1	DeleteOnReset
2	Disabled	1	DeleteOnReset
3	Disabled	1	DeleteOnReset
4	Disabled	1	DeleteOnReset
5	Disabled	1	DeleteOnReset
6	Disabled	1	DeleteOnReset
7	Disabled	1	DeleteOnReset
8	Disabled	1	DeleteOnReset
9	Disabled	1	DeleteOnReset
10	Disabled	1	DeleteOnReset
11	Disabled	1	DeleteOnReset
12	Disabled	1	DeleteOnReset
13	Disabled	1	DeleteOnReset
14	Disabled	1	DeleteOnReset
15	Disabled	1	DeleteOnReset
16	Disabled	1	DeleteOnReset
17	Disabled	1	DeleteOnReset
18	Disabled	1	DeleteOnReset
19	Disabled	1	DeleteOnReset
20	Disabled	1	DeleteOnReset
21	Disabled	1	DeleteOnReset
22	Disabled	1	DeleteOnReset
23	Disabled	1	DeleteOnReset
24	Disabled	1	DeleteOnReset
25	Disabled	1	DeleteOnReset
26	Disabled	1	DeleteOnReset
27	Disabled	1	DeleteOnReset
28	Disabled	1	DeleteOnReset

Figure 6- 41. Port Security Settings window

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 you to enable or disable Port Security (locked MAC address table for the selected ports).
<b>Max. Learning Addr. (0-20)</b>	The number of MAC addresses that will be in the MAC address forwarding table for the selected switch and group of ports.
<b>Lock Address Mode</b>	This pull-down menu allows you to select 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 not age out after the aging timer expires. <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.

Click **Apply** to implement changes made.

## QoS

The DES-3550 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.

### 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 DES-3550 implements 802.1P priority queuing.

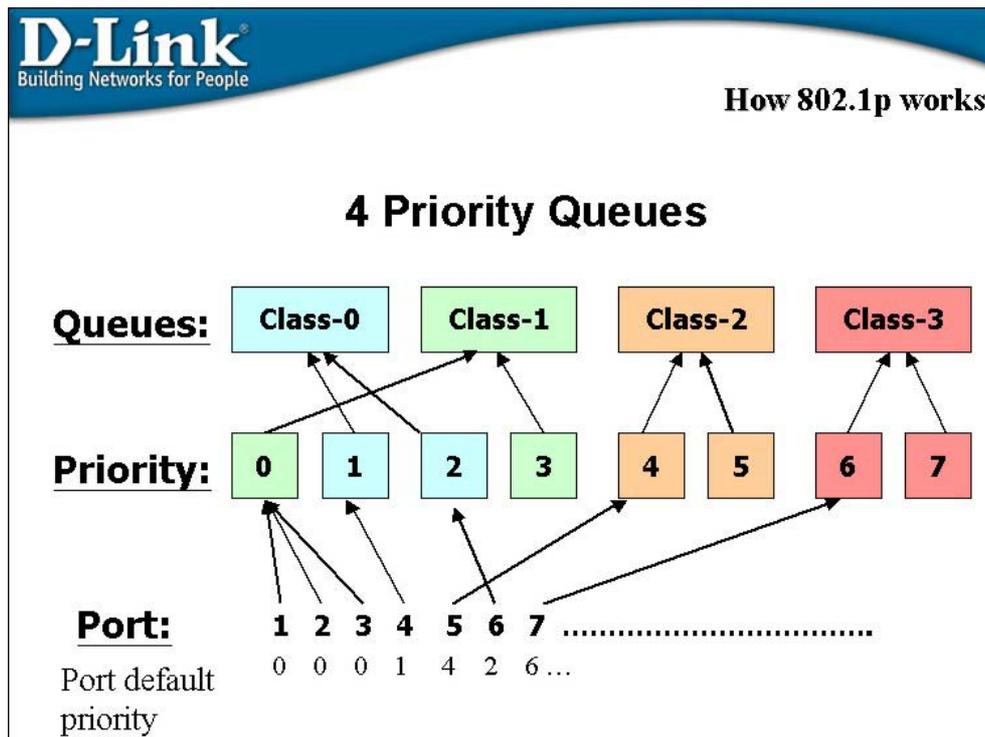


Figure 6- 42. Mapping QoS on the Switch

The picture above shows the default priority setting for the Switch. Class-3 has the highest priority of the four priority queues 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 tagged. Then the user may forward these tagged packets to designated queues on the Switch where they will be emptied, based on priority.

For example, let's 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 Switch has four priority queues. These priority queues are labeled as 3, the high queue to 0, the lowest queue. The eight priority tags, specified in IEEE 802.1p are mapped to the Switch's priority tags as follows:

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

For strict priority-based scheduling, any packets residing in the higher priority queues are transmitted first. Multiple strict priority queues empty based on their priority tags. Only when these queues 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 DES-3550 has four priority queues (and four Classes of Service) for each port on the Switch.

## Port Bandwidth

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

Bandwidth Settings					
From	To	Type	No Limit	Rate	Apply
Port 1	Port 1	RX	Disabled	1	Apply

Port Bandwidth Table		
Port	RX Rate (Mbit/sec)	TX Rate (Mbit/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
11	No Limit	No Limit
12	No Limit	No Limit

**Figure 6- 43. Bandwidth Settings 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 you to select 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 you to specify that the selected port will have no bandwidth limit. <i>Enabled</i> disables the limit.
<b>Rate</b>	This field allows you to enter the data rate, in kb/s, that will be the limit for the selected port.

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

## Scheduling

QoS can be customized by changing the output scheduling used for the hardware queues in the Switch. As with any changes to QoS implementation, careful consideration should be given to how network traffic in lower priority queues is affected. Changes in scheduling may result in unacceptable levels of packet loss or significant transmission delay. If you choose 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 window shown below.

QoS Output Scheduling		
	Max. Packets(0-255)	Max. Latency(0-255)
Class-0	<input type="text" value="0"/>	<input type="text" value="0"/>
Class-1	<input type="text" value="0"/>	<input type="text" value="0"/>
Class-2	<input type="text" value="0"/>	<input type="text" value="0"/>
Class-3	<input type="text" value="0"/>	<input type="text" value="0"/>
		<input type="button" value="Apply"/>

Figure 6- 44. QoS Output Scheduling window

You may assign the following values to the QoS classes to set the scheduling.

Parameter	Description
<b>Max. Packets (0-255)</b>	Specifies the maximum number of packets the above specified hardware priority queue will be allowed to transmit before allowing the next lowest priority queue to transmit its packets. A value between 0 and 255 can be specified.
<b>Max. Latency (0-255)</b>	Specifies the maximum amount of time the above specified hardware priority queue will be allowed to transmit packets before allowing the next lowest hardware priority queue to begin transmitting its packets. A value between 0 and 255 can be specified - with this value multiplied by 16 ms to arrive at the total allowed time for the queue to transmit packets. For example, a value of 3 specifies $3 \times 16 = 48$ ms. The queue will continue transmitting the last packet until it is finished when the max latency timer expires.

Click **Apply** to implement changes made.



**NOTE:** The settings you assign to the queues, numbers 0-7, represent the IEEE 802.1p priority tag number. Do not confuse these settings with port numbers.

## 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 window 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

**Figure 6- 45. 802.1p Default Priority Settings window**

This window allows you to assign a default 802.1p priority to any given port on the Switch. The priority queues are numbered from 0, the lowest priority, to 7, the highest priority. Click **Apply** to implement your settings.

## 802.1p User Priority

The DES-3550 allows the assignment of a user priority to each of the 802.1p priorities. In the **Configuration** folder open the **QoS** folder and click **802.1p User Priority**, to view the window shown below.

Priority	Class
Priority-0	Class-1
Priority-1	Class-0
Priority-2	Class-0
Priority-3	Class-1
Priority-4	Class-2
Priority-5	Class-2
Priority-6	Class-3
Priority-7	Class-3

Apply

**Figure 6- 46. QoS Class of Traffic window**

Once you have assigned a priority to the port groups on the Switch, you can then assign this Class to each of the four levels of 802.1p priorities. Click **Apply** to set your changes.

## Traffic Segmentation

Traffic segmentation is used to limit traffic flow from a single port to a group of ports on either a single switch (in standalone mode) or a group of ports on another switch in a switch stack (Single IP). 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.

In the **Configuration** folder open the **QoS** folder and click **Traffic Segmentation**, to view the window shown below.

Traffic Segmentation Table	
Port	Forward Portlist
1	1-50
2	1-50
3	1-50
4	1-50
5	1-50
6	1-50
7	1-50
8	1-50
9	1-50
10	1-50
11	1-50
12	1-50
13	1-50

**Figure 6- 47. Traffic Segmentation Setting window**

This window allows you to determine which port on a given switch will be allowed to forward packets to other ports on that switch.

The user may set the following parameters:

Parameter	Description
<b>Port</b>	Check the corresponding boxes for the port(s) you wish to transmit packets.
<b>Forward Portlist</b>	Check the boxes to select which of the ports on the Switch will be able to forward packets. These ports will be allowed to receive packets from the port specified above.

Clicking the **Apply** button will enter the combination of transmitting port and allowed receiving ports into the Switch's Traffic Segmentation Table.

## System Severity Alerts

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.

**Figure 6- 48. System Severity Settings**

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

Parameter	Description
<b>Severity Name</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 Type</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.

Click **Apply** to implement the new System Severity alert level.

## System Log Server

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

System Log Servers						
Add New System Log Server						Add
Current System Log Servers						
Index	Server IP	Severity	Facility	UDP Port	Status	Delete
<a href="#">1</a>	10.1.1.1	warning	Local0	514	Enabled	<input type="checkbox"/>

Figure 6- 49. System Log Servers window

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

System Log Server	
Index	<input type="text" value="0"/>
Server IP	<input type="text" value="0.0.0.0"/>
Severity	<input type="text" value="Warning"/>
Facility	<input type="text" value="Local0"/>
UDP Port	<input type="text" value="0"/>
Status	<input type="text" value="Disabled"/>
Apply	
<a href="#">Show All System Log Servers</a>	

Figure 6- 50. System Log Server window – Add

The following parameters can be set:

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> <p>Numerical Facility Code</p> <p>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 local use 0 (local0)</b> <b>17 local use 1 (local1)</b> <b>18 local use 2 (local2)</b> <b>19 local use 3 (local3)</b> <b>20 local use 4 (local4)</b> <b>21 local use 5 (local5)</b> <b>22 local use 6 (local6)</b> <b>23 local use 7 (local7)</b></p>
<b>UDP Port (514 or 6000-65535)</b>	Type the UDP port number used for sending Syslog messages. The default is 0.
<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  under the Delete heading of the entry you wish to delete. To return to the **System Log Servers** window, click the [Show All System Log Servers link](#).

## SNTP Settings

### Current Time Settings

To configure the time settings for the Switch, open the **Configuration** folder, then the **SNTP** folder and click on the **Current Time Setting** link, revealing the following screen for the user to configure.

Current Time: Status	
Current Time	0 days 00:52:52
Time Source	System Clock
Current Time: SNTP Settings	
SNTP State	Disabled ▾
SNTP Primary Server	0.0.0.0
SNTP Secondary Server	0.0.0.0
SNTP Poll Interval in Seconds	720
Apply	
Current Time: Set Current Time	
Year	2002 ▾
Month	January ▾
Day	01 ▾
Time in HH MM	00 ▾ 00 ▾
Apply	

Figure 6- 51. Current Time: Status window

The following parameters can be set or are displayed:

Parameter	Description
Current Time: Status	
<b>Current Time</b>	Displays the time when the Switch was initially started for this session.
<b>Time Source</b>	Displays the time source for the system.
Current Time: SNTP Settings	
<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</b>	This is the interval, in seconds, between requests for updated SNTP information.
Current Time: Set Current Time	
<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</b>	Enter the current time in hours and minutes, if you would like to update the system clock.

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 **Configuration** folder, then the **SNTP** folder and click on the **Time Zone and DST** link, revealing the following window.

Time Zone and DST Settings	
Daylight Saving Time State	Disabled ▾
Daylight Saving Time Offset in Minutes	60 ▾
Time Zone Offset from GMT in +/-HH:MM	- ▾ 06 ▾ 00 ▾
Apply	
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 ▾
Apply	
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- 52. Time Zone and DST Settings window

The following parameters can be set:

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

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

## Access Profile Table

### Configuring the Access Profile Table

Access profiles allow you to establish criteria to determine whether or not the Switch will forward packets based on the information contained in each packet's header.



**Note:** Treatment of the Access Profile feature has been changed for the Release III version of the firmware. There are also some restrictions on the use of access profiles on the Switch. For more information on the changes for Release III and the limitations on access profiles, please read the CLI Reference Manual's discussion of Access Control Lists (ACL) Commands.

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.

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** window, as shown below.

Add			
Access Profile Table			
Profile ID	Type	Access Rule	Delete
1	IP	Modify	X
2	Ethernet	Modify	X
3	Packet Content Mask	Modify	X

**Figure 6- 53. Access Profile Table window**

To add an entry to the Access Profile Table, click the **Add** button. This will open the **Access Profile Configuration** window, as shown below. There are three **Access Profile Configuration** windows; 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** windows by using the Type drop-down menu. The window shown below is the **Access Profile Configuration** window for Ethernet.



**Note:** Up to 9 Access Profiles may be created for the Switch. The Profile ID is used for relative priority for an Access Profile should a conflict arise between a rule created in one profile and a rule created in a different profile. Please read the CLI Reference Manual chapter discussing Access Control List (ACL) Commands.

Figure 6- 54. Access Profile Configuration window (Ethernet)

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

Parameter	Description
<b>Profile ID (1-255)</b>	Type in a unique identifier number for this profile set. The number is used to set the relative priority for the profile. Priority is set relative to other profiles where the lowest profile ID has the highest priority. If a conflict occurs among configured access rules, the profile ID establishes relative priority of the rules. The value can be set from 1 to 255 however there is a limit to the total number of profiles that can be created.
<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. <ul style="list-style-type: none"> <li>Select <i>Ethernet</i> to instruct the Switch to examine the layer 2 part of each packet header.</li> <li>Select <i>IP</i> to instruct the Switch to examine the IP address in each frame's header.</li> <li>Select <i>Packet Content Mask</i> to specify a mask to hide the content of the packet header.</li> </ul>
<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 window shown below is the **Access Profile Configuration** window for IP.

**Figure 6- 55. Access Profile Configuration window (IP)**

The following parameters can be set, for IP:

Parameter	Description
<b>Profile ID (1-255)</b>	Type in a unique identifier number for this profile set. The number is used to set the relative priority for the profile. Priority is set relative to other profiles where the lowest profile ID has the highest priority. If a conflict occurs among configured access rules, the profile ID establishes relative priority of the rules. The value can be set from 1 to 255 however there is a limit to the total number of profiles tht can be created.
<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. <ul style="list-style-type: none"> <li>Select <i>Ethernet</i> to instruct the Switch to examine the layer 2 part of each packet header.</li> <li>Select <i>IP</i> to instruct the Switch to examine the IP address in each frame's header.</li> <li>Select <i>Packet Content Mask</i> to specify a mask to hide the content of the packet header.</li> </ul>

Parameter	Description
<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>	<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> <ul style="list-style-type: none"> <li>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.</li> </ul> <p>Select IGMP to instruct the Switch to examine the Internet Group Management Protocol (IGMP) field in each frame's header.</p> <ul style="list-style-type: none"> <li>Select Type to further specify that the access profile will apply an IGMP type value</li> </ul> <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 deny. Flag bits are parts of a packet that determine what to do with the packet. The user may deny packets by denying 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> <ul style="list-style-type: none"> <li>src port mask - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff), which you wish to deny.</li> <li>dest port mask - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff) which you wish to deny.</li> </ul> <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> <ul style="list-style-type: none"> <li>src port mask - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff).</li> <li>dest port mask - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff).</li> </ul> <p>protocol id - Enter a value defining the protocol ID in the packet header to mask. Specify up to 5, Layer 4 port masks for the destination port in hex form (hex 0x0-0xffffffff).</p>

The window shown below is the **Access Profile Configuration** window for Packet Content Mask.

Access Profile Configuration		
Profile ID(1-255)	1	
Type	Packet Content Mask	
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
Apply		
<a href="#">Show All Access Profile Table Entries</a>		

**Figure 6- 56. Access Profile Configuration window (Packet Content Mask)**

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

Parameter	Description
<b>Profile ID (1-255)</b>	Type in a unique identifier number for this profile set. The number is used to set the relative priority for the profile. Priority is set relative to other profiles where the lowest profile ID has the highest priority. If a conflict occurs among configured access rules, the profile ID establishes relative priority of the rules. The value can be set from 1 to 255 however there is a limit to the total number of profiles tht can be created.
<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. <ul style="list-style-type: none"> <li>Select <i>Ethernet</i> to instruct the Switch to examine the layer 2 part of each packet header.</li> <li>Select <i>IP</i> to instruct the Switch to examine the IP address in each frame's header.</li> <li>Select <i>Packet Content Mask</i> to specify a mask to hide the content of the packet header.</li> </ul>

Parameter	Description
<b>Offset</b>	<p>This field will instruct the Switch to mask the packet header beginning with the offset value specified:</p> <ul style="list-style-type: none"> <li>• <i>value (0-15)</i> - Enter a value in hex form to mask the packet from the beginning of the packet to the 16th byte.</li> <li>• <i>value (16-31)</i> – Enter a value in hex form to mask the packet from byte 16 to byte 31.</li> <li>• <i>value (32-47)</i> – Enter a value in hex form to mask the packet from byte 32 to byte 47.</li> <li>• <i>value (48-63)</i> – Enter a value in hex form to mask the packet from byte 48 to byte 63.</li> <li>• <i>value (64-79)</i> – Enter a value in hex form to mask the packet from byte 64 to byte 79.</li> </ul>

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** window. Under the heading Access Rule, clicking **Modify**, will open the following window.

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

[Show All Access Profile Entries](#)

**Figure 6- 57. Access Rule Table window**

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.

**Access Rule Configuration**

Profile ID: 2

Mode:  Permit  Deny

Access ID: 1  Auto Assign

Type: IP

Priority(0-7):  0  Replace Priority with

Replace Dscp with(0-63):  0

VLAN Name:

Source IP: 0.0.0.0

Destination IP: 0.0.0.0

Dscp(0-63): 0

Protocol: ICMP: type 0 code 0

Port Number:

[Show All Access Rule Entries](#)

Apply

**Figure 6- 58. Access Rule Configuration window (IP)**

Configure the following Access Rule Configuration settings:

Parameter	Description
<b>Profile ID</b>	Type in a unique identifier number for this profile set. The number is used to set the relative priority for the profile. Priority is set relative to other profiles where the lowest profile ID has the highest priority. If a conflict occurs among configured access rules, the profile ID establishes relative priority of the rules. The value can be set from 1 to 255 however there is a limit to the total number of profiles that can be created.
<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 (1-65535)</b>	Type in a unique identifier number for this access or use <b>Auto Assign</b> .
<b>Type</b>	Selected profile based on Ethernet (MAC Address), IP address or Packet Content Mask. <ul style="list-style-type: none"> <li><i>Ethernet</i> instructs the Switch to examine the layer 2 part of each packet header.</li> <li><i>IP</i> instructs the Switch to examine the IP address in each frame's header.</li> <li><i>Packet Content Mask</i> instructs the Switch to examine the packet header</li> </ul>
<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 (0-7) 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.

Parameter	Description
<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>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>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 user may set the Access Rule to <i>Permit</i> or <i>Deny</i> on a per-port basis by entering a port number in this field. Any other specified criteria applies as well.

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

Access Rule Display	
Profile ID	2
Access ID	6
Mode	Permit
Type	IP
Priority	-----
Replace Dscp with	-----
VLAN Name	-----
Source IP	0.0.0.0
Destination IP	0.0.0.0
Dscp	-----
Protocol	ICMP-- type:0 ,code:0
Port Number	Port 2
<a href="#">Show All Access Rule Entries</a>	

**Figure 6- 59. 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 window:

Add

Access Rule Table					
Profile ID	Mode	Type	Access ID	Display	Delete
1	Permit	Ethernet	1	<a href="#">View</a>	

[Show All Access Profile Entries](#)

Figure 6- 60. Access Rule Table window

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	1
Mode	<input checked="" type="radio"/> Permit <input type="radio"/> Deny
Access ID	1 <input type="checkbox"/> Auto Assign
Type	Ethernet
Priority(0-7)	<input type="checkbox"/> 0 <input type="checkbox"/> Replace Priority with
Replace Dscp with(0-63)	<input type="checkbox"/> 0
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 Number	

[Show All Access Rule Entries](#)

Figure 6- 61. Access Rule Configuration window (Ethernet)

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

Parameters	Description
<b>Profile ID</b>	Type in a unique identifier number for this profile set. The number is used to set the relative priority for the profile. Priority is set relative to other profiles where the lowest profile ID has the highest priority. If a conflict occurs among configured access rules, the profile ID establishes relative priority of the rules. The value can be set from 1 to 255 however there is a limit to the total number of profiles that can be created.
<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 (1-65535)</b>	Type in a unique identifier number for this access or use <b>Auto Assign</b> .
<b>Type</b>	Selected profile based on Ethernet (MAC Address), IP address or Packet Content Mask. <ul style="list-style-type: none"> <li>• <i>Ethernet</i> instructs the Switch to examine the layer 2 part of each packet header.</li> <li>• <i>IP</i> instructs the Switch to examine the IP address in each frame's header.</li> <li>• <i>Packet Content Mask</i> instructs the Switch to examine the packet header</li> </ul>
<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 (0-7) 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 to 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 user may set the Access Rule to <i>Permit</i> or <i>Deny</i> on a per-port basis by entering a port number in this field. Any other specified criteria applies as well.

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

Access Rule Display	
Profile ID	1
Access ID	1
Mode	Permit
Type	Ethernet
Priority	-----
Replace Dscp with	-----
VLAN Name	default
Source MAC	-----
Destination MAC	-----
802.1p	-----
Ethernet Type	0
Port Number	Port 23

[Show All Access Rule Entries](#)

**Figure 6- 62. Access Rule Display window (Ethernet)**

To configure the Access Rule for Packet Content Mask, open the Access Profile Table and click **Modify** for a Packet Content Mask entry. This will display the Access Rule Table.

Access Rule Table					
Profile ID	Mode	Type	Access ID	Display	Delete
3	Permit	Packet Content Mask	1	<b>View</b>	

[Show All Access Profile Entries](#)

**Figure 6- 63. Access Rule Table window (Packet Content Mask)**

To remove a previously created rule, select it and click the button. Access rules are indexed using the Access ID number. To locate a specific Access Rule in the table, enter the Access ID and click **Find**. To display all rules in the table, click the **View All Entries** button.

To add a new Access Rule, click the **Add** button above the Access Rule Table to view the Access Rule Configuration menu.

Access Rule Configuration		
Profile ID	3	
Mode	<input checked="" type="radio"/> Permit <input type="radio"/> Deny	
Access ID	1 <input type="checkbox"/> Auto Assign	
Type	Packet Content Mask	
Priority(0-7)	<input type="checkbox"/> <input type="text"/> <input type="checkbox"/> Replace Priority with	
Replace Dscp with(0-63)	<input type="checkbox"/> <input type="text"/>	
Offset	<input type="checkbox"/> value(0-15)	mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
	<input type="checkbox"/> value(16-31)	mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
	<input type="checkbox"/> value(32-47)	mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
	<input type="checkbox"/> value(48-63)	mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
	<input type="checkbox"/> value(64-79)	mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
		mask <input type="text" value="00000000"/>
Port Number	<input type="text"/>	
<input type="button" value="Apply"/>		

Figure 6- 64. Access Rule Configuration window (Packet Content Mask)

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

Parameter	Description
<b>Profile ID</b>	Type in a unique identifier number for this profile set. The number is used to set the relative priority for the profile. Priority is set relative to other profiles where the lowest profile ID has the highest priority. If a conflict occurs among configured access rules, the profile ID establishes relative priority of the rules. The value can be set from 1 to 255 however there is a limit to the total number of profiles that can be created.
<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 (1-65535)</b>	Type in a unique identifier number for this access or use <b>Auto Assign</b> .
<b>Type</b>	Selected profile based on Ethernet (MAC Address), IP address or Packet Content Mask. <ul style="list-style-type: none"> <li>• <i>Ethernet</i> instructs the Switch to examine the layer 2 part of each packet header.</li> <li>• <i>IP</i> instructs the Switch to examine the IP address in each frame's header.</li> <li>• <i>Packet Content Mask</i> instructs the Switch to examine the packet header.</li> </ul>
<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 (0-7) 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>Offset</b>	This field will instruct the Switch to mask the packet header beginning with the offset value specified: <ul style="list-style-type: none"> <li>• <i>value (0-15)</i> - Enter a value in hex form to mask the packet from the beginning of the packet to the 16th byte.</li> <li>• <i>value (16-31)</i> - Enter a value in hex form to mask the packet from byte 16 to byte 31.</li> <li>• <i>value (32-47)</i> - Enter a value in hex form to mask the packet from byte 32 to byte 47.</li> <li>• <i>value (48-63)</i> - Enter a value in hex form to mask the packet from byte 48 to byte 63.</li> <li>• <i>value (64-79)</i> - Enter a value in hex form to mask the packet from byte 64 to byte 79.</li> </ul>
<b>Port</b>	The user may set the Access Rule to <i>Permit</i> or <i>Deny</i> on a per-port basis by entering a port number in this field. Any other specified criteria applies as well.

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

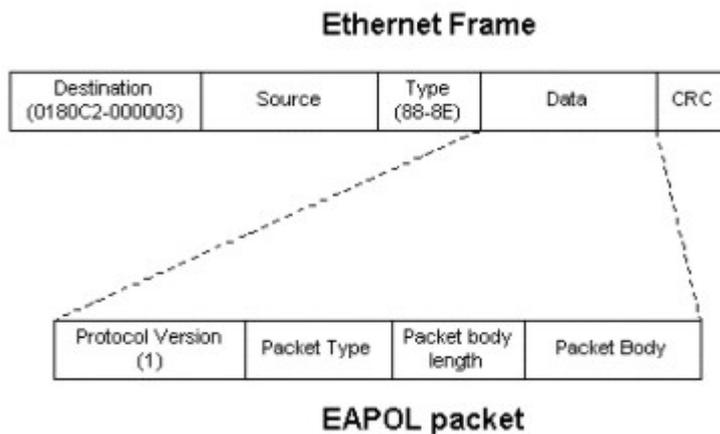
Access Rule Display	
Profile ID	3
Access ID	1
Mode	Permit
Type	Packet Content Mask
Priority	4 Replace Priority with
Replace Dscp with	23
Offset	<b>Offset (0 - 15)</b> mask:0x11111111 mask:0x00000000 mask:0x00000000 mask:0x00000000 <b>Offset (16 - 31)</b> mask:0x00000000 mask:0x00000000 mask:0x00000000 mask:0x00000000 <b>Offset (32 - 47)</b> mask:0x00000000 mask:0x00000000 mask:0x00000000 mask:0x00000000 <b>Offset (48 - 63)</b> mask:0x00000000 mask:0x00000000 mask:0x00000000 mask:0x00000000 <b>Offset (64 - 79)</b> mask:0x00000000 mask:0x00000000 mask:0x00000000 mask:0x00000000
Port Number	Port 1

Figure 6- 65. Access Rule Display window (Packet Content)

## PAE Access Entity (802.1X)

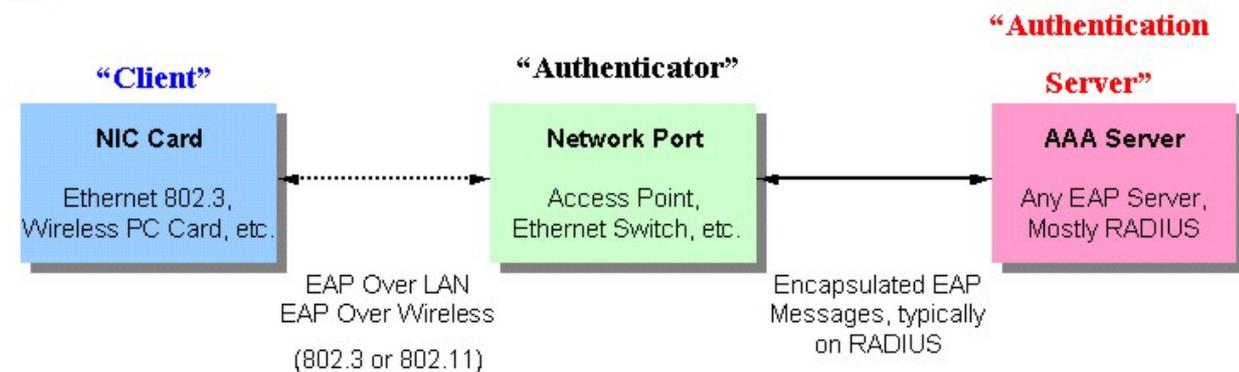
### 802.1x Port-Based and MAC-Based Access Control

The IEEE 802.1x standard is a security measure for authorizing and authenticating users to gain access to various wired or wireless devices on a specified Local Area Network by using a Client and Server based access control model. This is accomplished by using a RADIUS server to authenticate users trying to access a network by relaying Extensible Authentication Protocol over LAN (EAPOL) packets between the Client and the Server. The following figure represents a basic EAPOL packet:



**Figure 6- 66. EAPOL Packet**

Utilizing this method, unauthorized devices are restricted from connecting to a LAN through a port to which the user is connected. EAPOL packets are the only traffic that can be transmitted through the specific port until authorization is granted. The 802.1x Access Control protocol consists of three components, each of which is vital to creating and maintaining a stable and working Access Control security method.



**Figure 6- 67. Three Functions of 802.1x**

The following section will explain Client, Authenticator, and Authentication Server in greater detail.

### Authentication Server

The Authentication Server is a remote device that is connected to the same network as the Client and Authenticator, must be running a RADIUS Server program and must be configured properly on the Authenticator (Switch). Clients connected to a port on the Switch must be authenticated by the Authentication Server (RADIUS) before attaining any services offered by the Switch on the LAN. The role of the Authentication Server is to certify the identity of the Client attempting to access the network by exchanging secure information between the RADIUS server and the Client through EAPOL packets and, in turn, informs the Switch whether or not the Client is granted access to the LAN and/or switch services.

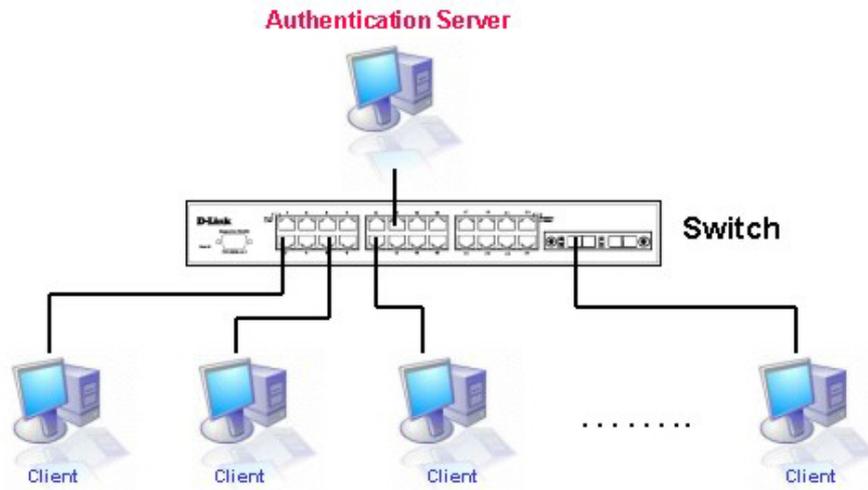


Figure 6- 68. Authentication Server

## Authenticator

The Authenticator (the Switch) is an intermediary between the Authentication Server and the Client. The Authenticator serves two purposes when utilizing 802.1x. The first purpose is to request certification information from the Client through EAPOL packets, which is the only information allowed to pass through the Authenticator before access is granted to the Client. The second purpose of the Authenticator is to verify the information gathered from the Client with the Authentication Server, and to then relay that information back to the Client.

Three steps must be implemented on the Switch to properly configure the Authenticator.

1. The 802.1x State must be enabled. (**Configuration > Switch Information > Advanced Settings > 802.1x Status**)
2. The 802.1x settings must be implemented by port. (**Port Access Entity > PAE System Control > Port Capability > Capability**)
3. A RADIUS server must be configured on the Switch. (**Port Access Entity > RADIUS Server > Authentic RADIUS Server**)

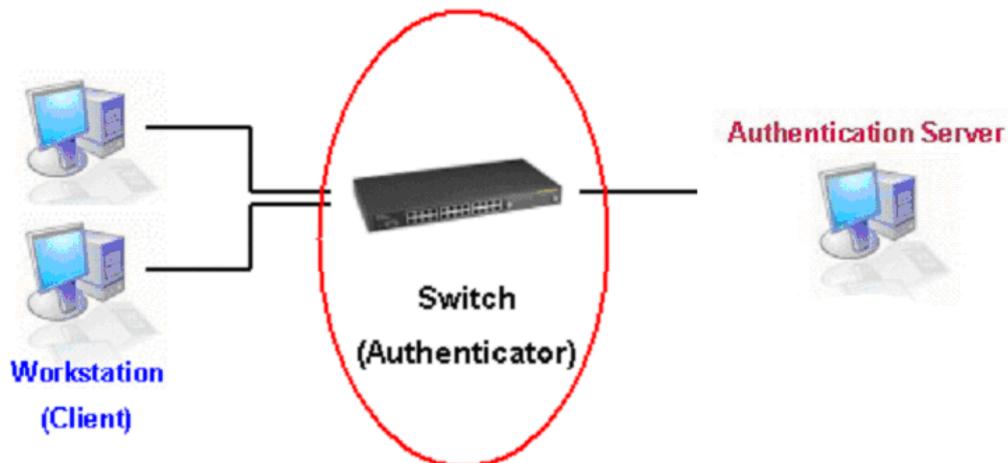


Figure 6- 69. Authenticator

## Client

The Client is simply the workstation that wishes to gain access to the LAN or switch services. All workstation must be running software that is compliant with the 802.1x protocol. For users running Windows XP, that software is included within the operating system. All other users are required to attain 802.1x client software from an outside source. The Client will request access to the LAN and or Switch through EAPOL packets and, in turn will respond to requests from the Switch.

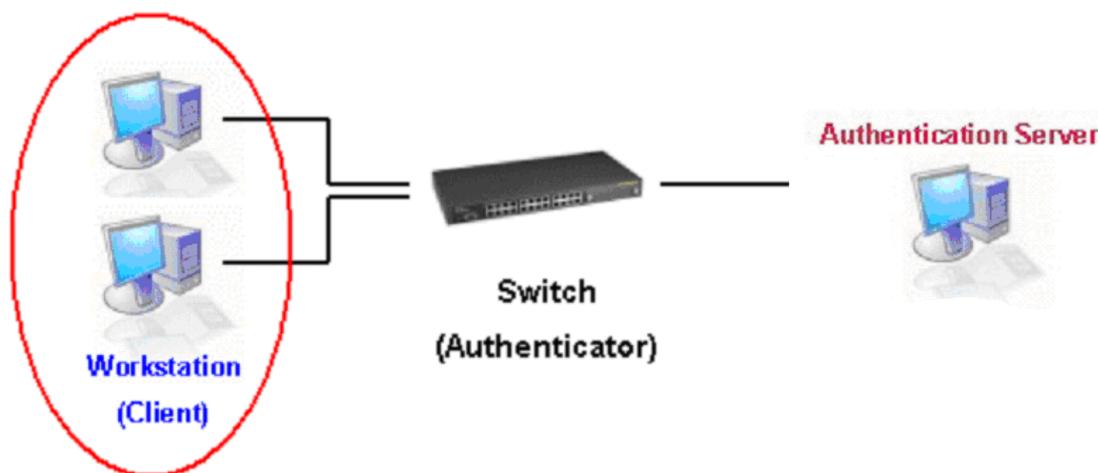


Figure 6- 70. Client

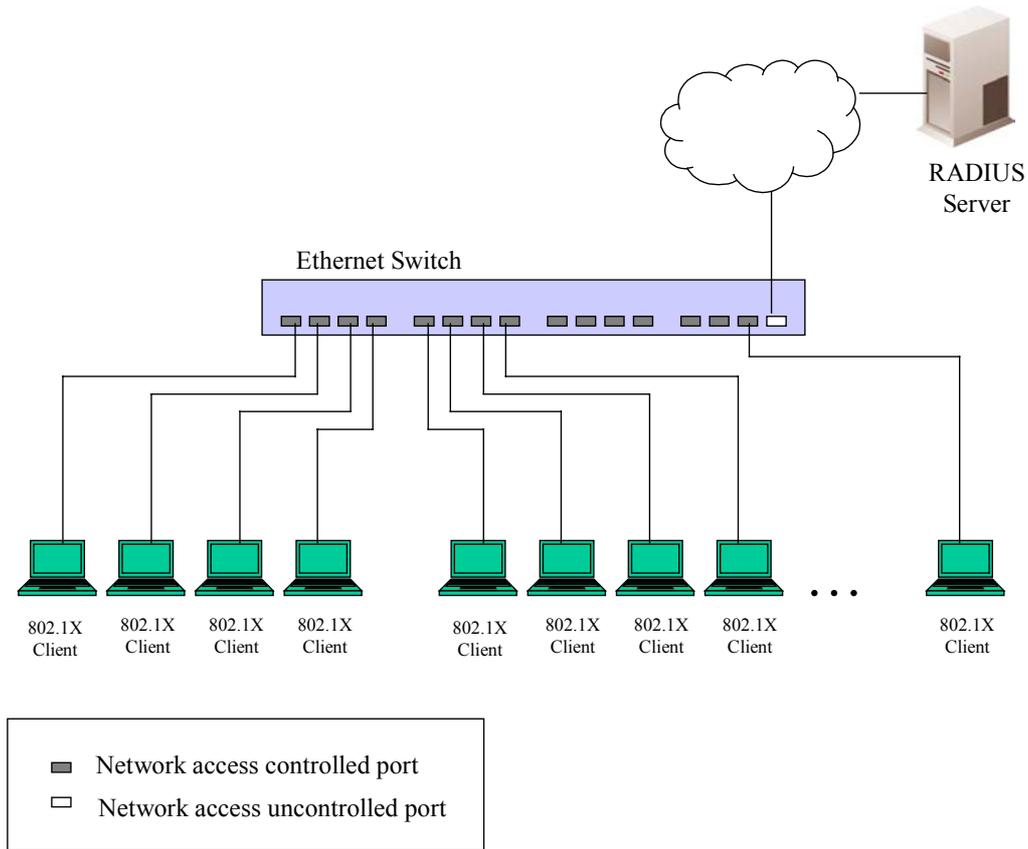
## Authentication Process

Utilizing the three components stated above, the 802.1x protocol provides a stable and secure way of authorizing and authenticating users attempting to access the network. Only EAPOL traffic is allowed to pass through the specified port before a successful authentication is made. This port is “locked” until the point when a Client with the correct username and password (and MAC address if 802.1x is enabled by MAC address) is granted access and therefore successfully “unlocks” the port. Once unlocked, normal traffic is allowed to pass through the port. The D-Link implementation of 802.1x allows network administrators to choose between two types of Access Control used on the Switch, which are:

1. Port-Based Access Control – This method requires only one user to be authenticated per port by a remote RADIUS server to allow the remaining users on the same port access to the network.
2. MAC-Based Access Control – Using this method, the Switch will automatically learn up to sixteen MAC addresses by port and set them in a list. Each MAC address must be authenticated by the Switch using a remote RADIUS server before being allowed access to the Network.

## Port-Based Network Access Control

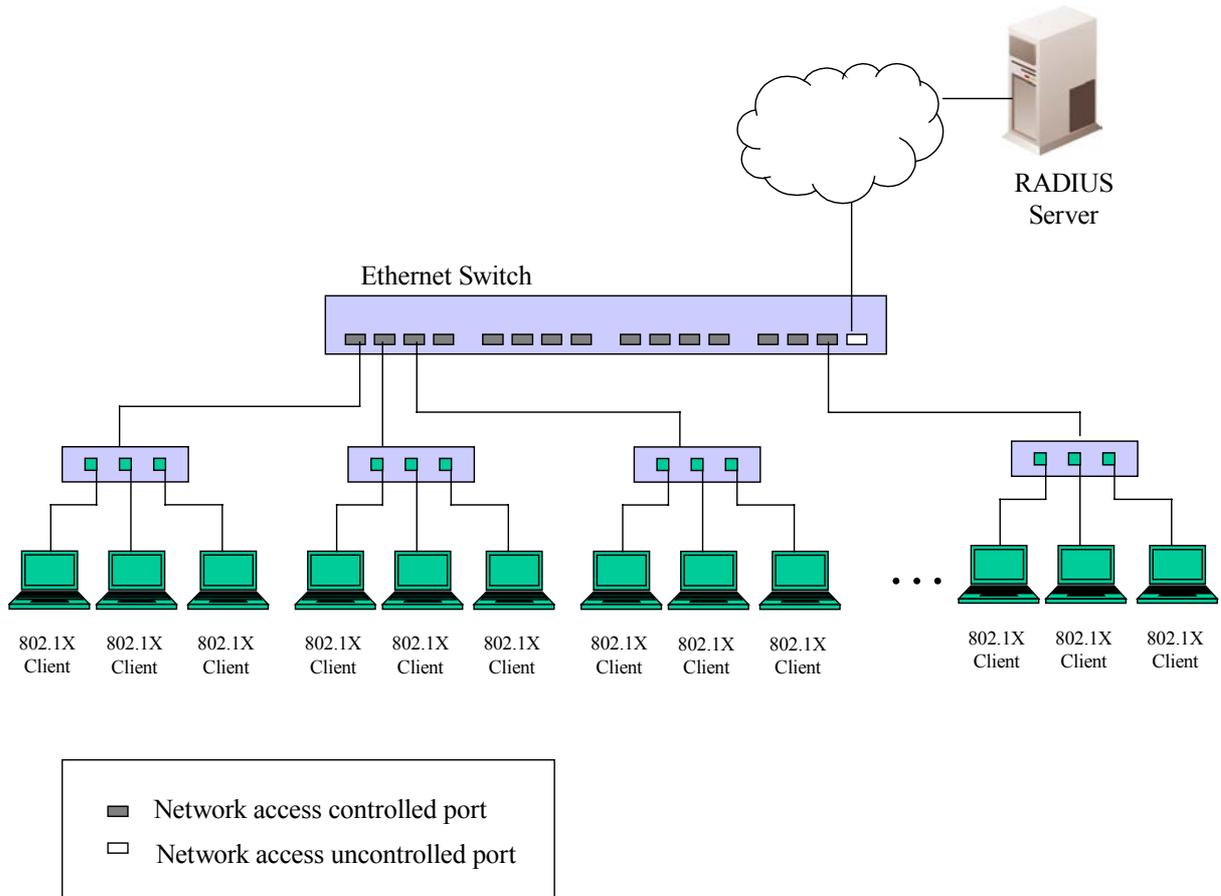
The original intent behind the development of 802.1x was to leverage the characteristics of point-to-point in LANs. Any single LAN segment in such an infrastructures has no more than two devices attached to it, one of which is a Bridge Port. The Bridge Port detects events that indicate the attachment of an active device at the remote end of the link, or an active device becoming inactive. These events can be used to control the authorization state of the Port and initiate the process of authenticating the attached device if the Port is unauthorized. This is the Port-Based Network Access Control.



**Figure 6- 71. Example of Typical Port-Based Configuration**

Once the connected Client has successfully been authenticated, the Port then becomes Authorized, and all subsequent traffic on the Port is not subject to access control restriction until an event occurs that causes the Port to become Unauthorized. Hence, if the Port is actually connected to a shared media LAN segment with more than one attached device, successfully authenticating one of the attached devices effectively provides access to the LAN for all devices on the shared segment. Clearly, the security offered in this situation is open to attack.

## MAC-Based Network Access Control



**Figure 6-72. Example of Typical MAC-Based Configuration**

In order to successfully make use of 802.1x in a shared media LAN segment, it would be necessary to create “virtual” Ports, one for each attached device that required access to the LAN. The Switch would regard the single physical Port connecting it to the shared media segment as consisting of a number of distinct virtual Ports, each virtual Port being independently controlled from the point of view of EAPOL exchanges and authorization state. The Switch learns each attached device’s individual MAC address, and effectively creates a virtual Port that the attached device can then use to communicate with the LAN via the Switch

## Configure Authenticator

To configure the 802.1X Authenticator Settings, click **PAE Access Entity** > **Configure Authenticator**:

802.1X Authenticator Settings										
Port	AdminCtrlDir	OperCtrlDir	Port Ctrl	TxPeriod	Quiet Period	Supp-Timeout	Server-Timeout	MaxReq	ReAuth Period	ReAuth Enabled
<a href="#">1</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">2</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">3</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">4</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">5</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">6</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">7</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">8</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">9</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">10</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">11</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">12</a>	both	both	Auto	30	60	30	30	2	3600	no
<a href="#">13</a>	both	both	Auto	30	60	30	30	2	3600	no

Figure 6- 73. 802.1X Authenticator Settings window

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 ▾
AdminCtrlDir	both ▾
PortControl	Auto ▾
TxPeriod	30
QuietPeriod	60
Supp Timeout	30
Server Timeout	30
MaxReq	2
ReAuthPeriod	3600
ReAuth	Disabled ▾
<a href="#">Show Authenticators Setting</a> <span style="float: right;">Apply</span>	

Figure 6- 74. 802.1X Authenticator Settings window - Modify

This window allows you to set the following features:

Parameter	Description
<b>From [ ] To [ ]</b>	Enter the port or ports to be set.
<b>AdmCtrlDir &lt;both&gt;</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 you 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 &lt;Auto &gt;</b>	<p>This allows you 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 [30 ]</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 [60 ]</b>	This allows you 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 [30 ]</b>	This value determines timeout conditions in the exchanges between the Authenticator and the client. The default setting is 30 seconds.
<b>ServerTimeout [30 ]</b>	This value determines timeout conditions in the exchanges between the Authenticator and the authentication server. The default setting is 30 seconds.
<b>MaxReq [2 ]</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 [3600]</b>	A constant that defines a nonzero number of seconds between periodic reauthentication of the client. The default setting is 3600 seconds.
<b>ReAuth &lt;Disabled&gt;</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.

## PAE System Control

Existing 802.1x port settings are displayed and can be configured using the windows below.

### Port Capability

Click **Port Access Entity > PAE System Control > Port Capability** to view the following window:

From	To	Capability	Apply
Port 1	Port 1	None	Apply

Port	Capability
1	None
2	None
3	None
4	None
5	None
6	None
7	None
8	None
9	None
10	None
11	None
12	None

**Figure 6- 75. 802.1x Capability Settings window**

To set up the Switch's 802.1x port-based authentication, select which ports are to be configured in the From and To fields. Next, enable the ports by selecting *Authenticator* from the drop-down menu under Capability. Click **Apply** to let your change take effect.

Configure the following 802.1x capability settings:

Parameter	Description
<b>From and To</b>	Ports being configured for 802.1x settings.
<b>Capability</b>	Two role choices can be selected: <i>Authenticator</i> - A user must pass the authentication process to gain access to the network. <i>None</i> - The port is not controlled by the 802.1x functions.

## Initializing Ports for Port Based 802.1x

Existing 802.1x port and MAC settings are displayed and can be configured using the window below.

Click **Port Access Entity > PAE System Control > Initialize Port(s)** to open the following window:

Initialize Port			
Unit	From	To	Apply
1	Port 1	Port 1	Apply
Initialize Port Table-Unit 1			
Port	Auth PAE State	Backend_State	Port Status
1	ForceAuth	Success	Authorized
2	ForceAuth	Success	Authorized
3	ForceAuth	Success	Authorized
4	ForceAuth	Success	Authorized
5	ForceAuth	Success	Authorized
6	ForceAuth	Success	Authorized

**Figure 6- 76. Initialize Port window**

This window allows you to initialize a port or group of ports. The Initialize Port Table in the bottom half of the window displays the current status of the port(s).

This window displays the following information:

Parameter	Description
<b>Unit</b>	Choose the Switch ID number of the Switch in the switch stack to be modified.
<b>From and To</b>	Select ports to be initialized.
<b>Port</b>	A read only field indicating a port on the Switch.
<b>MAC Address</b>	The MAC address of the Switch connected to the corresponding port, if any.
<b>Auth PAE State</b>	The Authenticator PAE State will display one of the following: <i>Initialize, Disconnected, Connecting, Authenticating, Authenticated, Aborting, Held, ForceAuth, ForceUnauth, and N/A.</i>
<b>Backend State</b>	The Backend Authentication State will display one of the following: <i>Request, Response, Success, Fail, Timeout, Idle, Initialize, and N/A.</i>
<b>Port Status</b>	The status of the controlled port can be <i>Authorized, Unauthorized, or N/A.</i>

## Initializing Ports for MAC Based 802.1x

To initialize ports for the MAC side of 802.1x, the user must first enable 802.1x by MAC address in the **Advanced Settings** window. Click **Configuration > Port Access Entity > PAE System Control > Initialize Port(s)** to open the following window:

Initialize Port(s)	
Unit	1
From	Port 1
To	Port 1
MAC Address	<input type="checkbox"/> <input type="text"/>
Apply	

**Figure 6- 77. Initialize Ports (MAC-based 802.1x) window**

To initialize ports, first choose the switch in the switch stack by using the Unit pull-down menu, then the range of ports in the From and To field. Then the user must specify the MAC address to be initialized by entering it into the MAC Address field and checking the corresponding check box. To begin the initialization, click **Apply**.



**NOTE:** The user must first globally enable 802.1X in the **Advanced Settings** window in the **Configuration** folder before initializing ports. Information in the Initialize Ports Table cannot be viewed before enabling 802.1X.

## Reauthenticate Port(s) for Port Based 802.1x

This window allows you to reauthenticate a port or group of ports by choosing a port or group of ports by using the pull down menus From and To and clicking **Apply**. The **Reauthenticate Port** window displays the current status of the reauthenticated port(s) once you have clicked **Apply**.

Click **Configuration > Port Access Entity > PAE System Control > Reauthenticate Port(s)** to open the **Reauthenticate Port(s)** window:

Reauthenticate Port					
From	To	Apply			
Port 1 ▾	Port 1 ▾	Apply			
Reauthenticate Port Table					
Port	MAC Address	Auth State	BackendState	OperDir	PortStatus
1	---	N/A	N/A	both	Authorized
2	---	N/A	N/A	both	Authorized
3	---	N/A	N/A	both	Authorized
4	---	N/A	N/A	both	Authorized
5	---	N/A	N/A	both	Authorized

Figure 6- 78. Reauthenticate Port window

This window displays the following information:

Parameter	Description
<b>Port</b>	The port number of the reauthenticated port.
<b>MAC Address</b>	Displays the physical address of the Switch where the port resides.
<b>Auth State</b>	The Authenticator State will display one of the following: <i>Initialize, Disconnected, Connecting, Authenticating, Authenticated, Aborting, Held, ForceAuth, ForceUnauth,</i> and <i>N/A</i> .
<b>BackendState</b>	The Backend State will display one of the following: <i>Request, Response, Success, Fail, Timeout, Idle, Initialize,</i> and <i>N/A</i> .
<b>OpenDir</b>	Operational Controlled Directions are <i>both</i> and <i>in</i> .
<b>PortStatus</b>	The status of the controlled port can be <i>Authorized, Unauthorized,</i> or <i>N/A</i> .

## RADIUS Server

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

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

RADIUS Server Authentication Setting					
Succession	First <input type="button" value="v"/>				
RADIUS Server	0.0.0.0 <input type="button" value="v"/>				
Authentic Port	0 <input type="button" value="v"/>				
Accounting Port	0 <input type="button" value="v"/>				
Key	<input type="text"/>				
Confirm Key	<input type="text"/>				
Accounting Method	Add/Modify <input type="button" value="v"/>				
					<input type="button" value="Apply"/>
Current RADIUS Server Settings Table					
Succession Index	IP Address	Auth-Port Number	Acct-Port Number	Status	key
First	0.0.0.0	0	0		
Second	0.0.0.0	0	0		
Third	0.0.0.0	0	0		

**Figure 6- 79. RADIUS Server Authentication Setting window**

This window displays the following information:

Parameter	Description
<b>Succession</b> <First>	Choose the desired RADIUS server to configure: <i>First</i> , <i>Second</i> or <i>Third</i> .
<b>RADIUS Server</b> <0.0.0.0>	Set the RADIUS server IP.
<b>Authentic Port</b> <1812>	Set the RADIUS authentic server(s) UDP port. The default port is 1812.
<b>Accounting Port</b> <1813>	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>Accounting Method</b>	This allows you to <i>Add/Modify</i> or <i>Delete</i> the RADIUS Server.

## Layer 3 IP Networking

### Static ARP Table

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 Settings** window, open the **Configuration** folder, and then open the **Layer 3 IP Networking** folder and click on the **Static ARP Table** link.

Figure 6- 80. Static ARP Settings window

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

Figure 6- 81. Static ARP Table – Add a New Entry window

The following fields can be set:

Parameter	Description
<b>IP Address</b>	The IP address of the ARP entry.
<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.



**NOTE:** The Switch supports up to 255 static ARP entries.

## 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 **Configuration 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

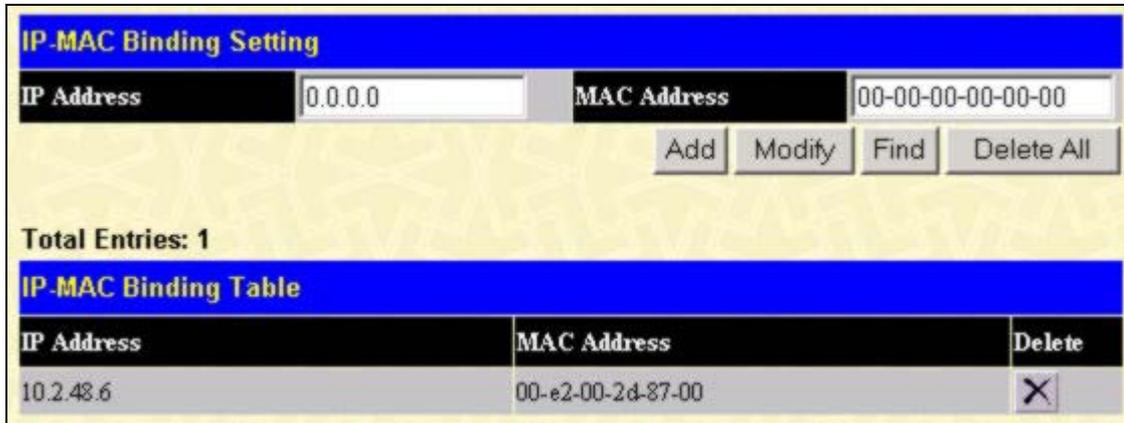
  

IP-MAC Binding Port State Table			
Port	State	Port	State
1	Enabled	26	Disabled
2	Enabled	27	Disabled
3	Disabled	28	Disabled
4	Disabled	29	Disabled
5	Disabled	30	Disabled
6	Disabled	31	Disabled
7	Disabled	32	Disabled
8	Disabled	33	Disabled
9	Disabled	34	Disabled
10	Disabled	35	Disabled
11	Disabled	36	Disabled
12	Disabled	37	Disabled
13	Disabled	38	Disabled
14	Disabled	39	Disabled
15	Disabled	40	Disabled
16	Disabled	41	Disabled
17	Disabled	42	Disabled
18	Disabled	43	Disabled
19	Disabled	44	Disabled
20	Disabled	45	Disabled
21	Disabled	46	Disabled
22	Disabled	47	Disabled
23	Disabled	48	Disabled
24	Disabled	49	Disabled
25	Disabled	50	Disabled

Figure 6- 82. IP-MAC Binding Ports window

## 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	0.0.0.0	MAC Address	00-00-00-00-00-00
		Add	Modify
		Find	Delete All
Total Entries: 1			
IP-MAC Binding Table			
IP Address	MAC Address	Delete	
10.2.48.6	00-e2-00-2d-87-00	X	

Figure 6- 83. IP-MAC Binding Table window

## 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 on the **Configuration** menu to open the **IP-MAC Binding Blocked** window.

**IP-MAC Binding Blocked**

VLAN Name  MAC Address

Find Delete All

Total Entries: 21

**IP-MAC Binding Blocked Table**

VID	VLAN NAME	MAC Address	Delete
1	default	00-03-09-18-10-01	X
1	default	00-03-44-ae-bc-12	X
1	default	00-07-e9-13-8f-50	X
1	default	00-0c-6e-55-bc-82	X
1	default	00-0c-f8-20-90-01	X
1	default	00-0c-f8-41-c0-01	X
1	default	00-0c-f8-42-40-01	X
1	default	00-0c-f8-44-10-01	X
1	default	00-0d-60-8f-49-38	X
1	default	00-50-ba-10-d8-eb	X
1	default	00-50-ba-da-01-58	X
1	default	00-50-ba-da-02-3e	X
1	default	00-50-ba-da-04-1f	X
1	default	00-80-c8-2e-c7-4c	X
1	default	00-80-c8-3b-ef-32	X
1	default	00-80-c8-4c-69-f8	X
1	default	00-80-c8-92-2d-58	X
1	default	00-80-c8-92-67-9f	X
1	default	00-e0-18-45-c7-15	X
1	default	00-e0-18-70-b3-b4	X

Next

**Figure 6- 84. IP-MAC Binding Blocked window**

To find an unauthorized device that has been blocked by the IP-MAC binding restrictions, enter the **VLAN name** and **MAC Address** in the appropriate fields and click **Find**. To delete an entry click the delete button next to the entry's MAC address. To delete all the entries in the **IP-MAC Binding Blocked Table** click **Delete All**.

## Limited IP Multicast Range Settings

That Switch may be configured to restrict the multicast within a range of IP addresses. Use the Limited IP Multicast Range menu to specify the ports and IP address boundaries for multicasting.

The **Limited IP Multicast Range** window allows the administrator to permit or deny access a port or range of ports by specifying a range of multicast addresses. Click **Configuration > Limited IP Multicast Range** to open the **Limited IP Multicast Range** window shown below:

Limited IP Multicast Range						
From	To	State	From Multicast IP	To Multicast IP	Access	Apply
Port 1	Port 1	Disabled	0.0.0.0	0.0.0.0	Permit	Apply

The Port Information Table				
Port	State	From Multicast IP	To Multicast IP	Access
1	Disabled	0.0.0.0	0.0.0.0	None
2	Disabled	0.0.0.0	0.0.0.0	None
3	Disabled	0.0.0.0	0.0.0.0	None
4	Disabled	0.0.0.0	0.0.0.0	None
5	Disabled	0.0.0.0	0.0.0.0	None
6	Disabled	0.0.0.0	0.0.0.0	None
7	Disabled	0.0.0.0	0.0.0.0	None
8	Disabled	0.0.0.0	0.0.0.0	None
9	Disabled	0.0.0.0	0.0.0.0	None
10	Disabled	0.0.0.0	0.0.0.0	None
11	Disabled	0.0.0.0	0.0.0.0	None
12	Disabled	0.0.0.0	0.0.0.0	None
13	Disabled	0.0.0.0	0.0.0.0	None
14	Disabled	0.0.0.0	0.0.0.0	None
15	Disabled	0.0.0.0	0.0.0.0	None
16	Disabled	0.0.0.0	0.0.0.0	None
17	Disabled	0.0.0.0	0.0.0.0	None
18	Disabled	0.0.0.0	0.0.0.0	None
19	Disabled	0.0.0.0	0.0.0.0	None
20	Disabled	0.0.0.0	0.0.0.0	None
21	Disabled	0.0.0.0	0.0.0.0	None
22	Disabled	0.0.0.0	0.0.0.0	None
23	Disabled	0.0.0.0	0.0.0.0	None
24	Disabled	0.0.0.0	0.0.0.0	None
25	Disabled	0.0.0.0	0.0.0.0	None
26	Disabled	0.0.0.0	0.0.0.0	None
27	Disabled	0.0.0.0	0.0.0.0	None
28	Disabled	0.0.0.0	0.0.0.0	None
29	Disabled	0.0.0.0	0.0.0.0	None

Figure 6- 85. Limited Multicast VLAN Range menu

**To configure Limited IP Multicast Range:**

Choose the port or sequential range of ports using the **From...To...** port pull-down menus.

Use the remaining pull-down menus to configure the parameters described below:

Parameter	Description
<b>State</b>	Toggle the State field to either <i>Enabled</i> or <i>Disabled</i> a given port or group of ports where access is to be either permitted or denied.
<b>From Multicast IP</b>	Enter the lowest multicast IP address of the range.
<b>To Multicast IP</b>	Enter the highest multicast IP address of the range.
<b>Access</b>	Toggle the Access field to either <i>Permit</i> or <i>Deny</i> to limit or grant access to a specified range of Multicast addresses on a particular port or range of ports.

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

## DHCP/BOOTP Relay

The Switch can setup as a DHCP relay agent. A DHCP relay agent extends the reach of a DHCP server so that it is not necessary to use multiple DHCP servers to accommodate multiple IP subnets. As a relay agent, the Switch does not manage IP addresses. It relays DHCP requests on behalf of clients located on a local subnet to a remote or centralized DHCP server.

An additional feature has been created to further aid in local management of the IP addresses. Option 82 is used by the relay agent to insert additional information into the client's DHCP request. This information can be used to implement policies intended to improve security and efficiency.

For simplicity, references to DHCP include BOOTP, i.e. DHCP requests are treated identically to BOOTP requests for the DHCP relay agent.

## DHCP / BOOTP Relay Global Settings

To enable and configure **DHCP/BOOTP Relay Global Settings** on the Switch, click **Configuration > Layer 3 Networking > DHCP/BOOTP Relay > DHCP/BOOTP Relay Global Settings**:

**Figure 6- 86. DHCP/ BOOTP Relay Global Settings window**

The following fields can be set:

Parameter	Description
<b>Relay State</b>	This field can be toggled between <i>Enabled</i> and <i>Disabled</i> using the pull-down menu. It is used to enable or disable the DHCP/BOOTP Relay service on the Switch. The default is <i>Disabled</i> .
<b>Relay Hops Count Limit (1-16)</b>	This field allows an entry between 1 and 16 to define the maximum number of router hops DHCP/BOOTP messages can be forwarded across. The default hop count is 4.
<b>Relay Time Threshold (0-65535)</b>	This is used to make a forwarding decision. When a DHCP/BOOTP client sends a request, information is inserted regarding the time (in seconds) elapsed since that client began booting up. This information is read by the Switch. The Switch forwards a DHCP request if the time elapsed is equal to or greater than the time parameter entered here. If the elapsed time is less, the DHCP request is dropped. The default value = 0, so the default setting requires the Switch to forward all DHCP requests. Entering a value greater than zero here can be used to provide redundancy or backup in order to forward a DHCP request from a client that is not normally served by the Switch.
<b>DHCP Agent Information Option 82 State</b>	<p>This field can be toggled between <i>Enabled</i> and <i>Disabled</i> using the pull-down menu. It is used to enable or disable the DHCP Agent Information Option 82 on the Switch. The default is <i>Disabled</i>.</p> <p><i>Enabled</i> –When this field is toggled to <i>Enabled</i> the relay agent will insert and remove DHCP relay information (option 82 field) in messages between DHCP servers and clients. When the relay agent receives the DHCP request, it adds the option 82 information, and the IP address of the relay agent (if the relay agent is configured), to the packet. Once the option 82 information has been added to the packet it is sent on to the DHCP server. When the DHCP server receives the packet, if the server is capable of option 82, it can implement policies like restricting the number of IP addresses that can be assigned to a single remote ID or circuit ID. Then the DHCP server echoes the option 82 field in the DHCP reply. The DHCP server unicasts the reply back to the relay agent if the request was relayed to the server by the relay agent. The switch verifies that it originally inserted the option 82 data. Finally, the relay agent removes the option 82 field and forwards the packet to the switch port that connects to the DHCP client that sent the DHCP request.</p> <p><i>Disabled</i>- If the field is toggled to <i>Disabled</i> the relay agent will not insert and remove DHCP relay information (option 82 field) in messages between DHCP servers and clients, and the check and policy settings will have no effect.</p>
<b>DHCP Agent Information Option 82 Check</b>	<p>This field can be toggled between <i>Enabled</i> and <i>Disabled</i> using the pull-down menu. It is used to enable or disable the Switches ability to check the validity of the packet's option 82 field.</p> <p><i>Enabled</i>– When the field is toggled to <i>Enable</i>, the relay agent will check the validity of the packet's option 82 field. If the switch receives a packet that contains the option-82 field from a DHCP client, the switch drops the packet because it is invalid. In packets received from DHCP servers, the relay agent will drop invalid messages.</p> <p><i>Disabled</i>- When the field is toggled to <i>Disabled</i>, the relay agent will not check the validity of the packet's option 82 field.</p>
<b>DHCP Agent Information Option 82 Policy</b>	<p>This field can be toggled between <i>Replace</i>, <i>Drop</i>, and <i>Keep</i> by using the pull-down menu. It is used to set the Switches policy for handling packets when the DHCP Agent Information Option 82 Check is set to <i>Disabled</i>. The default is <i>Replace</i>.</p> <p><i>Replace</i>- The option 82 field will be replaced if the option 82 field already exists in the packet received from the DHCP client.</p> <p><i>Drop</i>- The packet will be dropped if the option 82 field already exists in the packet received from the DHCP client.</p> <p><i>Keep</i>-The option 82 field will be retained if the option 82 field already exists in the packet received from the DHCP client.</p>

Click **Apply** to implement any changes that have been made.



**NOTE:** If the switch receives a packet that contains the option-82 field from a DHCP client and the information-checking feature is enabled, the Switch drops the packet because it is invalid. However, in some instances, you might configure a client with the option-82 field. In this situation, you should disable the information-check feature so that the switch does not remove the option-82 field from the packet. You can configure the action that the switch takes when it receives a packet with existing option-82 information by configuring the **DHCP Agent Information Option 82 Policy**.

The Implementation of DHCP Information Option 82 in DES-3526

The **config dhcp\_relay option\_82** command configures the DHCP relay agent information option 82 setting of the switch. The formats for the circuit ID sub-option and the remote ID sub-option are as follows:



**NOTE:** For the circuit ID sub-option of a standalone switch, the module field is always zero.

#### Circuit ID sub-option format:

1.	2.	3.	4.	5.	6.	7.
1	6	0	4	VLAN	Module	Port
1 byte	1 byte	1 byte	1 byte	2 bytes	1 byte	1 byte

- Sub-option type
- Length
- Circuit ID type
- Length
- VLAN : the incoming VLAN ID of DHCP client packet.
- Module : For a standalone switch, the Module is always 0; For a stackable switch, the Module is the Unit ID.

#### Remote ID sub-option format :

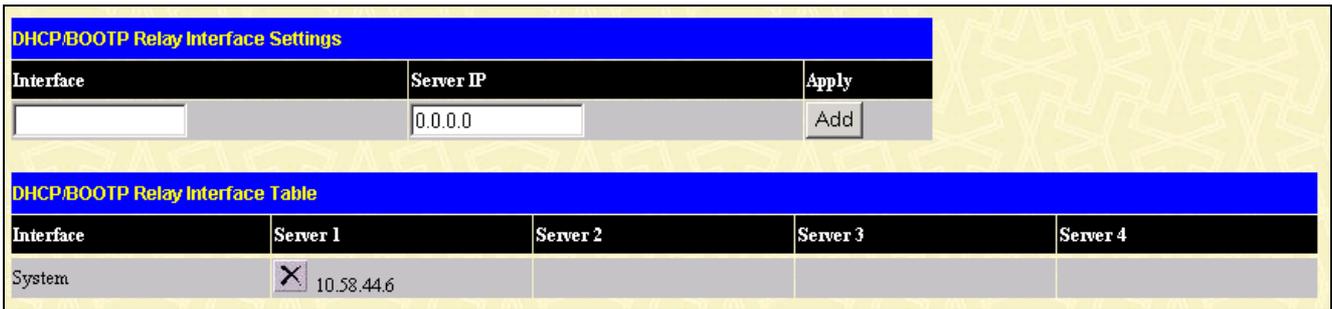
1.	2.	3.	4.	5.
2	8	0	6	MAC address
1 byte	1 byte	1 byte	1 byte	6 bytes

- Sub-option type
- Length
- Remote ID type
- Length
- MAC address: The Switch's system MAC address.

**Figure 6- 87. Circuit ID and Remote ID Sub-option Format**

## DHCP/BOOTP Relay Interface Settings

The **DHCP/ BOOTP Relay Interface Settings** allow the user to set up a server, by IP address, for relaying DHCP/ BOOTP information to the Switch. The user may enter a previously configured IP interface on the Switch that will be connected directly to the DHCP/BOOTP server using the following window. Properly configured settings will be displayed in the **BOOTP Relay Table** at the bottom of the following window, once the user clicks the **Add** button under the **Apply** heading. The user may add up to four server IPs per IP interface on the Switch. Entries may be deleted by clicking it's corresponding . To enable and configure **DHCP/BOOTP Relay Global Settings** on the Switch, click **Configuration > Layer 3 Networking > DHCP/BOOTP Relay > DHCP/BOOTP Relay Interface Settings**:



DHCP/BOOTP Relay Interface Settings				
Interface	Server IP	Apply		
	0.0.0.0	Add		

DHCP/BOOTP Relay Interface Table				
Interface	Server 1	Server 2	Server 3	Server 4
System	 10.58.44.6			

**Figure 6- 88. DHCP/BOOTP Relay Interface Settings and DHCP/BOOTP Relay Interface Table window**

The following parameters may be configured or viewed.

Parameter	Description
<b>Interface</b>	The IP interface on the Switch that will be connected directly to the Server.
<b>Server IP</b>	Enter the IP address of the DHCP/BOOTP server. Up to four server IPs can be configured per IP Interface

## Section 7

# Management

**Security IP**

**User Accounts**

**Access Authentication Control (TACACS)**

**Secure Sockets Layer (SSL)**

**Secure Shell (SSH)**

**SNMP Manager**

The following section will aid the user in configuring security functions for the Switch. The Switch includes various functions for security, including TACACS, Security IPs, SSL, SSH and SNMP, all discussed in detail in the following section.

## Security IP

Go to the **Management** folder and click on the **Security IP** link; the following window will appear.

Security IP Management		
IP1 Access to Switch	<input type="text" value="0.0.0.0"/>	
IP2 Access to Switch	<input type="text" value="0.0.0.0"/>	
IP3 Access to Switch	<input type="text" value="0.0.0.0"/>	
		<input type="button" value="Apply"/>

**Figure 7- 1. Security IP Management window**

Use the **Security IP Management** window to permit remote stations to manage the Switch. If you choose to define one or more designated management stations, only the chosen stations, as defined by IP address, will be allowed management privilege through the web manager or Telnet session. To define a management station IP setting, type in the IP address and click the **Apply** button.

## User Accounts

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

User Account Management		
User Name	Access Right	Add
Trinity	Admin	<input type="button" value="Modify"/>

**Figure 7- 2. User Account 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 7- 3. User Account Modify Table window - 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 7- 4. User Account Modify Table window - Modify**

Modify or delete an existing user account in the **User Account Modify Table** window. 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.

## Admin and User Privileges

There are two levels of user privileges, *Admin* and *User*. Some menu selections available to users with *Admin* privileges may not be available to those with *User* privileges.

The following table summarizes the Admin and User privileges:

Management	Admin	User
Configuration	Yes	Read Only
Network Monitoring	Yes	Read Only
Community Strings and Trap Stations	Yes	Read Only
Update Firmware and Configuration Files	Yes	No
System Utilities	Yes	No
Factory Reset	Yes	No

User Account Management		
Add/Update/Delete User Accounts	Yes	No
View User Accounts	Yes	No

Table 7- 1. Admin and User Privileges

After establishing a User Account with Admin-level privileges, be sure to save the changes by opening the **Maintenance** folder, opening the **Save Changes** window and clicking the **Save Configuration** button.

## 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.)

## 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 Management > Access Authentication Control > Policy & Parameters**:

**Figure 7- 5. Policy & Parameters Settings window**

The following parameters can be set:

Parameters	Description
<b>Authentication Policy</b>	Use the pull down menu to enable or disable the Authentication Policy on the Switch.
<b>Response Timeout (0-255)</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 0 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 7- 6. 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 <b>Login Method Lists</b> 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 <b>Enable Method Lists</b> window, in this section, for more information.

Click **Apply** to implement changes made.

## Authentication Server Group Settings

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.

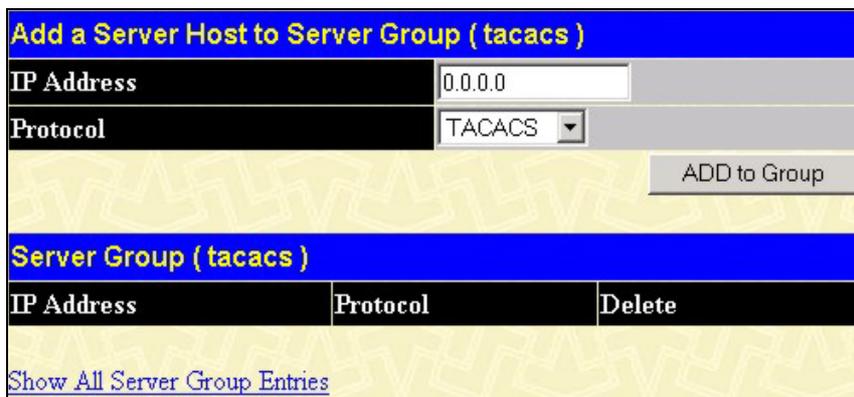
To view the following window, click **Security Management > Access Authentication Control > Authentication Server Group**:



Authentication Server Group Settings	
Group Name	Delete
<a href="#">radius</a>	X
<a href="#">tacacs</a>	X
<a href="#">tacacs+</a>	X
<a href="#">xtacacs</a>	X

**Figure 7-7. Authentication Server Group Settings window**

This screen displays the Authentication Server Groups on the Switch. The Switch has three 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.



Add a Server Host to Server Group ( tacacs )		
IP Address	<input type="text" value="0.0.0.0"/>	
Protocol	TACACS	
		<input type="button" value="ADD to Group"/>
Server Group ( tacacs )		
IP Address	Protocol	Delete
<a href="#">Show All Server Group Entries</a>		

**Figure 7-8. Add a Server Host to Server Group (tacacs) 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 Group** to add this Authentication Server Host to the group.



**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.

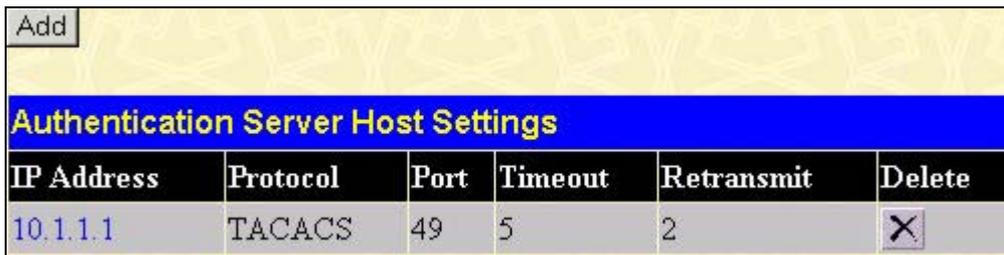


**NOTE:** The three built in server groups can only have server hosts running the same TACACS daemon. TACACS/XTACACS/TACACS+ protocols are separate entities and are not compatible with each other.

## Authentication Server Hosts

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.

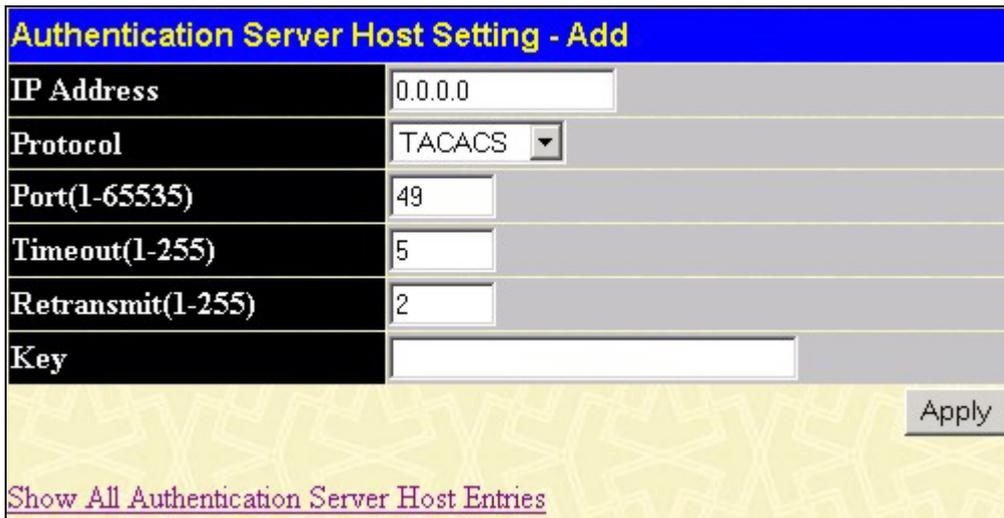
To view the following window, click **Security Management > Access Authentication Control > Authentication Server Host**:



Authentication Server Host Settings					
IP Address	Protocol	Port	Timeout	Retransmit	Delete
10.1.1.1	TACACS	49	5	2	X

Figure 7- 9. Authentication Server Host Settings window

To add an Authentication Server Host, click the **Add** button, revealing the following window:



Authentication Server Host Setting - Add	
IP Address	0.0.0.0
Protocol	TACACS
Port(1-65535)	49
Timeout(1-255)	5
Retransmit(1-255)	2
Key	

Apply

[Show All Authentication Server Host Entries](#)

Figure 7- 10. 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 the user wishes to add.
<b>Protocol</b>	The protocol used by the server host. The user may choose one of the following: <ul style="list-style-type: none"> <li>– <i>TACACS</i> - Enter this parameter if the server host utilizes the TACACS protocol.</li> <li>– <i>XTACACS</i> - Enter this parameter if the server host utilizes the XTACACS protocol.</li> <li>– <i>TACACS+</i> - Enter this parameter if the server host utilizes the TACACS+ protocol.</li> <li>– <i>RADIUS</i> - Enter this parameter if the server host utilizes the RADIUS protocol.</li> </ul>
<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				X

**Figure 7- 11. Login Method Lists 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:

Method List Name	default
Method 1	local Keyword
Method 2	
Method 3	
Method 4	

Apply

[Show All Authentication Login Method List Entries](#)

**Figure 7- 12. Login Method List - Edit window (default)**

Figure 7- 13. Login Method List – Add window

To define a 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> <ul style="list-style-type: none"> <li>– <i>tacacs</i> - Adding this parameter will require the user to be authenticated using the TACACS protocol from a remote TACACS server.</li> <li>– <i>xtacacs</i> - Adding this parameter will require the user to be authenticated using the XTACACS protocol from a remote XTACACS server.</li> <li>– <i>tacacs+</i> - Adding this parameter will require the user to be authenticated using the TACACS+ protocol from a remote TACACS+ server.</li> <li>– <i>radius</i> - Adding this parameter will require the user to be authenticated using the RADIUS protocol from a remote RADIUS server.</li> <li>– <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.</li> <li>– <i>local</i> - Adding this parameter will require the user to be authenticated using the local user account database on the Switch.</li> <li>– <i>none</i> - Adding this parameter will require no authentication to access the Switch.</li> </ul>

## 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 7- 14. 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:

Enable Method List - Edit	
Method List Name	default
Method 1	local_enable <input type="checkbox"/> Keyword
Method 2	<input type="text"/>
Method 3	<input type="text"/>
Method 4	<input type="text"/>
<input type="button" value="Apply"/>	
<a href="#">Show All Authentication Enable List Entries</a>	

**Figure 7- 15. Enable Method List - Edit window**

Enable Method List - Add	
Method List Name	<input type="text"/>
Method 1	local_enable <input type="checkbox"/>
Method 2	<input type="text"/>
Method 3	<input type="text"/>
Method 4	<input type="text"/>
<input type="button" value="Apply"/>	
<a href="#">Show All Authentication Enable List Entries</a>	

**Figure 7- 16. Enable Method List - Add window**

To define an Enable 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> <ul style="list-style-type: none"> <li>– <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.</li> <li>– <i>none</i> - Adding this parameter will require no authentication to access the Switch.</li> <li>– <i>radius</i> - Adding this parameter will require the user to be authenticated using the RADIUS protocol from a remote RADIUS server.</li> <li>– <i>tacacs</i> - Adding this parameter will require the user to be authenticated using the TACACS protocol from a remote TACACS server.</li> <li>– <i>xtacacs</i> - Adding this parameter will require the user to be authenticated using the XTACACS protocol from a remote XTACACS server.</li> <li>– <i>tacacs+</i> - Adding this parameter will require the user to be authenticated using the TACACS protocol from a remote TACACS server.</li> <li>– <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.</li> </ul>

## 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 7- 17. Configure Local Enable Password window

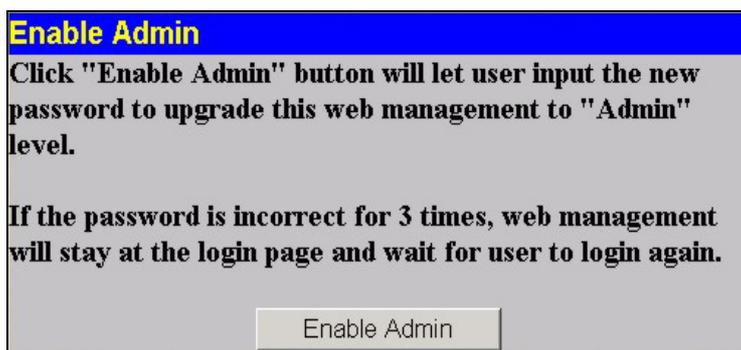
To set the Local Enable Password, set the following parameters and click **Apply**.

Parameter	Description
<b>Old Local Enabled</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 Enabled</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 Enabled</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.

## 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 Management > Access Authentication Control > Enable Admin**:



**Figure 7- 18. Enable Admin window**

When this window 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.



**Figure 7- 19. Enter Network Password dialog box**

## 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 and TLSv1. 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. The Switch is shipped with a certificate pre-loaded though the user may need to download more, depending on user circumstances.

To view the following window, click **Configuration > Secure Socket Layer (SSL) > Download Certificate**:

**Figure 7- 20. Download Certificate window**

To download certificates, set the following parameters and click **Apply**.

Parameter	Description
<b>Certificate Type</b>	Enter the type of certificate to be downloaded. This type refers to the server responsible for issuing certificates. This field has been limited to <i>local</i> for this firmware release.
<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)

## Ciphersuite

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://10.90.90.90) 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 **Configuration > Secure Socket Layer (SSL) > Configuration**:

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
SSL Status	Disabled ▾
Apply	

Figure 7- 21. Ciphersuite window

To set up the SSL function on the Switch, configure the following parameters and click **Apply**.

Parameter	Description
<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.
<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> .



**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. For more information on SSL and its functions, see the **DES-3550 Command Line Reference Manual**, located on the documentation CD of this product.



**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**:

Current SSH Configuration Settings	
SSH Server Status	Disabled
Max Session	8
Time Out	300
Auth. Fail	2
Session Rekeying	Never
Ports	22

New SSH Configuration Settings	
SSH Server Status	Disabled ▾
Max Session(1-8)	8
Time Out(120-600)	300
Auth. Fail(2-20)	2
Session Rekeying	Never ▾

Apply

Figure 7- 22. Current SSH Configuration Settings window

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>Time Out (120-600)</b>	Allows the user to set the connection timeout. The user may set a time between 120 and 600 seconds. The default setting is 300 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</i> , <i>10 min</i> , <i>30 min</i> , and <i>60 min</i> . The default setting is <i>Never</i> .

## SSH Algorithm

The SSH Algorithm window allows the configuration of the desired types of SSH algorithms used for authentication encryption. There are four 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 Management > Secure Shell (SSH) > SSH Algorithm**:

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 ▾
Authentication Algorithm	
Password	Enabled ▾
Publickey	Enabled ▾
Host-based	Enabled ▾
Apply	

Figure 7- 23. Encryption Algorithm window

The following algorithms may be set:

Parameter	Description
<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-SHA1</b>	Use the pull-down to enable or disable the HMAC (Hash for Message Authentication Code) mechanism utilizing the Secure Hash algorithm. The default is <i>Enabled</i> .
<b>HMAC-MD5</b>	Use the pull-down to enable or disable the HMAC (Hash for Message Authentication Code) mechanism utilizing the MD5 Message Digest encryption algorithm. The default is <i>Enabled</i> .
<b>Public Key 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 encryption. The default is <i>Enabled</i> .

Parameter	Description
<b>Authentication Algorithm</b>	
<b>Password</b>	This parameter may be enabled if the administrator wishes to use a locally configured password for authentication on the Switch. The default is <i>Enabled</i> .
<b>Public Key</b>	This parameter may be enabled if the administrator wishes to use a publickey configuration set on a SSH server, for authentication on the Switch. The default is <i>Enabled</i> .
<b>Host-based</b>	This parameter may be enabled 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. The default is <i>Enabled</i> .

Click **Apply** to implement changes made.

## SSH User Authentication

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="#">Trinity</a>	Password		

**Figure 7- 24. Current Accounts window**

In the example window above, the User Account “Trinity” 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.

<b>User Name</b>	<input type="text" value="Trinity"/>
<b>Auth. Mode</b>	<input type="text" value="Password"/> ▾
<b>Host Name</b>	<input type="text"/>
<b>Host IP</b>	<input type="checkbox"/> <input type="text" value="0.0.0.0"/>
<input type="button" value="Apply"/>	
<a href="#">Show All User Authentication Entries</a>	

**Figure 7- 25. SSH User window**

The user may set the following parameters:

Parameter	Description
<b>User Name</b>	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.
<b>Auth. Mode</b>	<p>The administrator may choose one of the following to set the authorization for users attempting to access the Switch.</p> <p><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.</p> <p><i>Host Name</i> – Enter an alphanumeric string of no more than 31 characters to identify the remote SSH user.</p> <p><i>Host IP</i> – Enter the corresponding IP address of the SSH user.</p> <p><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.</p> <p><i>Public Key</i> – This parameter should be chosen if the administrator wishes to use the publickey on a SSH server for authentication.</p>
<b>Host Name</b>	Enter an alphanumeric string of no more than 31 characters to identify the remote SSH user. This parameter is only used in conjunction with the Host Based choice in the Auth. Mode field.
<b>Host IP</b>	Enter the corresponding IP address of the SSH user. This parameter is only used in conjunction with the Host Based choice in the Auth. Mode field.

Click **Apply** to implement changes made.



**NOTE:** To set the SSH User Authentication parameters on the Switch, a User Account must be previously configured. For more information on configuring local User Accounts on the Switch, see the User Accounts section of this manual located in this section.

# SNMP Manager

## 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 DES-3550 supports the SNMP versions 1, 2c, and 3. You can specify which version of the SNMP you want 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.

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

Management and counter information are stored by the Switch in the Management Information Base (MIB). The Switch uses the standard MIB-II Management Information Base module. Consequently, values for MIB objects can be retrieved from any SNMP-based network management software. In addition to the standard MIB-II, 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.

The DES-3550 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 DES-3550 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** window displays all of the SNMP User's currently configured on the Switch.

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

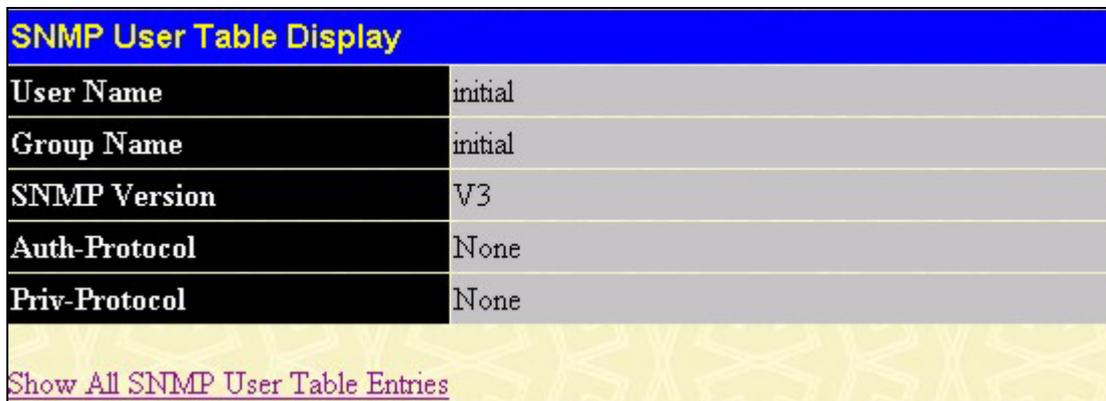


User Name	Group Name	SNMP Version	Delete
<a href="#">initial</a>	initial	V3	<input type="checkbox"/>

Figure 7- 26. SNMP User Table window

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

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



User Name	initial
Group Name	initial
SNMP Version	V3
Auth-Protocol	None
Priv-Protocol	None

[Show All SNMP User Table Entries](#)

Figure 7- 27. SNMP User Table Display window

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.

Figure 7- 28. SNMP User Table Configuration window

The following parameters can set:

Parameter	Description
<b>User Name</b>	Enter an alphanumeric string of up to 32 characters. This is used to identify the SNMP user.
<b>Group Name</b>	This name is used to specify the SNMP group created can request SNMP messages.
<b>SNMP Version</b>	V1 - Specifies that SNMP version 1 will be used. V2 - Specifies that SNMP version 2 will be used. V3 - Specifies that SNMP version 3 will be used.
<b>Auth-Protocol</b>	<i>MD5</i> - Specifies that the HMAC-MD5-96 authentication level will be used. This field is only operable when V3 is selected in the SNMP Version field and the Encryption field has been checked. This field will require the user to enter a password. <i>SHA</i> - Specifies that the HMAC-SHA authentication protocol will be used. This field is only operable when V3 is selected in the SNMP Version field and the Encryption field has been checked. This field will require the user to enter a password.
<b>Priv-Protocol</b>	<i>None</i> - Specifies that no authorization protocol is in use. <i>DES</i> - Specifies that DES 56-bit encryption is in use, based on the CBC-DES (DES-56) standard. This field is only operable when V3 is selected in the SNMP Version field and the Encryption field has been checked. This field will require the user to enter a password between 8 and 16 alphanumeric characters.
<b>Encrypted</b>	Checking the corresponding box will enable encryption for SNMP V3 and is only operable in SNMP V3 mode.

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 **Security Management** and click the **SNMP View Table** entry. The following window should appear:

Add			
Total Entries:8 (Note: Insert a maximum of 30 entries into the table.)			
SNMP View Table			
View Name	Subtree	View Type	Delete
restricted	1.3.6.1.2.1.1	Included	<input type="checkbox"/>
restricted	1.3.6.1.2.1.11	Included	<input type="checkbox"/>
restricted	1.3.6.1.6.3.10.2.1	Included	<input type="checkbox"/>
restricted	1.3.6.1.6.3.11.2.1	Included	<input type="checkbox"/>
restricted	1.3.6.1.6.3.15.1.1	Included	<input type="checkbox"/>
CommunityView	1	Included	<input type="checkbox"/>
CommunityView	1.3.6.1.6.3	Excluded	<input type="checkbox"/>
CommunityView	1.3.6.1.6.3.1	Included	<input type="checkbox"/>

Figure 7- 29. SNMP View Table window

To delete an existing SNMP View Table entry, click the  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.

SNMP View Table Configuration	
View Name	<input type="text"/>
Subtree OID	<input type="text"/>
View Type	Included <input type="button" value="v"/>
<input type="button" value="Apply"/>	
<a href="#">Show All SNMP View Table Entries</a>	

Figure 7- 30. 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 **Security Management** folder and click the **SNMP Group Table** entry. The following window should appear:

Add			
Total Entries:9 (Note: Insert a maximum of 30 entries into the table.)			
SNMP Group Table			
Group Name	Security Model	Security Level	Delete
<a href="#">public</a>	SNMPv1	NoAuthNoPriv	<input type="checkbox"/>
<a href="#">public</a>	SNMPv2	NoAuthNoPriv	<input type="checkbox"/>
<a href="#">initial</a>	SNMPv3	NoAuthNoPriv	<input type="checkbox"/>
<a href="#">private</a>	SNMPv1	NoAuthNoPriv	<input type="checkbox"/>
<a href="#">private</a>	SNMPv2	NoAuthNoPriv	<input type="checkbox"/>
<a href="#">ReadGroup</a>	SNMPv1	NoAuthNoPriv	<input type="checkbox"/>
<a href="#">ReadGroup</a>	SNMPv2	NoAuthNoPriv	<input type="checkbox"/>
<a href="#">WriteGroup</a>	SNMPv1	NoAuthNoPriv	<input type="checkbox"/>
<a href="#">WriteGroup</a>	SNMPv2	NoAuthNoPriv	<input type="checkbox"/>

Figure 7- 31. SNMP Group Table window

To delete an existing SNMP Group Table entry, click the corresponding  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 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 <input type="button" value="v"/>
Security Level	NoAuthNoPriv <input type="button" value="v"/>
<input type="button" value="Apply"/>	
<a href="#">Show All SNMP Group Table Entries</a>	

Figure 7- 32. 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 ▾
<input type="button" value="Apply"/>	
<a href="#">Show All SNMP Group Table Entries</a>	

Figure 7- 33. SNMP Group Table Configuration

The following parameters can set:

Parameter	Description
<b>Group Name</b>	Type an alphanumeric string of up to 32 characters. This is used to identify the new SNMP group of SNMP users.
<b>Read View Name</b>	This name is used to specify the SNMP group created can request SNMP messages.
<b>Write View Name</b>	Specify a SNMP group name for users that are allowed SNMP write privileges to the Switch's SNMP agent.
<b>Notify View Name</b>	Specify a SNMP group name for users that can receive SNMP trap messages generated by the Switch's SNMP agent.
<b>Security Model</b>	<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>
<b>Security Level</b>	<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** window, 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 **Security Management** folder, and click the **SNMP Community Table** link, which will open the following window:

Community Name	View Name	Access Right
<input type="text"/>	<input type="text"/>	Read Only ▾

Apply

Total Entries: 2 (Note: Insert a maximum of 10 entries into the table.)

Community Name	View Name	Access Right	Delete
private	CommunityView	Read Write	
public	CommunityView	Read Only	

Figure 7- 34. SNMP Community Table Configuration window

The following parameters can set:

Parameter	Description
<b>Community Name</b>	Type an alphanumeric string of up to 33 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 **Security Management** 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  under the Delete heading.

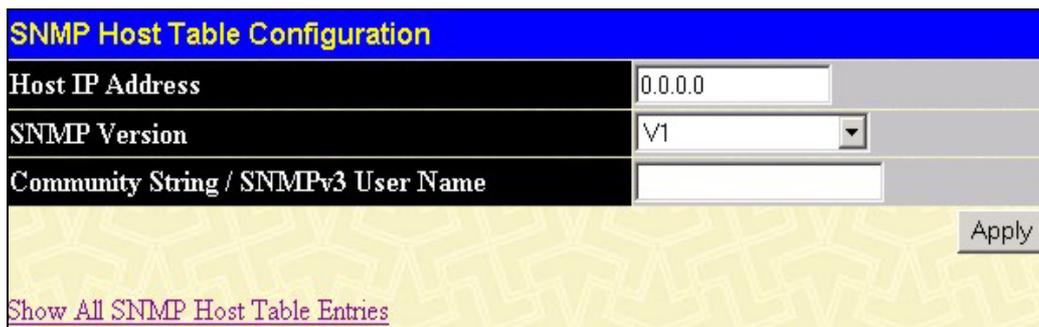
To display the current settings for an existing SNMP Group Table entry, click the blue link for the entry under the Host IP Address heading.



The screenshot shows the 'SNMP Host Table' window. At the top left is an 'Add' button. Below it, a message reads 'Total Entries:0 (Note: Insert a maximum of 10 entries into the table.)'. The main title is 'SNMP Host Table'. Below the title is a table with the following columns: 'Host IP Address', 'SNMP Version', 'Community Name/SNMPv3 User Name', and 'Delete'.

**Figure 7- 35. 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.



The screenshot shows the 'SNMP Host Table Configuration' window. It has a blue header with the title 'SNMP Host Table Configuration'. Below the header are three input fields: 'Host IP Address' with the value '0.0.0.0', 'SNMP Version' with a dropdown menu set to 'V1', and 'Community String / SNMPv3 User Name' with an empty text box. An 'Apply' button is located at the bottom right. At the bottom left, there is a link that says 'Show All SNMP Host Table Entries'.

**Figure 7- 36. SNMP Host Table Configuration window**

The following parameters can set:

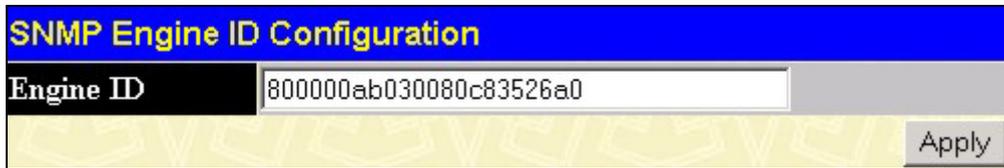
Parameter	Description
<b>Host IP Address</b>	Type the IP address of the remote management station that will serve as the SNMP host for the Switch.
<b>SNMP Version</b>	<p>V1 - To specifies that SNMP version 1 will be used.</p> <p>V2 - To specify that SNMP version 2 will be used.</p> <p>V3-NoAuth-NoPriv - 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 **Security Management** and click on the **SNMP Engine ID** link. This will open the **SNMP Engine ID Configuration** window, as shown below.

The image shows a configuration window titled "SNMP Engine ID Configuration". It features a blue header bar with the title in yellow text. Below the header, there is a label "Engine ID" in white text on a black background. To the right of the label is a text input field containing the alphanumeric string "800000ab030080c83526a0". At the bottom right of the window is a grey button labeled "Apply".

SNMP Engine ID Configuration	
Engine ID	800000ab030080c83526a0
<input type="button" value="Apply"/>	

**Figure 7- 37. SNMP Engine ID Configuration window**

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

## Section 8

# Monitoring

*Port Utilization*

*CPU Utilization*

*Packets*

*Errors*

*Size*

*MAC Address*

*Switch History Log*

*IGMP Snooping Group*

*IGMP Snooping Forwarding*

*VLAN Status*

*Router Port*

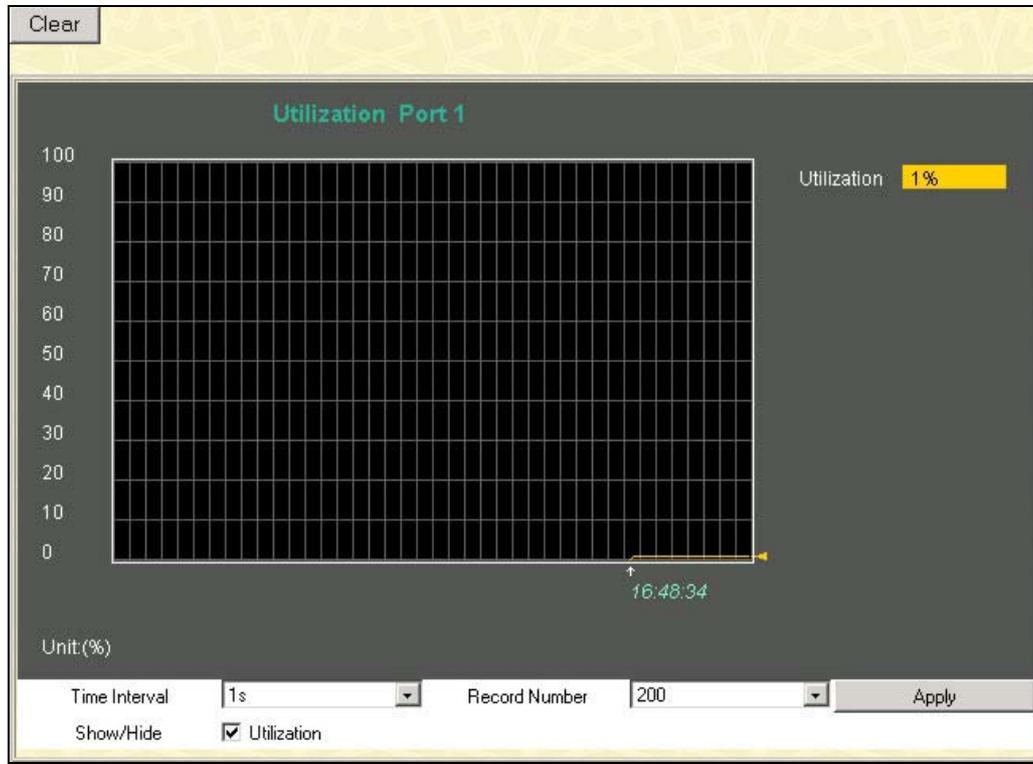
*Port Access Control*

*Layer 3 Feature*

## Port Utilization

The **Utilization** window 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 8- 1. Utilization window**

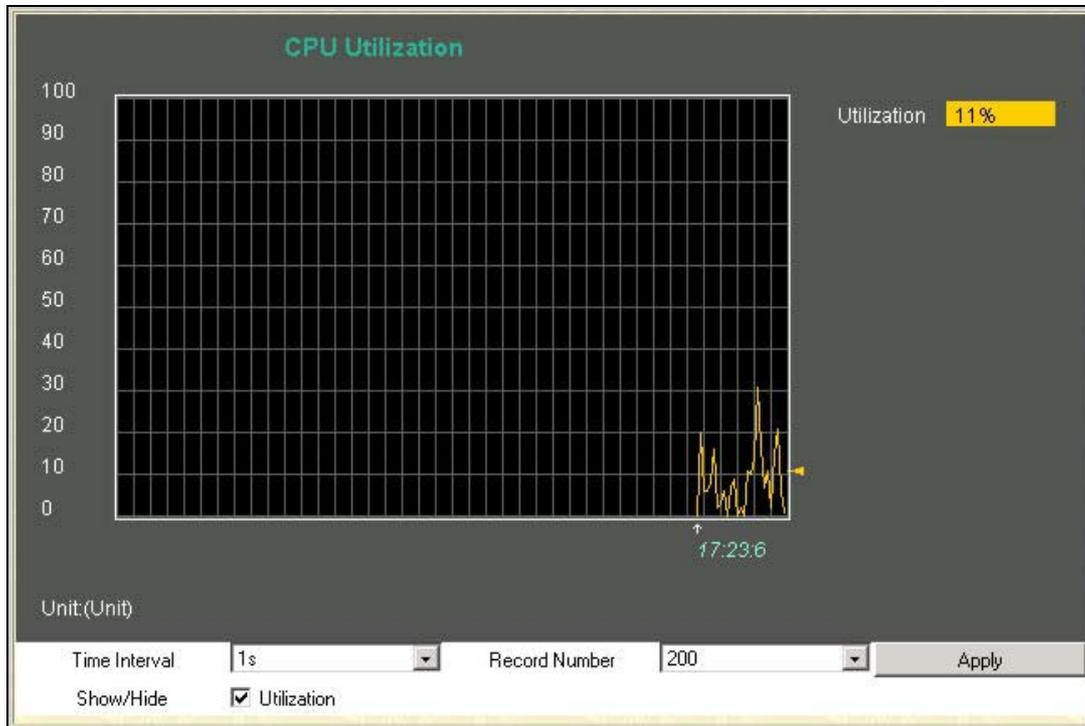
The following field can be set:

Parameter	Description
<b>Time Interval</b>	Select the desired setting between <i>1s</i> and <i>60s</i> , where "s" stands for seconds. The default value is one second.
<b>Record Number</b>	Select number of times the Switch will be polled between <i>20</i> and <i>200</i> . The default value is <i>200</i> .

Click **Clear** to refresh the graph. Click **Apply** to set changes implemented.

## CPU Utilization

The **CPU Utilization** window displays the percentage of the CPU being used, expressed as an integer percentage and calculated as a simple average by time interval. To view this window, open the **Monitoring** folder and click the **CPU Utilization** link.



**Figure 8- 2. CPU Utilization window**

Click **Apply** to implement the configured settings. The window will automatically refresh with new updated statistics

The information is described as follows:

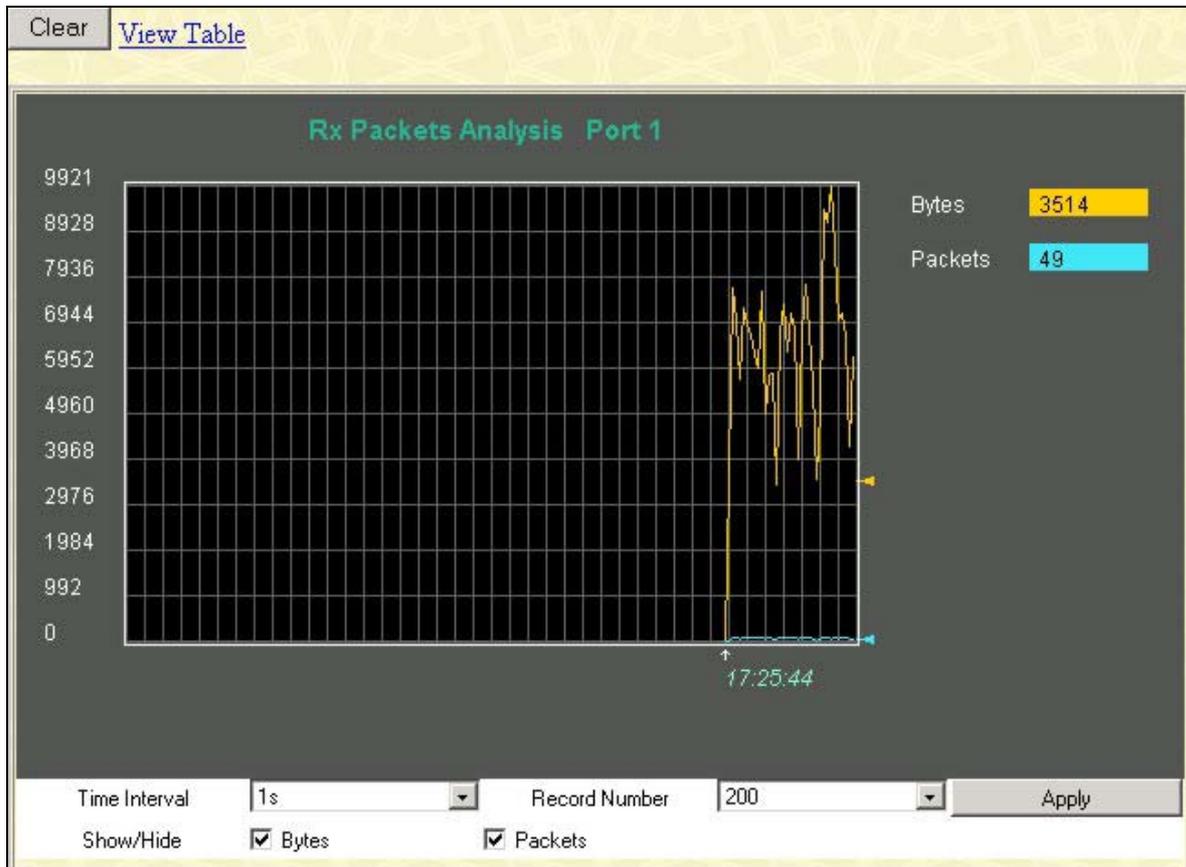
Parameter	Description
<b>Time Interval</b>	Select the desired setting between <i>1s</i> and <i>60s</i> , where "s" stands for seconds. The default value is one second.
<b>Record Number</b>	Select number of times the Switch will be polled between <i>20</i> and <i>200</i> . The default value is <i>20</i> .
<b>Utilization</b>	Check whether or not to display Utilization.

## Packets

The Web Manager allows various packet statistics to be viewed as either a line graph or a table. Six windows are offered.

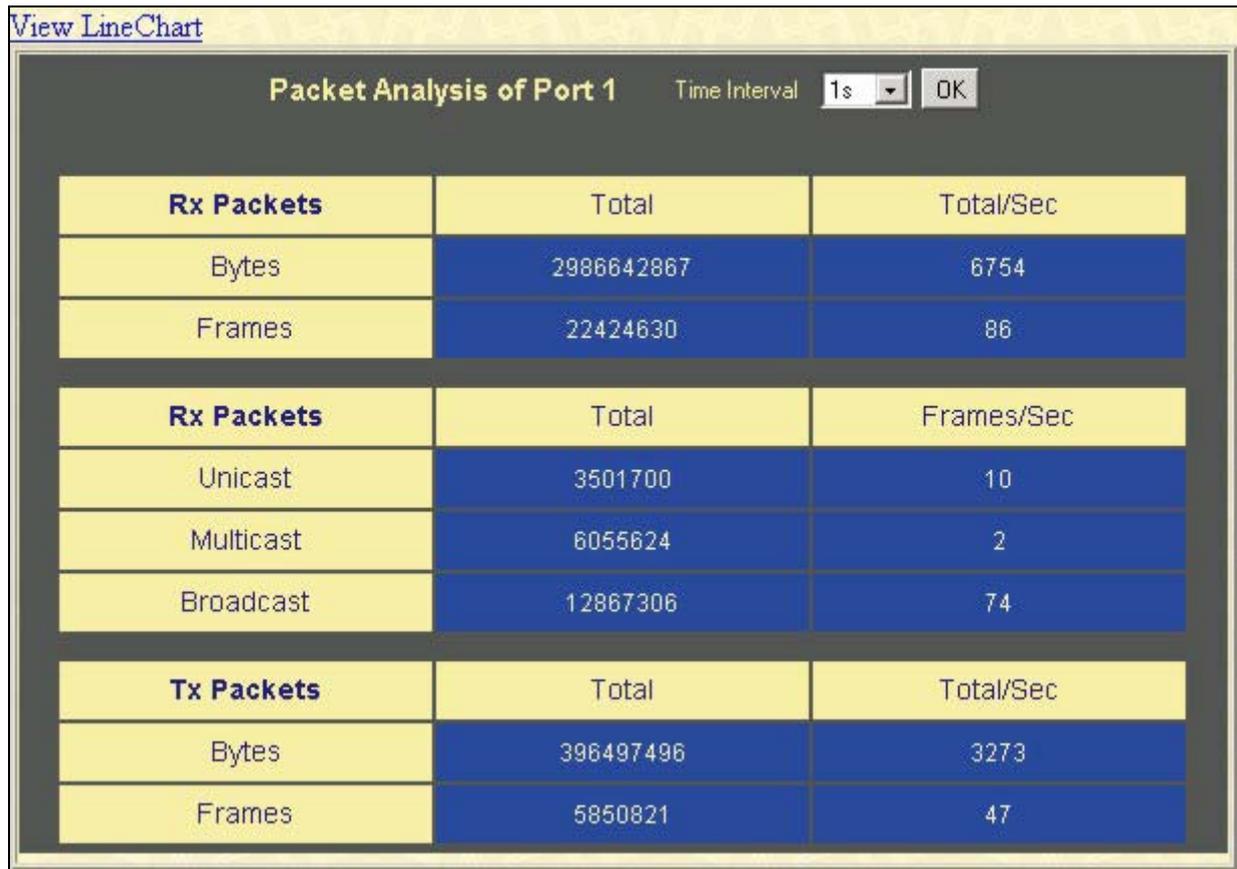
### Received (RX)

Click the **Received (RX)** link in the **Packets** folder of the **Monitoring** menu to view the following graph of packets received on the Switch.



**Figure 8- 3. Rx Packets Analysis window (line graph for Bytes and Packets)**

To view the Received Packets Table, click the link [View Table](#), which will show the following table:



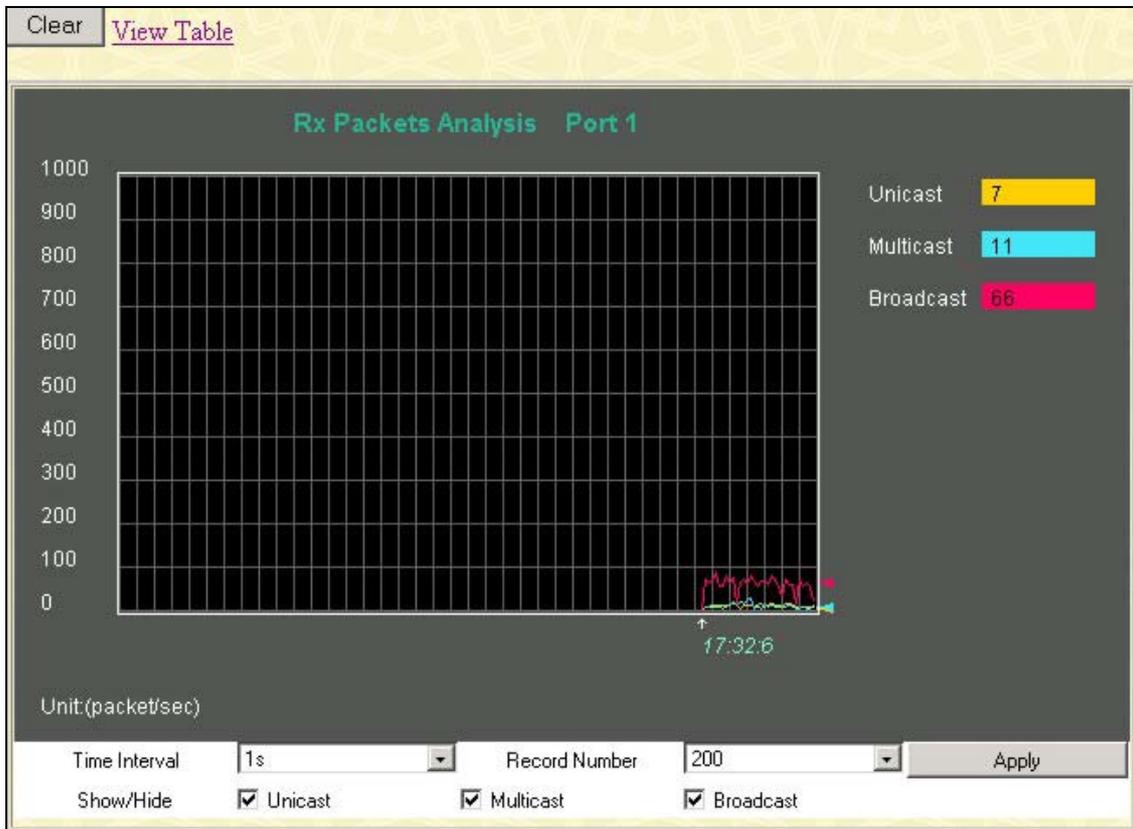
**Figure 8- 4. Rx Packets Analysis window (table for Bytes and Packets)**

The following fields may be set or viewed:

Parameter	Description
<b>Time Interval</b>	Select the desired setting between <i>1s</i> and <i>60s</i> , where "s" stands for seconds. The default value is one second.
<b>Record Number</b>	Select number of times the Switch will be polled between <i>20</i> and <i>200</i> . The default value is <i>20</i> .
<b>Bytes</b>	Counts the number of bytes received on the port.
<b>Packets</b>	Counts the number of packets received on the port.
<b>Show/Hide</b>	Check whether to display Bytes and Packets.
<b>Clear</b>	Clicking this button clears all statistics counters on this window.
<a href="#">View Table</a>	Clicking this button instructs the Switch to display a table rather than a line graph.
<a href="#">View Line Chart</a>	Clicking this button instructs the Switch to display a line graph rather than a 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.



**Figure 8- 5. Rx Packets Analysis window (line graph for Unicast, Multicast, and Broadcast Packets)**

To view the UMB Cast Table, click the [View Table](#) link, which will show the following table:

[View LineChart](#)

**Packet Analysis of Port 1** Time Interval

<b>Rx Packets</b>	Total	Total/Sec
Bytes	2989143039	7045
Packets	22455133	88

<b>Rx Packets</b>	Total	Frames/Sec
Unicast	3505079	7
Multicast	6060387	30
Broadcast	12889667	51

<b>Tx Packets</b>	Total	Total/Sec
Bytes	397682662	3352
Packets	5866088	44

**Figure 8- 6. Rx Packets Analysis window (table for Unicast, Multicast, and Broadcast Packets)**

The following fields may be set or viewed:

Parameter	Description
<b>Time Interval</b>	Select the desired setting between <i>1s</i> and <i>60s</i> , where "s" stands for seconds. The default value is one second.
<b>Record Number</b>	Select number of times the Switch will be polled between <i>20</i> and <i>200</i> . The default value is <i>20</i> .
<b>Unicast</b>	Counts the total number of good packets that were received by a unicast address.
<b>Multicast</b>	Counts the total number of good packets that were received by a multicast address.
<b>Broadcast</b>	Counts the total number of good packets that were received by a broadcast address.
<b>Show/Hide</b>	Check whether or not to display Multicast, Broadcast, and Unicast Packets.
<b>Clear</b>	Clicking this button clears all statistics counters on this window.
<a href="#">View Table</a>	Clicking this button instructs the Switch to display a table rather than a line graph.
<a href="#">View Line Chart</a>	Clicking this button instructs the Switch to display a line graph rather than a table.

## 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.

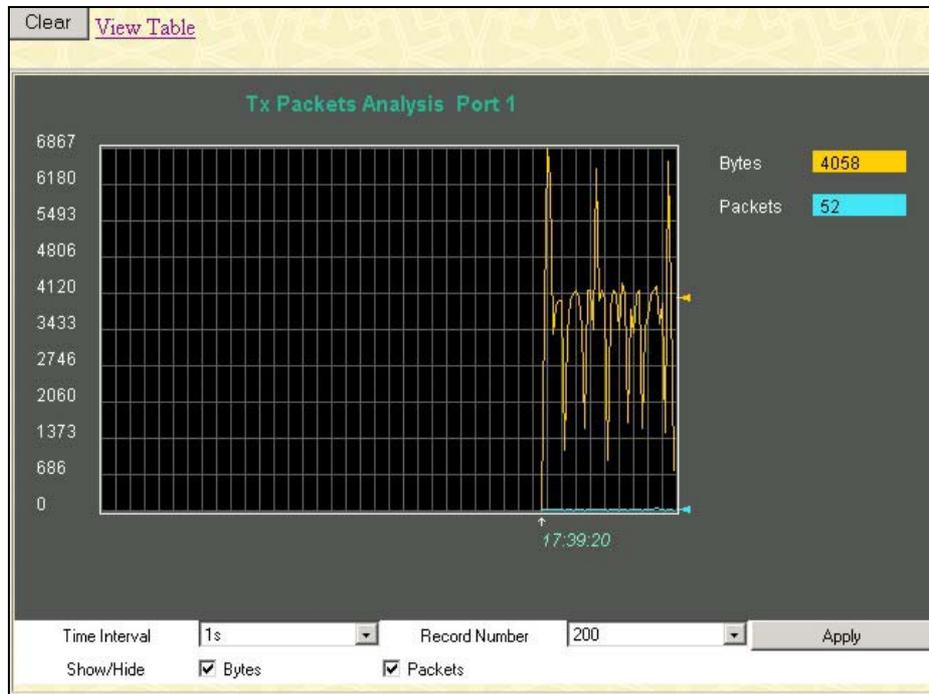


Figure 8- 7. Tx Packets Analysis window (line graph for Bytes and Packets)

To view the Transmitted (TX) Table, click the link [View Table](#), which will show the following table:

[View LineChart](#)

**Packet Analysis of Port 1** Time Interval

<b>Rx Packets</b>	Total	Total/Sec
Bytes	2991951049	6917
Packets	22487982	87

<b>Rx Packets</b>	Total	Frames/Sec
Unicast	3509189	15
Multicast	6065216	11
Broadcast	12913577	61

<b>Tx Packets</b>	Total	Total/Sec
Bytes	399059734	3705
Packets	5882760	51

Figure 8- 8. Tx Packets Analysis window (table for Bytes and Packets)

The following fields may be set or viewed:

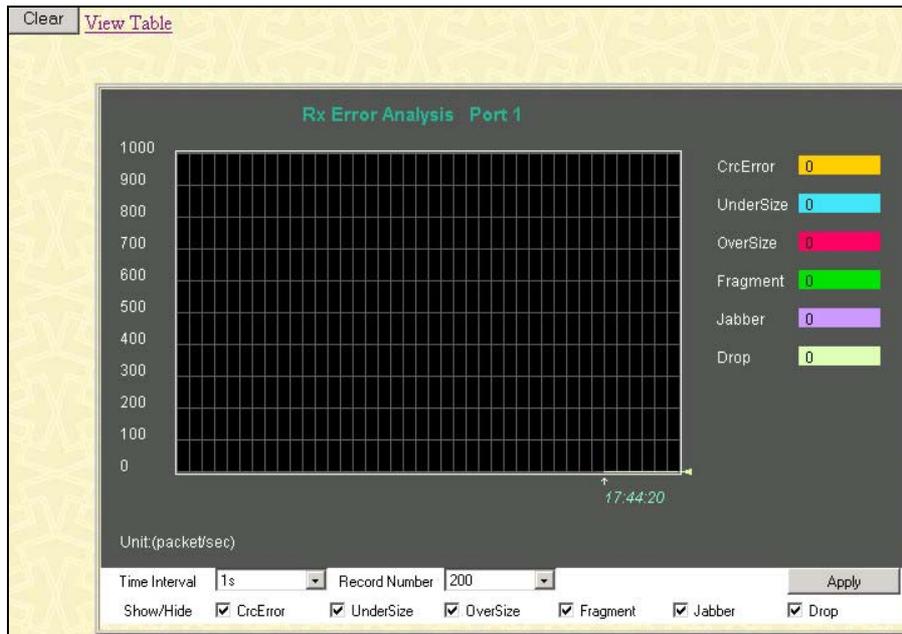
Parameter	Description
<b>Time Interval</b>	Select the desired setting between <i>1s</i> and <i>60s</i> , where "s" stands for seconds. The default value is one second.
<b>Record Number</b>	Select number of times the Switch will be polled between <i>20</i> and <i>200</i> . The default value is <i>20</i> .
<b>Bytes</b>	Counts the number of bytes successfully sent from the port.
<b>Packets</b>	Counts the number of packets successfully sent on the port.
<b>Show/Hide</b>	Check whether or not to display Bytes and Packets.
<b>Clear</b>	Clicking this button clears all statistics counters on this window.
<a href="#">View Table</a>	Clicking this button instructs the Switch to display a table rather than a line graph.
<a href="#">View Line Chart</a>	Clicking this button instructs the Switch to display a line graph rather than a table.

## 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.



**Figure 8- 9. Rx Error Analysis window (line graph)**

To view the Received Error Packets Table, click the link **View Table**, which will show the following table:

The screenshot shows the 'Packet Analysis of Port 1' window. At the top, there is a 'View LineChart' link and a 'Time Interval' dropdown set to '1s' with an 'OK' button. Below this is a table with two columns: 'Rx Error' and 'Total'. The table contains the following data:

Rx Error	Total
Crc Error	0
Under Size	0
Over Size	0
Fragment	0
Jabber	0
Drop	996642

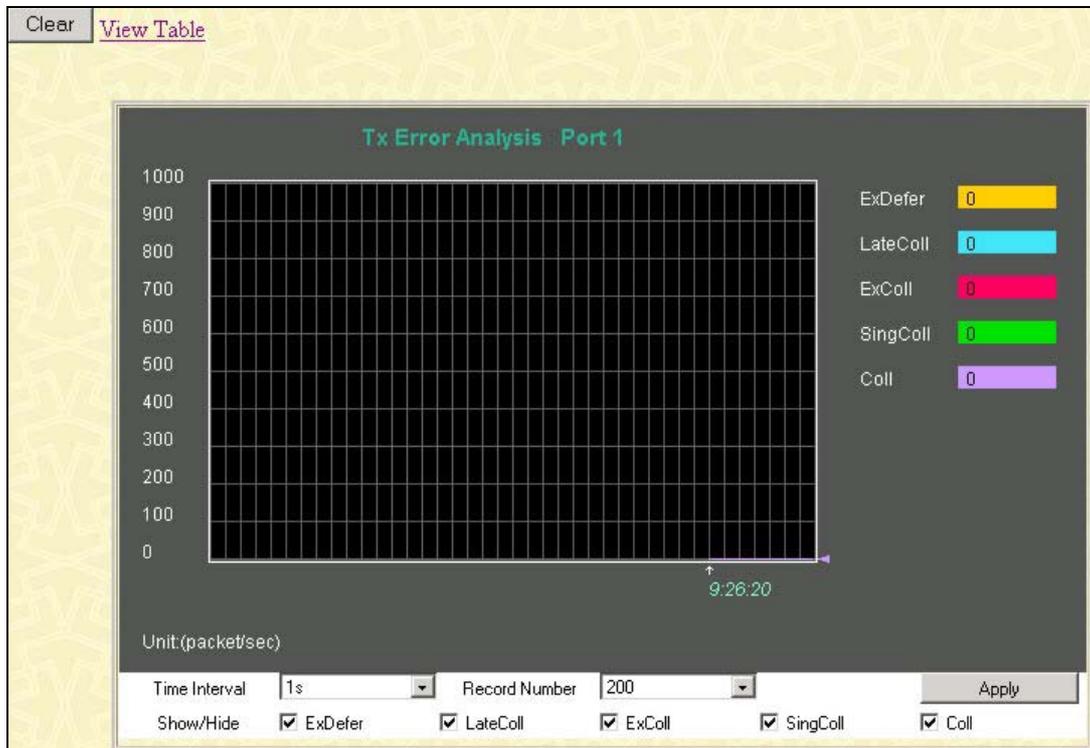
**Figure 8- 10. Rx Error Analysis window (table)**

The following fields can be set:

Parameter	Description
<b>Time Interval</b>	Select the desired setting between <i>1s</i> and <i>60s</i> , where "s" stands for seconds. The default value is one second.
<b>Record Number</b>	Select number of times the Switch will be polled between <i>20</i> and <i>200</i> . The default value is <i>20</i> .
<b>Crc Error</b>	Counts otherwise valid packets that did not end on a byte (octet) boundary.
<b>Under Size</b>	The number of packets detected that are less than the minimum permitted packets size of 64 bytes and have a good CRC. Undersize packets usually indicate collision fragments, a normal network occurrence.
<b>Over Size</b>	Counts packets received that were longer than 1518 octets, or if a VLAN frame is 1522 octets, and less than the MAX_PKT_LEN. Internally, MAX_PKT_LEN is equal to 1522.
<b>Fragment</b>	The number of packets less than 64 bytes with either bad framing or an invalid CRC. These are normally the result of collisions.
<b>Jabber</b>	The number of packets with lengths more than the MAX_PKT_LEN bytes. Internally, MAX_PKT_LEN is equal to 1522.
<b>Drop</b>	The number of packets that are dropped by this port since the last Switch reboot.
<b>Show/Hide</b>	Check whether or not to display Crc Error, Under Size, Over Size, Fragment, Jabber, and Drop errors.
<b>Clear</b>	Clicking this button clears all statistics counters on this window.
<a href="#">View Table</a>	Clicking this button instructs the Switch to display a table rather than a line graph.
<a href="#">View Line Chart</a>	Clicking this button instructs the Switch to display a line graph rather than a 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.



**Figure 8- 11. Tx Error Analysis window (line graph)**

To view the Transmitted Error Packets Table, click the link [View Table](#), which will show the following table:

[View LineChart](#)

**Packet Analysis of Port 1** Time Interval: 1s | OK

Tx Error	Total
ExDefer	0
LateColl	0
ExColl	0
SingColl	0
Coll	0

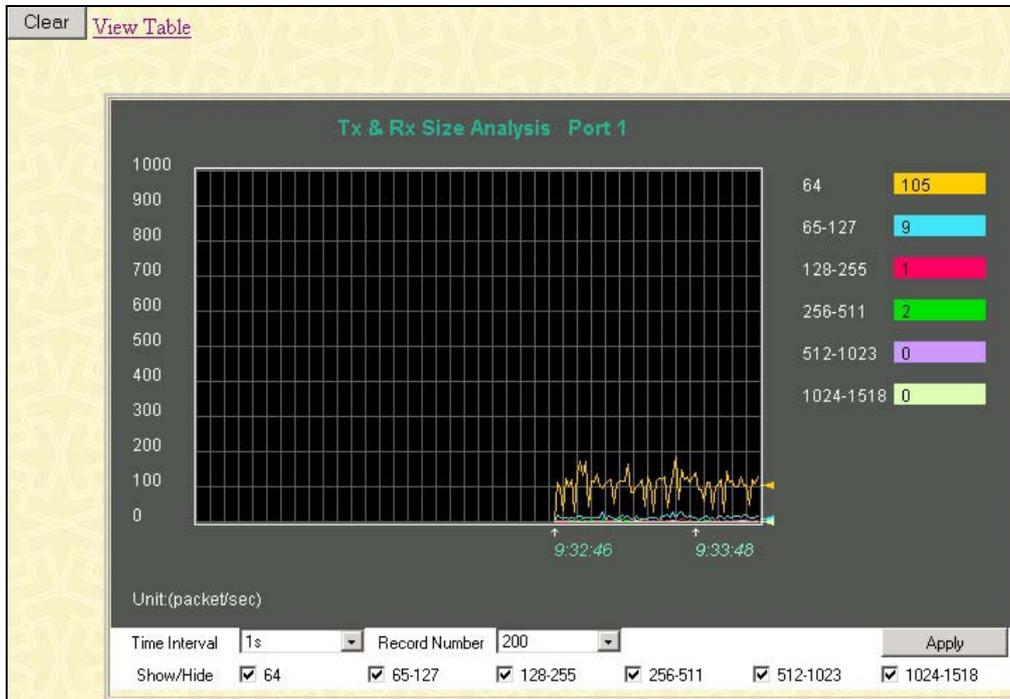
**Figure 8- 12. Tx Error Analysis window (table)**

The following fields may be set or viewed:

Parameter	Description
<b>Time Interval</b>	Select the desired setting between <i>1s</i> and <i>60s</i> , where "s" stands for seconds. The default value is one second.
<b>Record Number</b>	Select number of times the Switch will be polled between <i>20</i> and <i>200</i> . The default value is <i>20</i> .
<b>ExDefer</b>	Counts the number of packets for which the first transmission attempt on a particular interface was delayed because the medium was busy.
<b>LateColl</b>	Counts the number of times that a collision is detected later than 512 bit-times into the transmission of a packet.
<b>ExColl</b>	Excessive Collisions. The number of packets for which transmission failed due to excessive collisions.
<b>SingColl</b>	Single Collision Frames. The number of successfully transmitted packets for which transmission is inhibited by more than one collision.
<b>Coll</b>	An estimate of the total number of collisions on this network segment.
<b>Show/Hide</b>	Check whether or not to display ExDefer, LateColl, ExColl, SingColl, and Coll errors.
<b>Clear</b>	Clicking this button clears all statistics counters on this window.
<a href="#">View Table</a>	Clicking this button instructs the Switch to display a table rather than a line graph.
<a href="#">View Line Chart</a>	Clicking this button instructs the Switch to display a line graph rather than a table.

## 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.



**Figure 8- 13. Rx Size Analysis window (line graph)**

To view the Packet Size Analysis Table, click the link [View Table](#), which will show the following table:

[View Line Chart](#)

**Packet Analysis of Port 1** Time Interval

Tx/Rx Size	Total	Frames/Sec
64	131554	41
65-127	16590	9
128-255	3840	6
256-511	1315	2
512-1023	326	0
1024-1518	220	0

**Figure 8- 14. Rx Size Analysis window (table)**

The following fields can be set or viewed:

Parameter	Description
<b>Time Interval</b>	Select the desired setting between <i>1s</i> and <i>60s</i> , where "s" stands for seconds. The default value is one second.
<b>Record Number</b>	Select number of times the Switch will be polled between <i>20</i> and <i>200</i> . The default value is <i>20</i> .
<b>64</b>	The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets).
<b>65-127</b>	The total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets).
<b>128-255</b>	The total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets).
<b>256-511</b>	The total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).
<b>512-1023</b>	The total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets).
<b>1024-1518</b>	The total number of packets (including bad packets) received that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets).
<b>Show/Hide</b>	Check whether or not to display 64, 65-127, 128-255, 256-511, 512-1023, and 1024-1518 packets received.
<b>Clear</b>	Clicking this button clears all statistics counters on this window.
<a href="#">View Table</a>	Clicking this button instructs the Switch to display a table rather than a line graph.
<a href="#">View Line Chart</a>	Clicking this button instructs the Switch to display a line graph rather than a table.

## MAC Address

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:

<b>VLAN ID</b>	<input type="text"/>	Find	Delete
<b>MAC Address</b>	<input type="text" value="00-00-00-00-00-00"/>		
<b>Port</b>	Port 1 <input type="button" value="v"/>	Find	Delete
		View All Entry	Delete All Entry
<b>MAC Address Table</b>			
VID	MAC Address	Port	Learned
1	00-00-00-44-73-07	1	Dynamic
1	00-00-00-44-73-08	1	Dynamic
1	00-00-00-52-33-00	1	Dynamic
1	00-00-50-06-73-bd	1	Dynamic
1	00-00-55-46-03-00	1	Dynamic
1	00-00-55-56-67-78	1	Dynamic
1	00-00-e2-58-db-cf	1	Dynamic
1	00-00-e2-82-7d-90	1	Dynamic
1	00-01-02-03-04-01	1	Dynamic
1	00-01-06-30-10-63	1	Dynamic
1	00-01-24-02-45-00	1	Dynamic
1	00-01-30-12-13-02	1	Dynamic
1	00-02-06-12-34-56	1	Dynamic
1	00-02-3f-70-d8-fe	1	Dynamic
1	00-03-09-18-10-01	1	Dynamic
1	00-03-10-31-30-00	1	Dynamic
1	00-03-47-93-11-34	1	Dynamic
1	00-05-5d-19-a5-ab	1	Dynamic
1	00-05-5d-68-5d-9a	1	Dynamic
1	00-05-5d-7e-91-c0	1	Dynamic
			Next
<b>Total Entries: 221</b>			

Figure 8- 15. MAC Address Table window

The following fields can be viewed or set:

<b>Parameter</b>	<b>Description</b>
<b>VLAN ID</b>	Enter a VLAN ID 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 the port is a member of.
<b>MAC Address</b>	The MAC address entered into the address table.
<b>Port</b>	The port that the MAC address above corresponds to.
<b>Learned</b>	How 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

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		
Sequence	Time	Log Text
87	00000 days 00:01:02	Successful login through Web (Username: Anonymous)
86	00000 days 00:00:24	Topology changed
85	00000 days 00:00:24	New Root selected
84	00000 days 00:00:24	System started up
83	00000 days 00:00:17	Spanning Tree Protocol is enabled
82	00000 days 00:00:05	Port 1 link up, 100Mbps FULL duplex
81	00000 days 00:00:01	Spanning Tree Protocol is disabled
80	00000 days 00:25:13	Configuration saved to flash (Username: )
79	00000 days 00:25:13	Configuration saved to flash (Username: )
78	00000 days 00:23:33	Firmware upgraded successfully (Username: )
77	00000 days 00:23:32	Firmware upgraded successfully (Username: )
76	00000 days 00:10:40	Successful login through Web (Username: Anonymous)
75	00000 days 00:00:29	Topology changed
74	00000 days 00:00:27	Topology changed
73	00000 days 00:00:25	Topology changed
72	00000 days 00:00:25	New Root selected
71	00000 days 00:00:23	System started up
70	00000 days 00:00:16	Spanning Tree Protocol is enabled
69	00000 days 00:00:05	Port 1 link up, 100Mbps FULL duplex
68	00000 days 00:00:01	Spanning Tree Protocol is disabled

**Figure 8- 16. Switch History 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** window. Clicking **Clear** will allow the user to clear the **Switch History** window.

The information is described as follows:

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

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 Table**, click **IGMP Snooping Group** in the **Monitoring** menu:

VLAN ID		Multicast Group	MAC Address	Queries	Reports																			
0		0.0.0.0	00:00:00:00:00:00	Non-Querier	0																			
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
Total Entries: 0																								

Figure 8- 17. IGMP Snooping Table window

The user may search the **IGMP Snooping Table** window by VLAN ID(VID) by entering the VID in the top left hand corner and clicking **Search**.



**NOTE:** The Switch supports up to 128 IGMP Snooping groups.

The following field can be viewed:

Parameter	Description
<b>VLAN ID</b>	The VLAN ID (VID) 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>Queries</b>	A read only field showing the status of the Querier State. Disabled implies that the Switch is not transmitting IGMP Snooping Query packets, while Enabled means those packets are being transmitted.
<b>Reports</b>	The total number of reports received for this group.
<b>Port Map</b>	These are the ports where the IGMP packets were snooped are displayed.



**NOTE:** To configure IGMP snooping for the DES-3550, go to the **Configuration** folder and select **IGMP**. Configuration and other information concerning IGMP snooping may be found in Section 6 of this manual under **IGMP**.

## IGMP Snooping Forwarding

This window will display the current IGMP snooping forwarding table entries currently configured on the Switch. To view the following screen, open the **Monitoring** folder and click the **IGMP Snooping Forwarding** link.

VID :		Search																							
0																									
IGMP Snooping Forwarding Table																									
VLAN ID	Multicast Group	MAC Address																							
0	0.0.0.0	00:00:00:00:00:00																							
Port Member																									
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	
Total Entries: 0																									

**Figure 8- 18. IGMP Snooping Forwarding Table window**

The user may search the **IGMP Snooping Forwarding Table** window by VID using the top left hand corner **Search**.

The following field can be viewed:

Parameter	Description
<b>VLAN ID</b>	The VLAN ID (VID) 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>Port Map</b>	These are the ports where the IGMP packets were snooped are displayed.

## VLAN Status

This allows the VLAN status for each of the Switch's ports to be viewed by VLAN. This window displays the ports on the Switch that are currently Egress or Tag ports. To view the following table, open the **Monitoring** folder and click the **VLAN Status** link.

Total VLAN Entries: 1																									
VLAN Status																									
VLAN ID		VLAN Name					Status					Advertisemnet													
1		default					Static					Enabled													
Tag 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	
Egress 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	
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	
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	

Figure 8- 19. VLAN Status window

## 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. To view the following window, open the **Monitoring** folder and click the **Router Port** link.

Total Router Port Entries: 1																									
Router Port																									
VLAN ID												VLAN Name													
1												default													
Static Router 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	
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	
Dynamic Router 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	
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 8- 20. Router Port window

## Port Access Control

The following windows are used to monitor 802.1x statistics of the Switch, on a per port basis. To view the **Port Access Control** windows, open the monitoring folder and click the **Port Access Control** folder. There are six windows used in monitoring.

### Authenticator State

The following section describes the 802.1X Status on the Switch. To view the Authenticator State, click **Monitoring > Port Access Control > Authenticator State**.

Port	Auth_PAE_State	Backend_State	PortStatus
1	ForceAuth	Success	Authorized
2	ForceAuth	Success	Authorized
3	ForceAuth	Success	Authorized
4	ForceAuth	Success	Authorized
5	ForceAuth	Success	Authorized
6	ForceAuth	Success	Authorized
7	ForceAuth	Success	Authorized

Figure 8- 21. Authenticator State window – Port-based 802.1x

Index	MAC Address	Auth PAE State	Backend State	Port Status
1	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A

Figure 8- 22. Authenticator State window – MAC-Based 802.1x

This window displays the Authenticator State for individual ports on a selected device. To select unit within the switch stack, use the pull-down menu at the top of the window and click **Apply**. A polling interval between 1 and 60 seconds can be set using the drop-down menu at the top of the window and clicking **OK**.

The information on this window is described as follows:

Parameter	Description
<b>Auth PAE State</b>	The Authenticator PAE State value can be: <i>Initialize, Disconnected, Connecting, Authenticating, Authenticated, Aborting, Held, Force_Auth, Force_Unauth</i> , or <i>N/A</i> . <i>N/A</i> (Not Available) indicates that the port's authenticator capability is disabled.
<b>Backend State</b>	The Backend Authentication State can be <i>Request, Response, Success, Fail, Timeout, Idle, Initialize</i> , or <i>N/A</i> . <i>N/A</i> (Not Available) indicates that the port's authenticator capability is disabled.
<b>Port Status</b>	Controlled Port Status can be <i>Authorized, Unauthorized</i> , or <i>N/A</i> .

## Layer 3 Feature

### 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**.

Interface Name			
IP Address		0.0.0.0	Find 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	10.0.25.77	00-d0-59-a9-2a-c4	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	10.0.58.4	00-0c-6e-43-13-ae	Dynamic
System	10.1.1.7	00-00-48-af-62-23	Dynamic
System	10.1.1.101	00-03-12-16-10-00	Dynamic
System	10.1.1.102	00-50-ba-97-d7-c0	Dynamic
System	10.1.1.103	00-50-ba-97-d7-c9	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	10.1.1.156	00-50-ba-f5-f4-74	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	10.1.1.162	00-50-ba-70-e4-5a	Dynamic
System	10.1.1.163	00-50-ba-70-e4-55	Dynamic
System	10.1.1.164	00-50-ba-70-e4-65	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
<b>Total Entries: 405</b>			Next

Figure 8- 23. ARP Table window

## Section 9

# Maintenance

**TFTP Services**

**Switch History**

**Ping Test**

**Save Changes**

**Reboot Services**

**Logout**

**TFTP Services**

## 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 settings can be saved to the TFTP server, and a history log can be uploaded from the Switch to the TFTP server.

### Download Firmware From TFTP Server

To update the Switch's firmware, open the **TFTP Services** folder located in the **Maintenance** folder and click the **Download Firmware** link:

**Download/Update Firmware from TFTP Server**

<b>Server IP Address</b>	<input type="text"/>
<b>File Name</b>	<input type="text"/>
<b>Type</b>	<input checked="" type="radio"/> Download <input type="radio"/> Update <span style="margin-left: 10px;">Image 1 ▾</span>
<input type="button" value="Start"/>	

**Firmware Management**

ID	Boot Status	Version	Size	Date	From	User	Set Boot	Delete
1	Boot	2.00-B062476771	00000	days 00:23:33	10.53.13.94(W)		Apply	
2		1.00-B042071900	00000	days 00:00:00	Serial Port (PROM)	Unknown	Apply	X

**Free Space:** 3670016bytes

**Figure 9- 1. Download/Update Firmware from TFTP Server window**

The Switch can hold two firmware versions for the user, which can be specified in the Type field by clicking the Update radio button and selecting the *Image 1* or *Image 2*. To download or update firmware, configure the following fields and click **Start**.

Parameter	Description
<b>Server IP</b>	Enter the IP address of the server from which you wish to download firmware.
<b>File Name</b>	Specify the path and filename of the firmware on the Server.
<b>Type</b>	Specify the purpose of the firmware: <i>Download:</i> Clicking this radio button will specify a download to the Switch. This will be the firmware that the Switch will immediately use. <i>Update:</i> Clicking this radio button will save the firmware to the Switch's memory but not configure the Switch for this firmware. The Switch may hold two firmware versions specified as Section 1 and Section 2.

Information about firmware on the Switch can be viewed in the Firmware Management table in the same window. It holds the following information:

Parameter	Description
<b>ID</b>	The user defined Section ID of the firmware on the Switch.
<b>Boot Status</b>	The firmware that is currently being run on the Switch will be identified in this field with the term "Boot".
<b>Version</b>	The runtime version of the firmware.
<b>Size</b>	The size of the firmware, in bytes.
<b>Date</b>	The date that the firmware was added to the Switch.
<b>From</b>	The IP address of the Server from which the firmware came.
<b>User</b>	The name of the user who downloaded the firmware.
<b>Set Boot</b>	Click the <b>Apply</b> button in this field to set the firmware version to be used upon the next boot up of the Switch.
<b>Delete</b>	Click the <input type="checkbox"/> in this column to permanently delete the corresponding firmware from the Switch.

## Download Configuration File

To download a settings file from a TFTP server, click on the **TFTP Services** folder in the **Maintenance** folder and then the **Download Configuration File** link:

**Figure 9- 2. Download Settings from TFTP Server window**

Enter the IP address of the TFTP server and specify the location of the switch settings file on the TFTP server.

Click **Start** to record the IP address of the TFTP server and to initiate the file transfer.

## Upload Configuration

To upload the switch settings to a TFTP server, click on the **TFTP Services** folder, located in the **Maintenance** folder, and then click the **Upload Configuration** link:

**Figure 9- 3. Upload Settings to TFTP Server window**

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

To upload the switch history log file to a TFTP server, open the **TFTP Services** folder in the **Maintenance** folder and then click the **Upload Log** link:

**Figure 9- 4. Upload Log to TFTP Server window**

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.

## 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 9- 5. 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.

## Save Changes

The DES-3550 has two levels of memory; normal RAM and non-volatile or NV-RAM. Configuration changes are made effective by clicking the **Apply** 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 the **Save Changes** link in the **Maintenance** folder. The following window will appear:



**Figure 9- 6. Save Configuration window**

Click the **Save Configuration** button to save the current switch configuration in NV-RAM. The following dialog box will confirm that the configuration has been saved:



**Figure 9- 7. Save Configuration Confirmation**

Click the **OK** button to continue.

Once the Switch configuration settings have been saved to NV-RAM, they become the default settings for the Switch. These settings will be used every time the Switch is rebooted.

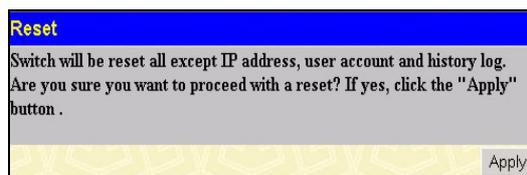
## Reset

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 gives the option of retaining the Switch's User Accounts and History Log while resetting all other configuration parameters to their factory defaults. If the Switch is reset using this screen, and **Save Changes** is not executed, the Switch will return to the last saved configuration when rebooted.



**Figure 9- 8. Reset window**

## Reset System

In addition, the **Reset System** option is added to reset all configuration parameters to their factory defaults, save these parameters to the Switch's non-volatile RAM, and then restart the Switch. This option is equivalent to **Reset Config** followed by **Save Changes**.

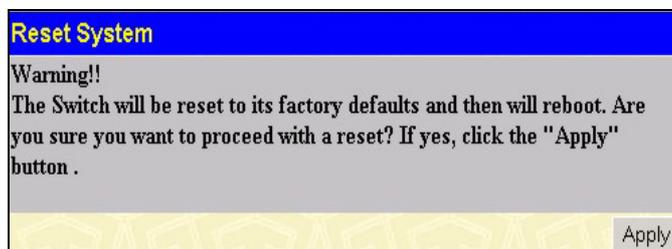


Figure 9- 9. Reset System window

## Reset Config

The Reset Config option will reset all of the Switch's configuration parameters to their factory defaults, without saving these default values to the Switch's non-volatile RAM. If the Switch is reset with this option enabled, and **Save Changes** is not executed, the Switch will return to the last saved configuration when rebooted.

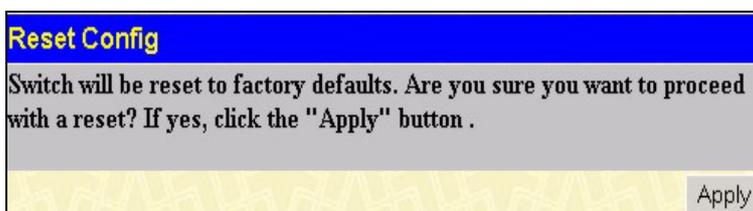


Figure 9- 10. Reset Config window

## Reboot Device

The following window is used to restart the Switch.

All of the configuration information entered from the last time **Save Changes** was executed, will be lost. Click the **Reboot** button to restart the Switch.

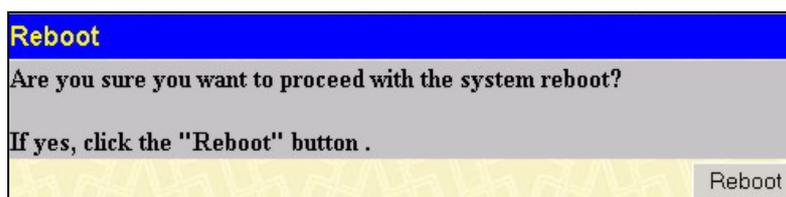


Figure 9- 11. Reboot window

## Logout

Use the Logout page to logout of the Switch's Web-based management agent by clicking on the Log Out button.

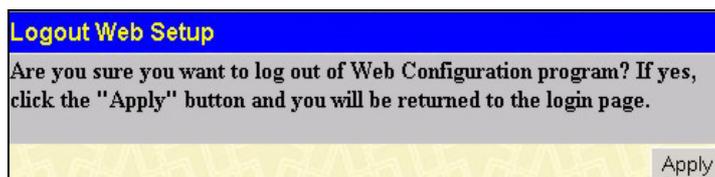


Figure 9- 12. Logout Web Setup window

<b>Section 10</b>
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# D-Link Single IP Management

## *Single IP Management (SIM) Overview*

### *Topology*

### *Firmware Upgrade*

### *Configuration Backup/Restore*

## 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 as 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 0-31), 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 DES-3550 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 through an automatic function of the DES-3550, or 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 Commander 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 DES-3550 switches may join the group either by an automatic method or 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 CS 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 DES-3550 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 10- 1. SIM Settings window (disabled)**

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

SIM Settings	
SIM State	Enabled ▾
Role State	Commander ▾
Discovery Interval	60 (30..90 sec)
Holdtime	180 (100..255 sec)
Apply	

**Figure 10- 2. SIM Settings window (enabled)**

The following parameters can be set:

Parameters	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 DES-3550.  <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 following message should appear the first time the user clicks the **Topology** link in the **Single IP Management** folder.

It is necessary to setup your Java Runtime Environment to v1.4.2 to view the topology. Click [here](#) to link to the topology page and it will setup your Java Runtime Environment automatically.

**Figure 10- 3. Java window**

Clicking the [here](#) link will setup the Java Runtime Environment on your server and lead you to the topology window, as seen below.

Device name	Local port	Speed	Remote port	Mac Address	Model name
(default:35-26-a0)	-	-	-	00-80-c8-35-26-a0	DES-3526 L2 Swit...
(default:46-03-00)	4	Gigabit-Full	1	00-00-55-46-03-00	DXS-3350SR L3 ...
(default:56-67-78)	33	Gigabit-Full	1	00-00-55-56-67-78	DXS-3350SR L3 ...
(default:42-50-00)	2	100-Full	1	00-47-65-42-50-00	DXS-3350SR L3 ...
(default:02-45-00)	23	Gigabit-Full	46	00-01-24-02-45-00	DXS-3326GSR L3...
my	11	Gigabit-Full	26	00-22-34-22-ab-00	DGS-3324SR L3 ...
DES3550-3	23	100-Full	11	00-35-50-10-21-03	DES-3550 L2 Swit...
DES3550-4	17	100-Full	11	00-35-50-10-21-04	DES-3550 L2 Swit...
DES3550-5	17	100-Full	11	00-35-50-10-21-05	DES-3550 L2 Swit...
12	12	100-Full	11	00-35-50-10-21-06	DES-3550 L2 Swit...
DES3550-7	7	100-Full	11	00-35-50-10-21-07	DES-3550 L2 Swit...
g	38	100-Full	11	00-35-50-10-21-08	DES-3550 L2 Swit...
(default:10-23-01)	48	100-Full	16	00-35-50-10-23-01	DES-3550 L2 Swit...
(default:10-23-03)	48	100-Full	14	00-35-50-10-23-03	DES-3550 L2 Swit...
(default:10-23-05)	48	100-Full	12	00-35-50-10-23-05	DES-3550 L2 Swit...
Crowley_2	48	100-Full	10	00-35-50-10-24-02	DES-3550 L2 Swit...
DGS3324SR-240	11	Gigabit-Full	6	00-47-65-11-20-15	DGS-3324SR L3 ...
(default:43-50-00)	32	Gigabit-Full	38	00-47-65-43-50-00	DXS-3350SR L3 ...
(default:50-09-00)	1	Gigabit-Full	47	00-54-85-50-09-00	DXS-3350SR L3 ...
(default:10-22-03)	2	100-Full	41	00-35-50-10-22-03	DES-3550 L2 Swit...
(default:10-23-02)	48	100-Full	15	00-35-50-10-23-02	DES-3550 L2 Swit...
DES3550-4	48	100-Full	13	00-35-50-10-23-04	DES-3550 L2 Swit...
Crowley_1	48	100-Full	9	00-35-50-10-23-06	DES-3550 L2 Swit...
(default:10-23-09)	48	100-Full	11	00-35-50-10-23-09	DES-3550 L2 Swit...
(default:10-24-05)	30	100-Full	40	00-35-50-10-24-05	DES-3550 L2 Swit...
(default:10-24-07)	35	100-Full	8	00-35-50-10-24-07	DES-3550 L2 Swit...
(default:10-22-02)	48	100-Full	47	00-35-50-10-22-02	DES-3550 L2 Swit...
(default:00-56-66)	48	100-Full	48	00-80-c8-00-56-66	DES-3550 L2 Swit...

**Figure 10- 4. 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 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>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.

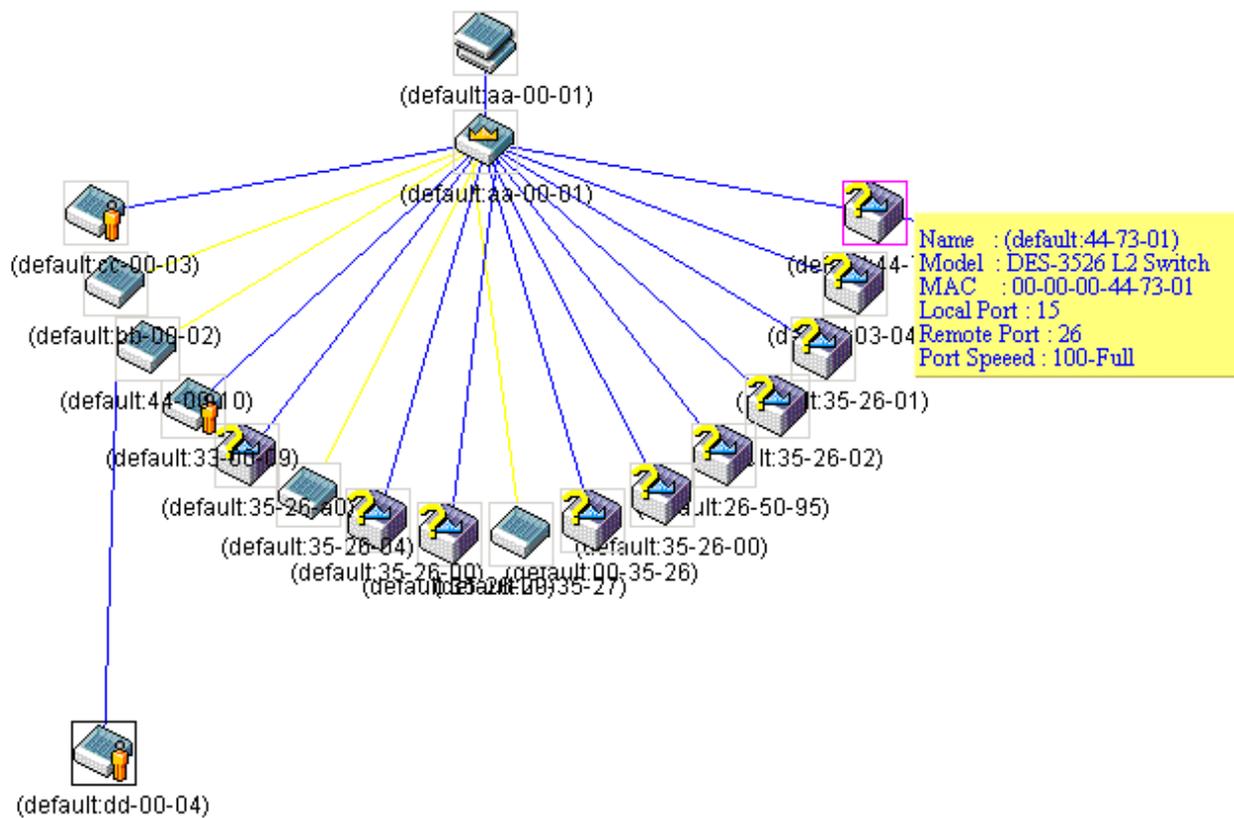
To view the **Topology Map**, click the View menu in the toolbar and then Topology, which will produce the following screen. The Topology View will refresh itself periodically (20 seconds by default).



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 10- 6. 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.

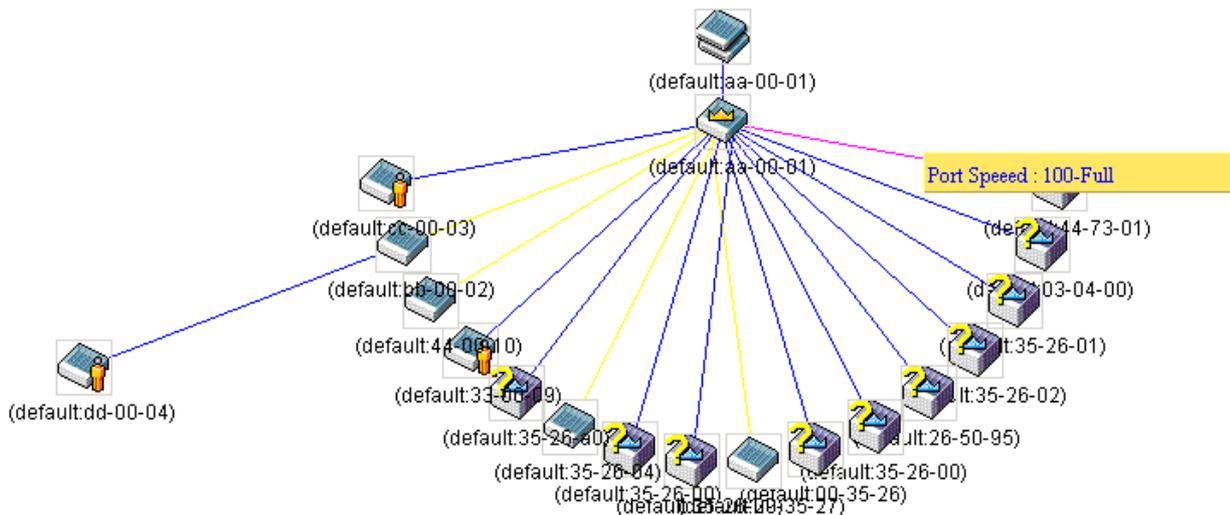


Figure 10- 7. Port Speed Utilizing the Tool Tip

## 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

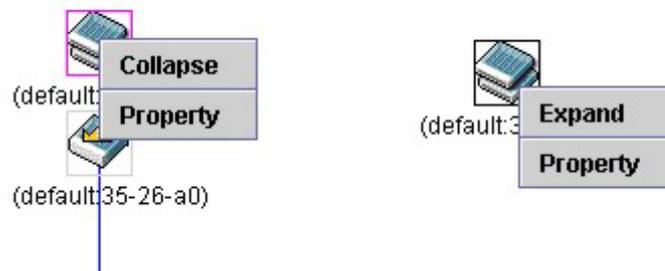


Figure 10- 8. Right Clicking a Group Icon

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.

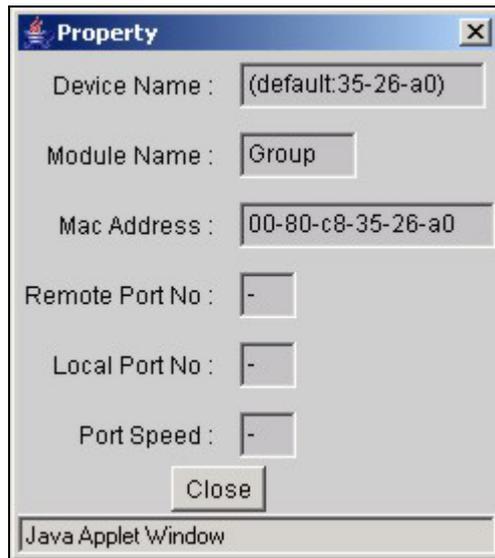


Figure 10- 9. Property window

## Commander Switch Icon

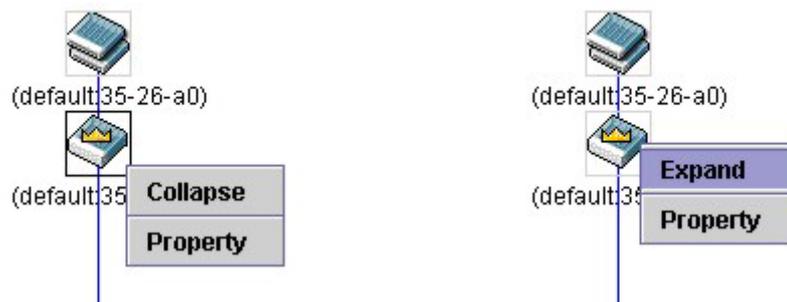


Figure 10- 10. Right-Clicking a Commander Icon

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.

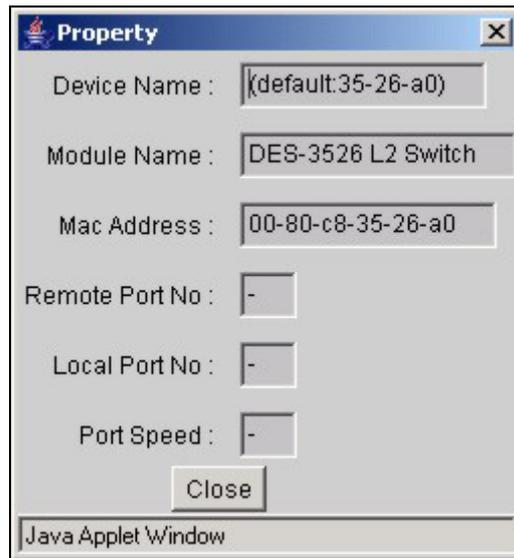


Figure 10- 11. Property window

## Member Switch Icon

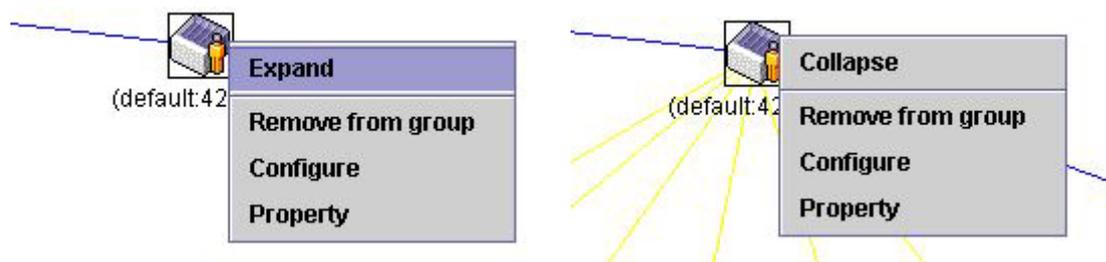


Figure 10- 12. Right-Clicking a Member icon

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.

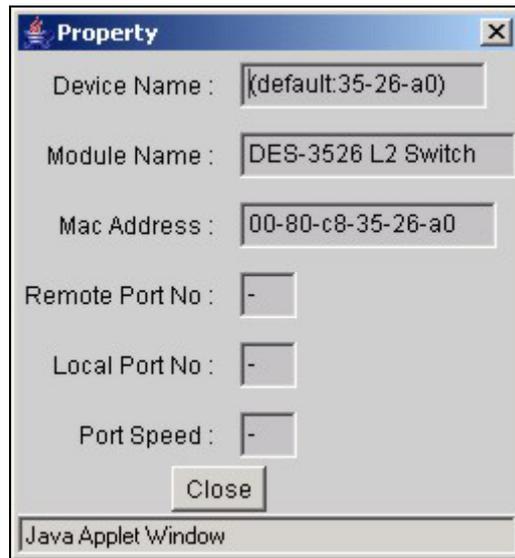


Figure 10- 13. Property window

## Candidate Switch Icon

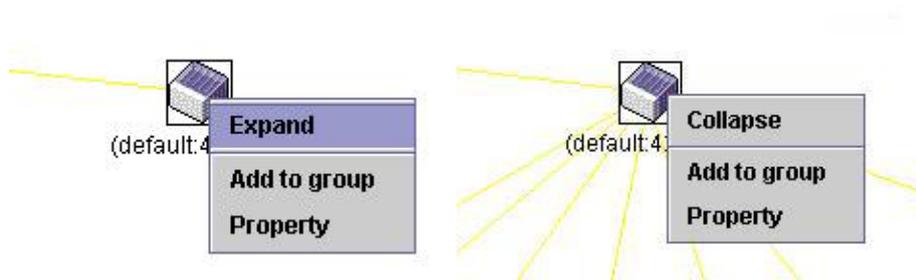


Figure 10- 14. Right-Clicking a Candidate icon

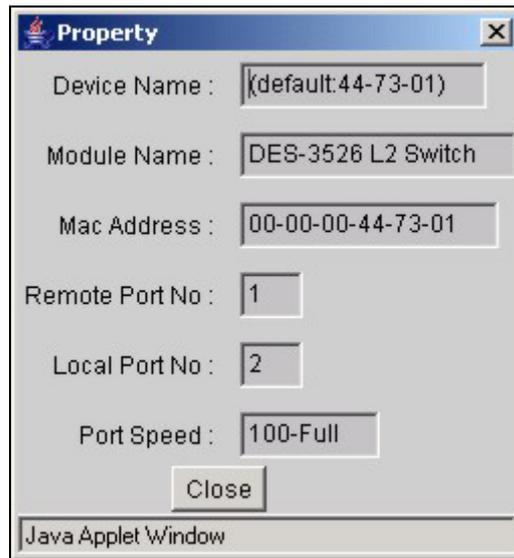
The following options may appear for the user to configure:

- **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 10- 15. Input password window.

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



**Figure 10- 16. 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 10- 17. 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 10- 18. 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.



**NOTE:** Upon this firmware release, some functions of the SIM can only be configured through the Command Line Interface. See the ***DES-3550 Command Line Interface Reference Manual*** for more information on SIM and its configurations.

## Firmware Upgrade

This screen is used to upgrade firmware from the Commander Switch to the Member Switch. 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/File name of the firmware. Click **Download** to initiate the file transfer.

Firmware Upgrade				
Port	Mac Address	Model Name	Version	
Server IP Address		<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Path \ File name		<input type="text"/>		
<input type="button" value="Download"/>				

Figure 10- 19. Firmware Upgrade window

## Configuration File Backup/Restore

This screen is used to upgrade configuration files from the Commander Switch to the Member Switch. 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 firmware resides and enter the Path/File name of the firmware. Click **Download** to initiate the file transfer.

Configuration File Backup/Restore				
Port	Mac Address	Model Name	Version	
Server IP Address		<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Path \ File name		<input type="text"/>		
<input type="button" value="Upload"/> <input type="button" value="Download"/>				

Figure 10- 20. Configuration File Backup/Restore window

# Appendix A

## Technical Specifications

Physical and Environmental	
<b>AC input &amp; External Redundant Power Supply:</b>	100 - 240 VAC, 50-60 Hz (internal universal power supply) Redundant power supply will take over when internal power supply fails.
<b>Power Consumption:</b>	60 watts maximum
<b>DC fans:</b>	2 built-in 40 x 40 x10 mm fans
<b>Operating Temperature:</b>	0 to 40 degrees Celsius (32 to 104 degrees Fahrenheit)
<b>Storage Temperature:</b>	-40 to 70 degrees Celsius (-40 to 158 degrees Fahrenheit)
<b>Humidity:</b>	Operating: 5% to 95% RH non-condensing
<b>Dimensions:</b>	441 mm x 309 mm x 44 mm (1U), 19 inch rack-mount width
<b>Weight:</b>	5 kg
<b>EMC:</b>	CE Class A FCC Class A C-Tick
<b>Safety:</b>	CSA International

<b>General</b>													
<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 802.1D 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												
<b>Protocols:</b>	CSMA/CD												
<b>Data Transfer Rates:</b>	<table border="0"> <tr> <td></td> <td>Half-duplex</td> <td>Full-duplex</td> </tr> <tr> <td><b>Ethernet</b></td> <td>10 Mbps</td> <td>20Mbps</td> </tr> <tr> <td><b>Fast Ethernet</b></td> <td>100Mbps</td> <td>200Mbps</td> </tr> <tr> <td><b>Gigabit Ethernet</b></td> <td>n/a</td> <td>2000Mbps</td> </tr> </table>		Half-duplex	Full-duplex	<b>Ethernet</b>	10 Mbps	20Mbps	<b>Fast Ethernet</b>	100Mbps	200Mbps	<b>Gigabit Ethernet</b>	n/a	2000Mbps
	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>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>Number of Ports:</b>	48 x 10/100 Mbps NWay ports 2 Gigabit Ethernet												

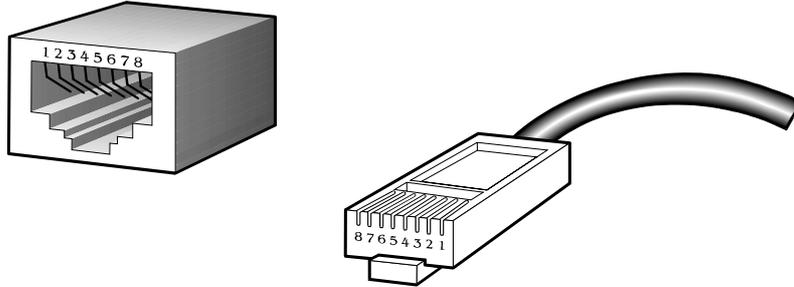
<b>Performance</b>	
<b>Transmission Method:</b>	Store-and-forward
<b>RAM Buffer:</b>	64 MB per device
<b>Filtering Address Table:</b>	8K MAC address per device
<b>Packet Filtering / Forwarding Rate:</b>	Full-wire speed for all connections. 148,810 pps per port (for 100Mbps) 1,488,100 pps per port (for 1000Mbps)
<b>MAC Address Learning:</b>	Automatic update
<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.



**Figure B- 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

**Table 2- 1. 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.

**aging:** 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 you to automatically map 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 you 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 you 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.

### **FCC Warning**

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.

### **CE Mark Warning**

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

### **Warnung!**

Dies ist ein Produkt der Klasse A. Im Wohnbereich kann dieses Produkt Funkstörungen verursachen. In diesem Fall kann vom Benutzer verlangt werden, angemessene Massnahmen zu ergreifen.

### **Precaución!**

Este es un producto de Clase A. En un entorno doméstico, puede causar interferencias de radio, en cuyo caso, puede requerirse al usuario para que adopte las medidas adecuadas.

### **Attention!**

Ceci est un produit de classe A. Dans un environnement domestique, ce produit pourrait causer des interférences radio, auquel cas l'utilisateur devrait prendre les mesures adéquates.

### **Attenzione!**

Il presente prodotto appartiene alla classe A. Se utilizzato in ambiente domestico il prodotto può causare interferenze radio, nel cui caso è possibile che l'utente debba assumere provvedimenti adeguati.

### **BSMI Warning**

#### **警告使用者**

這是甲類的資訊產品,在居住的環境中使用時,可能會造成射頻干擾,在這種情況下使用者會被要求採取某些適當的對策

# Warranty / Product 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.

<b>Product Type</b>	<b>Warranty Period</b>
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.

### **Trademarks**

Copyright 2005 D-Link Corporation. Contents subject to change without prior notice. D-Link is a registered trademark of D-Link Corporation/D-Link Systems, Inc. All other trademarks belong to their respective proprietors.

### **Copyright Statement**

No part of this publication may be reproduced in any form or by any means or used to make any derivative such as translation, transformation, or adaptation without permission from D-Link Corporation/D-Link Systems Inc., as stipulated by the United States Copyright Act of 1976.

## **FCC Warning**

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.

Limited Lifetime Warranty for the product is defined as follows:

- Hardware: For as long as the original customer/end user owns the product, or five (5) years after product discontinuance, whichever occurs first (excluding power supplies and fans)
- Power supplies and fans: Three (3) 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.

**Disclaimer of Other Warranties:** EXCEPT FOR THE LIMITED WARRANTY SPECIFIED HEREIN, THE PRODUCT IS PROVIDED "AS-IS" WITHOUT ANY WARRANTY OF ANY KIND WHATSOEVER 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, LOSS OF REVENUE OR PROFIT, WORK STOPPAGE, COMPUTER FAILURE OR MALFUNCTION, FAILURE OF OTHER EQUIPMENT OR COMPUTER PROGRAMS TO WHICH D-LINK'S PRODUCT IS CONNECTED WITH, 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. THE MAXIMUM LIABILITY OF D-LINK UNDER THIS WARRANTY IS LIMITED TO THE PURCHASE PRICE OF THE PRODUCT COVERED BY THE WARRANTY. THE FOREGOING EXPRESS WRITTEN WARRANTIES AND REMEDIES ARE EXCLUSIVE AND ARE IN LIEU OF ANY OTHER WARRANTIES OR REMEDIES, EXPRESS, IMPLIED OR STATUTORY.

**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 you may also have other rights which vary from state to state.

**Trademarks:** D-Link is a registered trademark of D-Link Systems, Inc. Other trademarks or registered trademarks are the property of their respective owners.

**Copyright Statement:** No part of this publication or documentation accompanying this product may be reproduced in any form or by any means or used to make any derivative such as translation, transformation, or adaptation without permission from D-Link Corporation/D-Link Systems, Inc., as stipulated by the United States Copyright Act of 1976 and any amendments thereto. Contents are subject to change without prior notice. Copyright 2005 by D-Link Corporation/D-Link Systems, Inc. All rights reserved.

**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 Product Warranty

## General Terms

The Limited Product Warranty set forth below is given by D-LINK (Europe) Ltd. (herein referred to as "D-LINK"). This Limited Product Warranty is only effective upon presentation of the proof of purchase. Upon further request by D-LINK, this warranty card has to be presented, too.

EXCEPT AS EXPRESSLY SET FORTH IN THIS LIMITED WARRANTY, D-LINK MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. D-LINK EXPRESSLY DISCLAIMS ALL WARRANTIES NOT STATED IN THIS LIMITED WARRANTY. ANY IMPLIED WARRANTIES THAT MAY BE IMPOSED BY LAW ARE LIMITED IN DURATION TO THE LIMITED WARRANTY PERIOD. SOME STATES OR COUNTRIES DO NOT ALLOW A LIMITATION ON HOW LONG AN IMPLIED WARRANTY LASTS OR THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR CONSUMER PRODUCTS. IN SUCH STATES OR COUNTRIES, SOME EXCLUSIONS OR LIMITATIONS OF THIS LIMITED WARRANTY MAY NOT APPLY TO YOU. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY ALSO HAVE OTHER RIGHTS THAT MAY VARY FROM STATE TO STATE OR FROM COUNTRY TO COUNTRY. YOU ARE ADVISED TO CONSULT APPLICABLE STATE OR COUNTRY LAWS FOR A FULL DETERMINATION OF YOUR RIGHTS.

This limited warranty applies to D-LINK branded hardware products (collectively referred to in this limited warranty as "D-LINK Hardware Products") sold by from D-LINK (Europe) Ltd., its worldwide subsidiaries, affiliates, authorized resellers, or country distributors (collectively referred to in this limited warranty as "D-LINK") with this limited warranty. The Term "D-LINK Hardware Product" is limited to the hardware components and all its internal components including firmware. The term "D-LINK Hardware Product" DOES NOT include any software applications or programs.

### Geographical Scope of the Limited Product Warranty

This Limited Product Warranty is applicable in all European Countries as listed in the addendum "European Countries for D-LINK Limited Product Warranty". The term "European Countries" in this D-LINK Limited Product Warranty only include the countries as listed in this addendum. The Limited Product Warranty will be honored in any country where D-LINK or its authorized service providers offer warranty service subject to the terms and conditions set forth in this Limited Product Warranty. However, warranty service availability and response times may vary from country to country and may also be subject to registration requirements.

### Limitation of Product Warranty

D-LINK warrants that the products described below under normal use are free from material defects in materials and workmanship during the Limited Product Warranty Period set forth below ("Limited Product Warranty Period"), if the product is used and serviced in accordance with the user manual and other documentation provided to the purchaser at the time of purchase (or as amended from time to time). D-LINK does not warrant that the products will operate uninterrupted or error-free or that all deficiencies, errors, defects or non-conformities will be corrected.

This warranty shall not apply to problems resulting from: (a) unauthorised alterations or attachments; (b) negligence, abuse or misuse, including failure to operate the product in accordance with specifications or interface requirements; (c) improper handling; (d) failure of goods or services not obtained from D-LINK or not subject to a then-effective D-LINK warranty or maintenance agreement; (e) improper use or storage; or (f) fire, water, acts of God or other catastrophic events. This warranty shall also not apply to any particular product if any D-LINK serial number has been removed or defaced in any way.

**D-LINK IS NOT RESPONSIBLE FOR DAMAGE THAT OCCURS AS A RESULT OF YOUR FAILURE TO FOLLOW THE INSTRUCTIONS FOR THE D-LINK HARDWARE PRODUCT.**

### Limited Product Warranty Period

The Limited Product Warranty Period starts on the date of purchase from D-LINK. Your dated sales or delivery receipt, showing the date of purchase of the product, is your proof of the purchase date. You may be required to provide proof of purchase as a condition of receiving warranty service. You are entitled to warranty service according to the terms and conditions of this document if a repair to your D-LINK branded hardware is required within the Limited Product Warranty Period.

This Limited Product Warranty extends only to the original end-user purchaser of this D-LINK Hardware Product and is not transferable to anyone who obtains ownership of the D-LINK Hardware Product from the original end-user purchaser.

Product Type	Product Warranty Period
Managed Switches (i.e. switches with built in SNMP agent)(including modules and management software)	Five (5) years
All other products	Two (2) years
Spare parts (i.e. External Power Adapters, Fans)	One (1) year

The warranty periods listed above are effective in respect of all D-LINK products sold in European Countries by D-LINK or one of its authorized resellers or distributors from 1st of January 2004. All products sold in European Countries by D-LINK or one of its authorized resellers or distributors before 1st January 2004 carry 5 years warranty, except power supplies, fans and accessories that are provided with 2 year warranty.

**The warranty period stated in this card supersedes and replaces the warranty period as stated in the user's manual or in the purchase contract for the relevant products. For the avoidance of doubt, if you have purchased the relevant D-LINK product as a consumer your statutory rights remain unaffected.**

### Performance of the Limited Product Warranty

If a product defect occurs, D-LINK's sole obligation shall be to repair or replace any defective product free of charge to the original purchaser provided it is returned to an Authorized D-LINK Service Center during the warranty period. Such repair or replacement will be rendered by D-LINK at an Authorized D-LINK Service Center. All component parts or hardware products removed under this limited warranty become the property of D-LINK. The replacement part or product takes on the remaining limited warranty status of the removed part or product. The replacement product need not be new or of an identical make, model or part; D-LINK may in its discretion replace the defective product (or any part thereof) with any reconditioned equivalent (or superior) product in all material respects to the defective product. Proof of purchase may be required by D-LINK.

### Warrantor

D-Link (Europe) Ltd.  
4th Floor, Merit House  
Edgware Road  
Colindale  
London NW9 5 AB  
United Kingdom

Telephone: +44-020-8731-5555

Facsimile: +44-020-8731-5511

[www.dlink.co.uk](http://www.dlink.co.uk)

## **D-Link Europe Limited Produktgarantie**

### **Allgemeine Bedingungen**

Die hierin beschriebene eingeschränkte Garantie wird durch D-LINK (Europe) Ltd. gewährt (im Folgenden: „D-LINK“). Diese eingeschränkte Garantie setzt voraus, dass der Kauf des Produkts nachgewiesen wird. Auf Verlangen von D-LINK muss auch dieser Garantieschein vorgelegt werden.

AUSSER IN DEM HIER AUSDRÜCKLICH BESCHRIEBENEN UMFANG GEWÄHRT D-LINK KEINE WEITEREN GARANTIE, WEDER AUSDRÜCKLICH NOCH STILLSCHWEIGEND. INSBESONDERE WIRD NICHT STILLSCHWEIGEND EINE GARANTIE FÜR DIE ALLGEMEINE GEBRAUCHSTAUGLICHKEIT ODER DIE EIGNUNG FÜR EINEN BESTIMMTEN ZWECK ERKLÄRT. D-LINK LEHNT AUSDRÜCKLICH JEDE GARANTIE AB, DIE ÜBER DIESE EINGESCHRÄNKTE GARANTIE HINAUSGEHT. JEDE GESETZLICH ANGEORDNETE GARANTIE IST AUF DIE LAUFZEIT DER EINGESCHRÄNKTEN GARANTIE BESCHRÄNKT. IN EINIGEN STAATEN ODER LÄNDERN IST DIE ZEITLICHE BESCHRÄNKUNG EINER STILLSCHWEIGEND ERKLÄRTEN GARANTIE SOWIE AUSSCHLUSS ODER BESCHRÄNKUNG VON SCHADENERSATZ FÜR NEBEN- ODER FOLGESCHÄDEN BEIM VERBRAUCHSGÜTERKAUF UNTERSAGT. SOWEIT SIE IN SOLCHEN STAATEN ODER LÄNDERN LEBEN, ENTFALTEN MÖGLICHERWEISE EINIGE AUSSCHLÜSSE ODER EINSCHRÄNKUNGEN DIESER EINGESCHRÄNKTEN GARANTIE GEGENÜBER IHNEN KEINE WIRKUNG. DIESE EINGESCHRÄNKTE GARANTIE GEWÄHRT IHNEN SPEZIFISCHE RECHTE. DARÜBER HINAUS STEHEN IHNEN MÖGLICHERWEISE NOCH WEITERE RECHTE ZU, DIE SICH JEDOCH VON STAAT ZU STAAT ODER VON LAND ZU LAND UNTERSCHIEDEN KÖNNEN. UM DEN UMFANG IHRER RECHTE ZU BESTIMMEN, WIRD IHNEN EMPFOHLEN, DIE ANWENDBAREN GESETZE DES JEWEILIGEN STAATES ODER LANDES ZU RATE ZU ZIEHEN.

Diese eingeschränkte Garantie ist auf Hardware-Produkte der Marke D-LINK (insgesamt im Folgenden: „D-LINK Hardware-Produkte“) anwendbar, die von D-LINK (Europe) Ltd. oder dessen weltweiten Filialen, Tochtergesellschaften, Fachhändlern oder Länderdistributoren (insgesamt im Folgenden: „D-LINK“) mit dieser eingeschränkten Garantie verkauft wurden. Der Begriff „D-LINK Hardware-Produkte“ beinhaltet nur Hardwarekomponenten und deren Bestandteile einschließlich Firmware. Der Begriff „D-LINK Hardware-Produkte“ umfasst KEINE Software-Anwendungen oder -programme.

### **Räumlicher Geltungsbereich der eingeschränkten Garantie**

Diese eingeschränkte Garantie gilt für alle genannten europäischen Staaten gemäß dem Anhang „Eingeschränkte Garantie von D-LINK in europäischen Staaten“. Im Rahmen dieser eingeschränkten Garantie sind mit dem Begriff „europäische Staaten“ nur die im Anhang genannten Staaten gemeint. Die eingeschränkte Garantie findet überall Anwendung, wo D-LINK oder dessen autorisierte Servicepartner Garantiedienste gemäß den Bestimmungen dieser eingeschränkten Garantie erbringen. Gleichwohl kann sich die Verfügbarkeit von Garantiediensten und die Bearbeitungszeit von Land zu Land unterscheiden und von Registrierungsanforderungen abhängig sein.

### **Einschränkung der Garantie**

D-LINK gewährleistet, dass die nachstehend aufgeführten Produkte bei gewöhnlicher Verwendung für die unten angegebene Laufzeit der eingeschränkten Garantie („Garantielaufzeit“) frei von wesentlichen Verarbeitungs- und Materialfehlern sind. Voraussetzung hierfür ist jedoch, dass das Produkt entsprechend dem Benutzerhandbuch und den weiteren Dokumentationen, die der Benutzer beim Kauf (oder später) erhalten hat, genutzt und gewartet wird. D-LINK garantiert nicht, dass die Produkte störungs- oder fehlerfrei arbeiten oder dass alle Mängel, Fehler, Defekte oder Kompatibilitätsstörungen beseitigt werden können.

Diese Garantie gilt nicht für Probleme wegen: (a) unerlaubter Veränderung oder Hinzufügung, (b) Fahrlässigkeit, Missbrauch oder Zweckentfremdung, einschließlich des Gebrauchs des Produkts entgegen den Spezifikationen oder den durch Schnittstellen gegebenen Vorgaben, (c) fehlerhafter Bedienung, (d) Versagen von Produkten oder Diensten, die nicht von D-LINK stammen oder nicht Gegenstand einer zum maßgeblichen Zeitpunkt gültigen Garantie- oder Wartungsvereinbarung sind, (e) Fehlgebrauch oder fehlerhafter Lagerung oder (f) Feuer, Wasser, höherer Gewalt oder anderer Katastrophen. Diese Garantie gilt ebenfalls nicht für Produkte, bei denen eine D-LINK-Seriennummer entfernt oder auf sonstige Weise unkenntlich gemacht wurde.

**D-LINK STEHT NICHT FÜR SCHÄDEN EIN, DIE DADURCH ENTSTEHEN, DASS DIE ANLEITUNG FÜR DAS D-LINK HARDWARE-PRODUKT NICHT BEFOLGT WIRD.**

### Laufzeit der eingeschränkten Garantie

Die Laufzeit der eingeschränkten Garantie beginnt mit dem Zeitpunkt, zu dem das Produkt von D-LINK gekauft wurde. Als Nachweis für den Zeitpunkt des Kaufs gilt der datierte Kauf- oder Lieferbeleg. Es kann von Ihnen verlangt werden, dass Sie zur Inanspruchnahme von Garantiediensten den Kauf des Produkts nachweisen. Wenn Ihre Hardware-Produkte der Marke D-LINK innerhalb der Laufzeit der eingeschränkten Garantie eine Reparatur benötigen, so sind Sie berechtigt, gemäß den Bedingungen dieser eingeschränkten Garantie Garantiedienste in Anspruch zu nehmen.

Diese eingeschränkte Garantie gilt nur für denjenigen, der das D-LINK Hardware-Produkt ursprünglich als originärer Endbenutzer gekauft hat. Sie ist nicht auf Dritte übertragbar, die das D-LINK-Produkt von dem ursprünglichen originären Endbenutzer erworben haben.

Produkttyp	Gewährleistungslaufzeit
Verwaltete Switches (d. h. Switches mit eingebauten SNMP-Agents) (einschließlich Modulen und Verwaltungssoftware)	Fünf (5) Jahre
Alle weiteren Produkte	Zwei (2) Jahre
Ersatzteile (z.B. externe Netzteile, Lüfter)	Ein (1) Jahr

Die oben aufgeführten Garantielaufzeiten gelten für alle D-LINK-Produkte, die in europäischen Staaten ab dem 1. Januar 2004 von D-LINK oder einem autorisierten Fachhändler oder Distributor verkauft werden. Alle vor dem 1. Januar 2004 von D-LINK oder einem autorisierten Vertragshändler oder Distributor verkauften Produkte haben eine Gewährleistung von 5 Jahren; ausgenommen sind Netzteile, Lüfter und Zubehör, diese haben eine Garantie von 2 Jahren.

Die durch diesen Garantieschein festgelegte Garantielaufzeit tritt an die Stelle der im Benutzerhandbuch oder im Kaufvertrag für das jeweilige Produkt angegebenen Laufzeit. Sollten Sie das betreffende D-LINK-Produkt als Verbraucher erworben haben, so sei klargestellt, dass Ihre gesetzlichen Rechte hiervon unberührt bleiben

### **Leistungsumfang der eingeschränkten Garantie**

Bei Auftreten eines Produktfehlers besteht die einzige Verpflichtung von D-LINK darin, dem ursprünglichen Käufer das defekte Produkt kostenlos zu reparieren oder es auszutauschen. Voraussetzung hierfür ist, dass das Produkt während der Garantielaufzeit einem autorisierten D-LINK-Servicecenter übergeben wird. Reparatur oder Austausch werden von D-LINK durch ein autorisiertes D-LINK-Servicecenter durchgeführt. Bauteile oder Hardware-Produkte, die gemäß dieser eingeschränkten Garantie entfernt werden, gehen in das Eigentum von D-LINK über. Die verbliebene eingeschränkte Garantie des entfernten Teils oder Produkts wird auf das Ersatzteil oder -produkt übertragen. Das Austauschprodukt muss weder neu sein noch dem defekten Produkt ganz oder in Teilen entsprechen. D-LINK darf dieses nach eigenem Ermessen gegen ein entsprechendes wiederaufbereitetes Produkt austauschen, welches dem defekten Produkt im Wesentlichen entspricht (oder höherwertig ist). D-LINK kann verlangen, dass der Kauf des Produkts nachgewiesen wird.

DIE VORSTEHENDE GARANTIE WURDE IN DIE DEUTSCHE SPRACHE AUS DEM ENGLISCHEN ÜBERSETZT. BEI ABWEICHUNGEN ZWISCHEN DER ENGLISCHEN VERSION UND DER DEUTSCHEN ÜBERSETZUNG GELTEN DIE BESTIMMUNGEN DER ENGLISCHEN VERSION.

### **Garantiegeber**

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## **D-Link Europe a limité la garantie des produits**

### **Conditions Générales**

La Garantie Produit Limitée énoncée ci-dessous émane de D-LINK (Europe) Ltd. (ci-après « D-LINK »). Cette Garantie Produit Limitée n'est valable que sur présentation de la preuve d'achat. D-LINK peut également exiger la présentation du présent bon de garantie.

SAUF INDICATION EXPLICITE DES PRESENTES, D-LINK NE FOURNIT AUCUNE AUTRE GARANTIE, EXPLICITE OU IMPLICITE, Y COMPRIS UNE GARANTIE IMPLICITE DE VALEUR MARCHANDE OU D'ADAPTATION DU PRODUIT A UN USAGE PRECIS. D-LINK DECLINE EXPLICITEMENT TOUTE GARANTIE NON ENONCEE DANS LES PRESENTES. TOUTE GARANTIE IMPLICITE IMPOSEE PAR LA LOI, LE CAS ECHEANT, EST LIMITEE DANS SA DUREE A CELLE DE LA GARANTIE LIMITEE. CERTAINS ETATS OU PAYS NE PERMETTENT PAS DE LIMITER LA DUREE DE LA GARANTIE IMPLICITE OU INTERDISENT D'EXCLURE OU DE LIMITER LA COUVERTURE DES DOMMAGES DIRECTS OU INDIRECTS OCCASIONNES AUX PRODUITS GRAND PUBLIC. DANS LES ETATS OU PAYS EN QUESTION, CERTAINES EXCLUSIONS OU LIMITATIONS DE LA PRESENTE GARANTIE PEUVENT NE PAS S'APPLIQUER A VOTRE CAS. LA PRESENTE GARANTIE LIMITEE VOUS OCTROIE CERTAINS DROITS LEGAUX SPECIFIQUES. VOUS POUVEZ EGALEMENT BENEFICIER D'AUTRES DROITS VARIABLES D'UN ETAT OU D'UN PAYS A L'AUTRE. NOUS VOUS RECOMMANDONS DE CONSULTER LA LEGISLATION EN VIGUEUR DANS VOTRE LIEU DE RESIDENCE POUR CONNAITRE L'ETENDUE DE VOS DROITS.

La présente garantie limitée s'applique aux produits matériels commercialisés sous la marque D-LINK (collectivement ici « les Produits Matériels D-LINK ») vendus par D-LINK (Europe) Ltd., ses filiales, sociétés affiliées, revendeurs agréés ou distributeurs locaux à travers le monde (collectivement ici « D-LINK ») avec la présente garantie limitée. Le terme de « Produit Matériel D-LINK » se limite aux composants matériels et à l'ensemble de leurs composants internes, notamment le firmware. Le terme de « Produit Matériel D-LINK » N'englobe PAS les applications ou programmes logiciels.

### **Etendue géographique de la Garantie Produit Limitée**

La présente Garantie Produit Limitée s'applique à tous les pays européens figurant dans l'annexe « Pays européens où s'applique la Garantie Produit Limitée D-LINK ». Le terme de « pays européens » utilisé dans la présente Garantie Produit Limitée D-LINK englobe uniquement les pays figurant dans la liste en annexe. La Garantie Produit Limitée sera honorée dans tout pays où D-LINK ou ses prestataires agréés proposent le service de garantie, sous réserve des modalités énoncées dans la présente Garantie Produit Limitée. Cependant, la disponibilité du service de garantie et les temps de réponse varient d'un pays à l'autre et peuvent également être assujettis à un enregistrement.

### **Limitation de la Garantie Produit**

D-LINK garantit que les produits décrits ci-dessous, dans le cadre d'une utilisation normale, sont dénués de défauts conséquents, tant au niveau de leurs composants matériels que de leur fabrication, et ce pendant toute la Période de Garantie Produit Limitée indiquée ci-dessous (« Période de Garantie Produit Limitée »), sous réserve qu'ils soient utilisés et entretenus conformément au manuel utilisateur et aux autres documents remis au client lors de l'achat (ou amendés de temps à autre). D-LINK ne garantit pas le fonctionnement ininterrompu ou sans erreur de ses produits. D-LINK ne s'engage pas non plus à corriger tous les défauts, erreurs ou non conformités.

La présente garantie ne s'applique pas aux problèmes qui sont la conséquence : (a) d'altérations ou d'ajouts non autorisés ; (b) d'une négligence, d'un abus ou d'une mauvaise utilisation, notamment une utilisation du produit non conforme à ses spécifications ou aux interfaces requises ; (c) d'une mauvaise manipulation ; (d) d'une panne de biens ou de services acquis auprès d'une société tierce (non D-LINK) ou qui ne font pas l'objet d'un contrat D-LINK de garantie ou de maintenance en bonne et due forme ; (e) d'une mauvaise utilisation ou d'un rangement dans des conditions inadéquates ; ou (f) du feu, de l'eau, d'une catastrophe naturelle ou autre. La présente garantie ne s'applique pas non plus à un produit dont le numéro de série D-LINK aurait été retiré ou altéré de quelque manière que ce soit.

**D-LINK N'EST NULLEMENT RESPONSABLE DE DOMMAGES RESULTANT DE VOTRE INOBSERVATION DES INSTRUCTIONS FOURNIES POUR L'UTILISATION DE SON PRODUIT MATERIEL.**

### Période de Garantie Produit Limitée

La Période de Garantie Produit Limitée court à compter de la date d'achat auprès de D-LINK. La date de votre reçu ou bon de livraison correspond à la date d'achat du produit et constitue la date de votre preuve d'achat. Il est possible que le service de garantie ne vous soit accordé que sur production de votre preuve d'achat. Vous avez droit à un service de garantie conforme aux modalités énoncées dans les présentes dès lors que votre matériel de marque D-LINK nécessite une réparation pendant la Période de Garantie Produit Limitée.

La présente Garantie Produit Limitée s'applique uniquement à l'acheteur utilisateur final initial du Produit Matériel D-LINK. Elle est non cessible à quiconque se procure le Produit Matériel D-LINK auprès de l'acheteur utilisateur final initial.

Type de produit	Période de Garantie
Switches gérés (switches comportant un agent SNMP intégré)(y compris modules et logiciels de gestion)	Cinq (5) ans
Tous autres produits	Deux (2) ans
Pièces détachées (adaptateurs d'alimentation externes, ventilateurs)	Un (1) an

Les périodes de garantie indiquées ci-dessus s'appliquent à tous les produits D-LINK vendus depuis le 1er janvier 2004 dans les pays européens par D-LINK ou l'un de ses revendeurs ou distributeurs agréés. Tous les produits vendus avant le 1er janvier 2004 dans les pays européens par D-LINK ou l'un de ses revendeurs ou distributeurs agréés bénéficient d'une garantie de 5 ans, excepté les fournitures électriques, ventilateurs et accessoires, qui sont couverts par une garantie de 2 ans.

La période de garantie indiquée sur ce bon annule et remplace celle qui figure dans le manuel utilisateur ou dans le contrat d'achat des produits considérés. Pour éviter le doute, si vous avez acheté votre produit D-LINK en tant que consommateur, vos droits légaux demeurent inchangés.

### **Exécution de la Garantie Produit Limitée**

En cas de défaut ou d'erreur d'un produit, l'unique obligation de D-LINK se limite à la réparation ou au remplacement gratuit du produit défectueux, au bénéfice de l'acheteur initial, sous réserve que le produit soit rapporté à un Centre de Service Agréé D-LINK pendant la période de garantie. D-LINK assure la réparation ou le remplacement dans un Centre de Service Agréé D-LINK. Les composants, pièces ou produits retirés dans le cadre de cette garantie limitée deviennent propriété de D-LINK. La pièce ou le produit de remplacement est couvert par la garantie limitée de la pièce ou du produit d'origine pendant la période restante. Le produit de remplacement n'est pas nécessairement neuf, ni d'une marque ou d'un modèle identique ; D-LINK peut décider, de manière discrétionnaire, de remplacer le produit défectueux (ou ses pièces) par un équivalent (ou un article supérieur) reconditionné ayant toutes les fonctionnalités du produit défectueux. D-LINK peut exiger la preuve d'achat.

### **Garant**

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## **Garantía limitada del producto D-LINK Europa**

### **Condiciones generales**

Esta garantía la ofrece D-LINK (Europe) Ltd. (en este documento, "D-LINK"). La garantía limitada del producto sólo es válida si se acompaña del comprobante de la compra. También deberá presentarse la tarjeta de garantía si D-LINK lo solicita.

EXCEPTO EN LO EXPRESAMENTE INDICADO EN ESTA GARANTÍA LIMITADA, D-LINK NO CONCEDE OTRAS GARANTÍAS, NI EXPLÍCITAS NI IMPLÍCITAS, INCLUIDAS LAS GARANTÍAS IMPLÍCITAS DE COMERCIALIDAD Y APTITUD A UN FIN DETERMINADO. D-LINK RECHAZA EXPLÍCITAMENTE CUALQUIER GARANTÍA QUE NO FIGURE EN ESTA GARANTÍA LIMITADA. LA DURACIÓN DE CUALQUIER GARANTÍA IMPLÍCITA QUE PUEDA SER IMPUESTA POR LEY QUEDA LIMITADA AL PERÍODO DE LA GARANTÍA LIMITADA. ALGUNOS ESTADOS O PAÍSES NO PERMITEN QUE EN LA GARANTÍA LIMITADA DE PRODUCTOS DE CONSUMO SE RESTRINJA LA DURACIÓN TEMPORAL, NI QUE SE EXCLUYAN O LIMITEN LOS DAÑOS INCIDENTALES O RESULTANTES PARA EL CONSUMIDOR DE LOS PRODUCTOS. EN ESTOS ESTADOS O PAÍSES, A USTED NO LE PUEDEN APLICAR ALGUNAS EXCLUSIONES O LIMITACIONES DE LA GARANTÍA LIMITADA. ESTA GARANTÍA LIMITADA LE CONCEDE DETERMINADOS DERECHOS. PUEDE, TAMBIÉN, TENER OTROS DERECHOS, QUE PUEDEN SER DISTINTOS DE UN ESTADO A OTRO O DE UN PAÍS A OTRO. SE RECOMIENDA QUE CONSULTE LAS LEYES PERTINENTES DE UN ESTADO O PAÍS A FIN DE QUE CONOZCA SUS DERECHOS.

Esta garantía limitada se aplica a los productos de hardware de la marca D-LINK (llamados en esta guía "Productos de hardware D-LINK") comprados a D-LINK (Europe) Ltd., a sus filiales en el mundo, a sus proveedores autorizados o a sus distribuidores locales (llamados en este documento "D-LINK") con esta garantía limitada. El término "producto de hardware D-LINK" se restringe a los componentes de hardware y a los componentes internos de estos, incluyendo el firmware. El término "producto de hardware D-LINK" NO incluye ni las aplicaciones ni los programas de software.

### **Cobertura geográfica de la garantía limitada del producto**

Esta garantía limitada del producto es válida en todos los países europeos que figuran en el apéndice "Países europeos de la garantía limitada del producto D-LINK". En esta garantía limitada del producto D-Link, el término "países europeos" sólo incluye los países que figuran en el apéndice. La garantía limitada del producto será válida en cualquier país en el que D-LINK o sus proveedores autorizados de servicios ofrezcan un servicio de garantía sujeto a los términos y condiciones recogidos en esta garantía limitada del producto. Sin embargo, la disponibilidad del servicio de garantía, así como el tiempo de respuesta, pueden variar de un país a otro y pueden estar sujetos a requisitos de registro.

### **Limitación de la garantía del producto**

D-LINK garantiza que los productos descritos más adelante están libres de defectos de fabricación y materiales, en condiciones normales de uso, a lo largo del período de la garantía limitada del producto que se indica en este documento ("período de la garantía limitada del producto"), si el producto se ha utilizado y mantenido conforme a lo recogido en el manual del usuario o en otra documentación que se haya proporcionado al comprador en el momento de la compra (o que se haya corregido). D-LINK no garantiza que los productos funcionarán sin interrupciones o sin errores, ni que se corregirán todas las deficiencias, errores, defectos o disconformidades.

Esta garantía no cubre problemas derivados de: (a) modificaciones o conexiones no autorizadas; (b) negligencia, abuso o mal uso, incluyendo el incumplimiento de las especificaciones y de los requisitos de la interfaz en el funcionamiento del producto; (c) manejo incorrecto; (d) errores en artículos o servicios ajenos a D-LINK o no sujetos a una garantía o un contrato de mantenimiento vigentes de D-LINK; (e) uso o almacenamiento incorrecto; o (f) fuego, agua, casos fortuitos u otros hechos catastróficos. Esta garantía tampoco es válida para aquellos productos a los que se haya eliminado o alterado de algún modo el número de serie D-LINK.

D-LINK NO SE RESPONSABILIZA DE LOS DAÑOS CAUSADOS COMO CONSECUENCIA DEL INCUMPLIMIENTO DE LAS INSTRUCCIONES DEL PRODUCTO DE HARDWARE D-LINK.

### Período de la garantía limitada del producto

El período de la garantía limitada del producto se inicia en la fecha en que se realizó la compra a D-LINK. Para el comprador, el comprobante de la fecha de la compra es el recibo de la venta o de la entrega, en el que figura la fecha de la compra del producto. Puede ser necesario tener que presentar el comprobante de la compra a fin de que se preste el servicio de garantía. El comprador tiene derecho al servicio de garantía conforme a los términos y condiciones de este documento, si requiere una reparación del hardware de la marca D-LINK dentro del período de garantía limitada del producto.

Esta garantía limitada del producto cubre sólo al originario comprador-usuario final de este producto de hardware D-LINK, y no es transferible a otras personas que reciban el producto de hardware D-LINK del originario comprador-usuario final.

Tipo de producto	Período de garantía del producto
Conmutadores gestionados (p. ej., conmutadores con agente SNMP integrado) (incluyendo módulos y software de gestión)	Cinco (5) años
Resto de productos	Dos (2) años
Piezas de repuesto (p. ej., adaptadores de alimentación externos, ventiladores)	Un (1) año

Estos períodos de garantía están en vigor para todos los productos D-LINK que hayan sido comprados en países europeos a D-LINK o a alguno de sus proveedores o distribuidores autorizados a partir del 1 de enero del 2004. Todos los productos comprados en países europeos a D-LINK o a uno de sus proveedores o distribuidores autorizados antes del 1 de enero del 2004 cuentan con 5 años de garantía, excepto las fuentes de alimentación, los ventiladores y los accesorios, que cuentan con 2 años de garantía.

El período de garantía que figura en esta tarjeta sustituye y reemplaza al período de garantía que consta en el manual del usuario o en el contrato de compra de los productos correspondientes. Para evitar dudas: si usted ha comprado el producto D-LINK correspondiente como consumidor, sus derechos legales no se ven afectados.

### **Uso de la garantía limitada del producto**

Si un producto presenta algún defecto, la obligación exclusiva de D-LINK será reparar o reemplazar, sin coste alguno para el comprador originario, cualquier producto defectuoso siempre y cuando éste sea entregado en un centro autorizado de servicio D-LINK durante el período de garantía. D-LINK realizará la reparación o sustitución para un centro autorizado de servicio D-LINK. Todos los productos de hardware o componentes que se eliminen bajo esta garantía limitada serán propiedad de D-LINK. La parte o el producto de repuesto adquiere, para el resto de la garantía limitada, el estatus de parte o producto eliminado. El producto de repuesto no ha de ser nuevo o de la misma marca, modelo o parte; D-LINK puede sustituir a discreción el producto defectuoso (o cualquier parte) con un producto equivalente reacondicionado (o superior) en cualquier material respecto al producto defectuoso. D-LINK puede pedir el comprobante de compra.

### **Garante**

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## **D-Link Europe Termini di Garanzia dei Prodotti**

### **Generalità**

La presente Garanzia viene fornita da D-LINK (Europe) Ltd. (di seguito denominata "D-LINK"). Essa viene riconosciuta solo se accompagnata dalla prova di acquisto. D-LINK può richiedere anche l'esibizione della presente cartolina di garanzia.

SALVO QUANTO ESPRESSAMENTE STABILITO NELLA PRESENTE GARANZIA LIMITATA, D-LINK NON FORNISCE NESSUN'ALTRA GARANZIA NE' ESPRESSA NE' IMPLICITA, COMPRESSE EVENTUALI GARANZIE DI COMMERCIALIZZABILITÀ O DI IDONEITÀ PER UN PARTICOLARE SCOPO. D-LINK NEGA ESPRESSAMENTE QUALUNQUE ALTRA GARANZIA CHE NON RIENTRI NELLA PRESENTE GARANZIA LIMITATA. QUALSIASI GARANZIA IMPLICITA, CHE DOVESSE ESSERE IMPOSTA PER LEGGE, SARÀ CIRCOSCRITTA ALLA DURATA DELLA PRESENTE GARANZIA. ALCUNI PAESI VIETANO QUALSIASI LIMITAZIONE DEL PERIODO DI VALIDITÀ DELLE GARANZIE IMPLICITE OPPURE L'ESCLUSIONE O LA LIMITAZIONE DEI DANNI INCIDENTALI O CONSEGUENZIALI PER I PRODOTTI. IN TALI PAESI, EVENTUALI ESCLUSIONI O LIMITAZIONI DELLA PRESENTE GARANZIA NON POTRANNO APPLICARSI AL VOSTRO CASO. LA PRESENTE GARANZIA VI CONFERISCE DIRITTI LEGALI SPECIFICI. INOLTRE POTRETE GODERE DI ULTERIORI DIRITTI CHE POSSONO VARIARE A SECONDA DEL PAESE. SIETE INVITATI A CONSULTARE LE LEGGI APPLICABILI DEL VOSTRO PAESE AL FINE DI DETERMINARE CON PRECISIONE I VOSTRI DIRITTI.

La presente garanzia trova applicazione su tutti i prodotti hardware recanti il marchio D-LINK (di seguito denominati collettivamente "Prodotti hardware D-LINK") venduti da D-LINK (Europe) Ltd., dalle sue controllate, dalle sue affiliate, dai rivenditori autorizzati o dai distributori nazionali (di seguito denominati collettivamente "D-LINK"), accompagnati dalla presente garanzia limitata. Il termine "Prodotto hardware D-LINK" si riferisce esclusivamente ai componenti hardware e a tutte le parti interne compreso il firmware. Il termine "Prodotto hardware D-LINK" NON comprende eventuali applicazioni o programmi software.

### **Ambito geografico della Garanzia limitata**

La presente Garanzia è estesa a tutti i Paesi europei elencati nell'appendice "Paesi europei - Garanzia limitata dei prodotti D-LINK". Il termine "Paesi europei" si riferisce esclusivamente ai paesi nominati in questa appendice. La Garanzia verrà riconosciuta in tutti i paesi nei quali D-LINK o i suoi Centri di Assistenza autorizzati offrono assistenza conformemente alle condizioni e ai termini stabiliti nella presente Garanzia. Tuttavia, la disponibilità all'assistenza e i tempi di intervento variano da paese a paese e possono essere soggetti a eventuali requisiti di registrazione.

### **Limitazione della Garanzia**

D-LINK garantisce che i prodotti sotto descritti in condizioni di normale utilizzo non presentano difetti di fabbricazione o vizi di materiale durante il Periodo di garanzia sotto specificato ("Periodo di garanzia"), a condizione che vengano utilizzati e sottoposti a manutenzione in conformità con il manuale d'uso e con ogni altra documentazione fornita all'acquirente all'atto dell'acquisto (e relativi emendamenti). D-LINK non garantisce che il funzionamento del prodotto sarà ininterrotto o esente da errori né tanto meno che tutti gli eventuali errori, carenze, difetti o non conformità potranno essere corretti.

La presente garanzia non copre eventuali problemi derivanti da: (a) alterazioni o aggiunte non autorizzate; (b) negligenza, abuso o utilizzo improprio, compresa l'incapacità di far funzionare il prodotto in conformità con le specifiche e i requisiti di connessione; (c) movimentazione impropria; (d) guasto di prodotti o servizi non forniti da D-LINK o non soggetti a una garanzia successiva di D-LINK o a un accordo di manutenzione; (e) impiego o conservazione impropri; (f) incendio, inondazione, cause di forza maggiore o altro evento catastrofico accidentale. La presente garanzia non si applica altresì ad alcun prodotto particolare qualora il numero di serie di D-LINK sia stato rimosso o reso illeggibile in altro modo.

**D-LINK DECLINA OGNI RESPONSABILITÀ PER EVENTUALI DANNI RISULTANTI DAL MANCATO RISPETTO DELLE ISTRUZIONI RELATIVE AL PRODOTTO HARDWARE D-LINK.**

## Periodo di garanzia

Il Periodo di garanzia ha decorrenza dalla data dell'acquisto presso D-LINK. Prova della data di acquisto è il documento fiscale (scontrino fiscale o ricevuta) recante la data di acquisto del prodotto. Per avere diritto alla garanzia può esserVi richiesto di esibire la prova di acquisto. Potete beneficiare delle prestazioni di assistenza previste dalla garanzia in conformità con i termini e le condizioni di cui sotto nel momento in cui il Vostro prodotto hardware D-LINK necessita di una riparazione durante il Periodo di garanzia.

La presente Garanzia si applica esclusivamente al primo acquirente del Prodotto hardware D-LINK e non può essere trasferita a terzi che abbiano ottenuto la proprietà del Prodotto hardware D-LINK dal primo acquirente.

Tipo di prodotto	Periodo di garanzia
Switch (solo switch dotati di agente SNMP incorporato) (inclusi moduli e software di gestione)	5 (cinque) anni
Tutti gli altri prodotti	2 (due) anni
Pezzi di ricambio (es. adattatori esterni di potenza, alimentatori esterni, ventole)	1 (un) anno

Il periodo di garanzia sopra specificato relativamente a tutti i prodotti D-LINK venduti nei Paesi europei da D-LINK o da qualsiasi suo rivenditore o distributore autorizzato decorre dal 1° gennaio 2004. Tutti i prodotti venduti nei Paesi europei da D-LINK o da uno qualsiasi dei suoi rivenditori o distributori autorizzati prima del 1° gennaio 2004 sono coperti da una garanzia di 5 anni fatto salvo per alimentatori, ventole e accessori che hanno 2 anni di garanzia.

Il periodo di garanzia qui menzionato sostituisce qualsiasi altro periodo di garanzia definito nel manuale d'uso o nel contratto di acquisto del prodotto. Se avete acquistato un prodotto D-LINK in qualità di consumatore i Vostri diritti rimangono invariati.

### **Prestazioni della Garanzia limitata**

Qualora comparisse un difetto o una non conformità, D-LINK avrà l'unico obbligo di riparare o sostituire il prodotto non conforme senza alcun costo per l'acquirente a condizione che il prodotto venga restituito a un Centro di Assistenza autorizzato D-LINK entro il periodo di garanzia. La riparazione o la sostituzione verranno eseguite da D-LINK presso un Centro di Assistenza autorizzato D-LINK. Tutti i componenti o i prodotti hardware rimossi conformemente ai termini e alle condizioni della presente garanzia divengono di proprietà di D-LINK. Il pezzo o il prodotto in sostituzione beneficerà della garanzia per il tempo residuo della parte o del prodotto originale. Il prodotto in sostituzione non deve necessariamente essere nuovo o di identica fattura, modello o composizione; D-LINK può a sua discrezione sostituire il prodotto non conforme (o qualsiasi parte di esso) con un prodotto che risulti essere equivalente (o di valore superiore) al prodotto non conforme. D-LINK può richiedere che venga esibita la prova di acquisto.

### **Garante**

D-Link (Europe) Ltd.  
4th Floor, Merit House  
Edgware Road  
Colindale  
Londra NW9 5 AB  
Regno Unito

Telefono: +44-020-8731-5555

Fax: +44-020-8731-5511

[www.dlink.co.uk](http://www.dlink.co.uk)

# Technical 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

#### ***D-Link Technical Support over the Internet:***

<http://www.dlink.co.nz>

email:[support@dlink.co.nz](mailto:support@dlink.co.nz)

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**Building Networks for People**

## 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)

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## 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>

<ftp://support.dlink.co.in>

email: [techsupport@dlink.co.in](mailto:techsupport@dlink.co.in)

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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

#### ***D-Link Technical Support over the Internet***

<http://www.dlink.ru>

email: [support@dlink.ru](mailto:support@dlink.ru)



# 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>**

**e-mail: [amostafa@dlink-me.com](mailto:amostafa@dlink-me.com)**

## 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:

#### ***D-Link Technical Support over the Telephone:***

0800-7014104

Monday to Friday 8:30am to 18:30pm

#### ***D-Link Technical Support over the Internet:***

[www.dlinkbrasil.com.br](http://www.dlinkbrasil.com.br)

email:[suporte@dlinkbrasil.com.br](mailto:suporte@dlinkbrasil.com.br)

## **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

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## 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>

## 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:***

<http://support.dlink.ca>

email:[support@dlink.ca](mailto:support@dlink.ca)

## 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)

Monday to Friday 8:00 am to 10:00 pm GMT

Sat & Sun 10.00 am to 7.00 pm GMT

#### ***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)

## 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.

Wenn Sie Kunde von D-Link außerhalb Deutschlands, Österreichs, der Schweiz und Osteuropas sind, wenden Sie sich bitte an die zuständige Niederlassung aus der Liste im Benutzerhandbuch.

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## Assistance technique

Vous trouverez la documentation et les logiciels les plus récents sur le site web **D-Link**.

Le service technique de **D-Link** est gratuit pour les clients aux Etats-Unis durant la période de garantie.

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)

## 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:**

+49 (1805)-2787

### **Pomoc techniczna firmy D-Link świadczona przez Internet:**

URL: <http://www.dlink.pl>

e-mail: [pomoc\\_techniczna@dlink.de](mailto:pomoc_techniczna@dlink.de)

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## 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.de>

E-Mail: [support@dlink.de](mailto:support@dlink.de)

Telefon: +49 (1805)-2787

Telefonická podpora je v provozu:

PO-ČT od 08.00 do 19.00

PÁ od 08.00 do 17.00

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## 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.

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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

**D-Link<sup>®</sup>**  
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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>



## **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>**

**[email:support@dlink.dk](mailto:support@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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## 技术支持

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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：北京市海淀区中关村南大街 9 号理工大厦  
1107 室 邮编:100081

维修中心电话：(010)68477035/68477036/68477037

维修中心传真：(010)68477036

网址：<http://www.dlink.com.cn>

办公时间：周一到周五，早09:00到晚18:00

**D-Link<sup>®</sup>**  
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# International Offices

U.S.A  
17595 Mt. Herrmann Street  
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TEL: 714-885-6000  
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URL: www.dlink.com

Canada  
2180 Winston Park Drive  
Oakville, Ontario, L6H 5W1  
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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  
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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  
Rue des Colonies 11  
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,  
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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

Finland  
Latokartanontie 7A  
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FAX: +358-10 309 8841  
URL: www.dlink.fi

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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)  
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FAX: 56-2-232-0923  
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Highveld Technopark  
Centurion  
Gauteng  
Republic of South Africa  
TEL: 27-12-665-2165  
FAX: 27-12-665-2186  
URL: www.d-link.co.za

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Grafsky per., 14, floor 6  
Moscow  
129626 Russia  
TEL: 7-095-744-0099  
FAX: 7-095-744-0099 #350  
URL: www.dlink.ru

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No.202,C1 Building, Huitong  
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URL: www.dlink.com.cn

Taiwan  
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Hsin-Tien, Taipei  
Taiwan  
TEL: 886-2-2910-2626  
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

# 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 Serial No.	* 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  DECnet Pathwork  Windows NT  Windows NTAS  Windows '95  
 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?*

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PLEASE  
PLACE STAMP  
HERE

**TO:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**D-Link®**