



**DES-3226S**  
Layer 2 Switch  
Release 4.01  
User's Guide

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## Introduction

This section describes the functionality features of the DES-3226S. Some background information about Ethernet/Fast Ethernet, Gigabit Ethernet, and Switching technology is presented.

## Features

The DES-3226S Switch was designed for easy installation and high performance in an environment where traffic on the network and the number of users increase continuously. Notable Switch features include:

## Ports

- 24 high performance NWay ports all operating at 10/100 Mbps with Auto-MDIX function for connecting to end stations, servers and hubs.
- All ports can auto-negotiate (NWay) between 10Mbps/ 100Mbps, half-duplex or full duplex and flow control for half-duplex ports.
- One front panel slide-in module interface for a 2-port 1000BASE-SX, 1000BASE-LX, 1000BASE-T, 100BASE-FX, GBIC or 1-port GBIC & stacking module.
- 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.

## Performance

- 24 built-in 10/100 Mbps ports
- Switch stacking configuration: 8 units per stack + 8 GBIC ports
- Support for stacking with DGS-3212SR or DGS-3312SR in star topology arrangement
- 1 open slot for 2 10/100 Mbps ports, 1 or 2 optional Fast Ethernet fiber or 2 Gigabit port (stand-alone configuration)
- 8.8 Gbps Switching fabric capacity
- Auto MDI/MDIX uplink for all twisted-pair ports
- Supports 802.1Q VLAN, IGMP snooping, 802.1p Priority Queues, port mirroring
- Multi-layer ACL and QoS control
- 802.1x port-based and MAC-based access control
- Asymmetric VLAN support
- Simple Network Time Protocol support
- Multicast filtering per port
- Per-port bandwidth control
- IEEE 802.3z compliant for all Gigabit ports (optional)
- IEEE 802.3x compliant Flow Control support for all Gigabit ports (optional)

## Management

- RS-232 console port for out-of-band network management via a console terminal or PC.
- IEEE 802.1w Rapid Spanning Tree Algorithm Protocol for creation of alternative backup paths and prevention of network loops.
- SNMP (v.1, v.2, v.3) Agent.
- IEEE 802.1X Support
- Port Security
- Fully configurable either in-band or out-of-band control via console serial connection.
- Flash memory for software upgrades. This can be done in-band via TFTP or out-of-band via the console. *Download the latest Switch firmware from the D-Link website.*
- Built-in SNMP management:
  - Bridge MIB (RFC 1493)
  - MIB-II (RFC 1213)
  - Mini-RMON MIB (RFC 1757) – 4 groups
  - 802.1p MIB (RFC 2674).
  - IF MIB (RFC 2233)
  - Ether-Like MIB (RFC 1643)
- Supports Web-based management.
- CLI management support
- TFTP support.
- BOOTP support.
- DCHP Client support.

## Switch Stacking

The DES-3226S can be used as a standalone or stacked Switch – using the optional stacking module. Up to 8 Switches may be stacked and managed as a unit with a single IP address.

Management for the entire stack is done through the Master Switch.

You may add Switches later as needed.

The Switch can also be grouped in a stack as a slave with the D-Link DGS-3212SR or DGS-3312SR Switch (acting as the Master).

## Fast Ethernet Technology

100Mbps Fast Ethernet (or 100BASE-T) 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.

## Unpacking and Setup

This chapter provides unpacking and setup information for the Switch.

### Unpacking

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

1. One DES-3226S 24-port Fast Ethernet Layer 2 Switch
2. Mounting kit: 2 mounting brackets and screws
3. Four rubber feet with adhesive backing
4. One AC power cord
5. This User's Guide with Registration Card

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

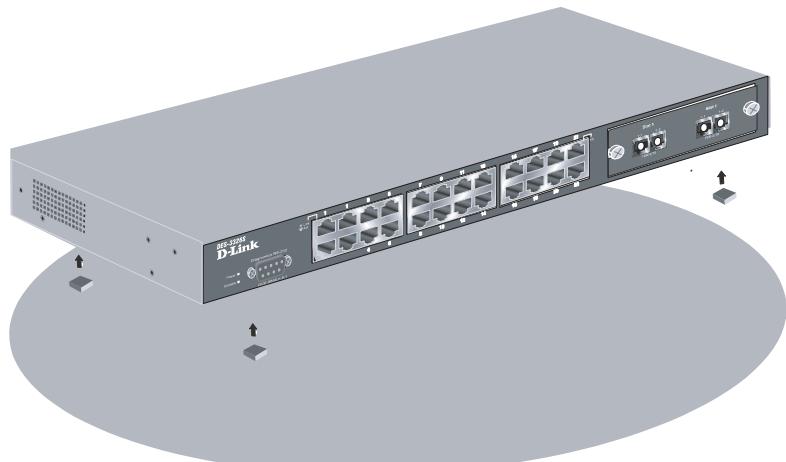
## Installation

Use the following guidelines when choosing a place to install the Switch:

- The surface must support at least 3 kg
- The power outlet should be within 1.82 meters (6 feet) of the device
- Visually inspect the power cord and see that it is secured to the AC power connector
- Make sure that there is proper heat dissipation from and adequate ventilation around the Switch. Do not place heavy objects on the Switch

### Desktop or Shelf Installation

When installing the Switch on a desktop or shelf, the rubber feet included with the device should first be attached. Attach these cushioning feet on the bottom at each corner of the device. Allow adequate space for ventilation between the device and the objects around it.



**Figure 2-1. Installing rubber feet for desktop installation**

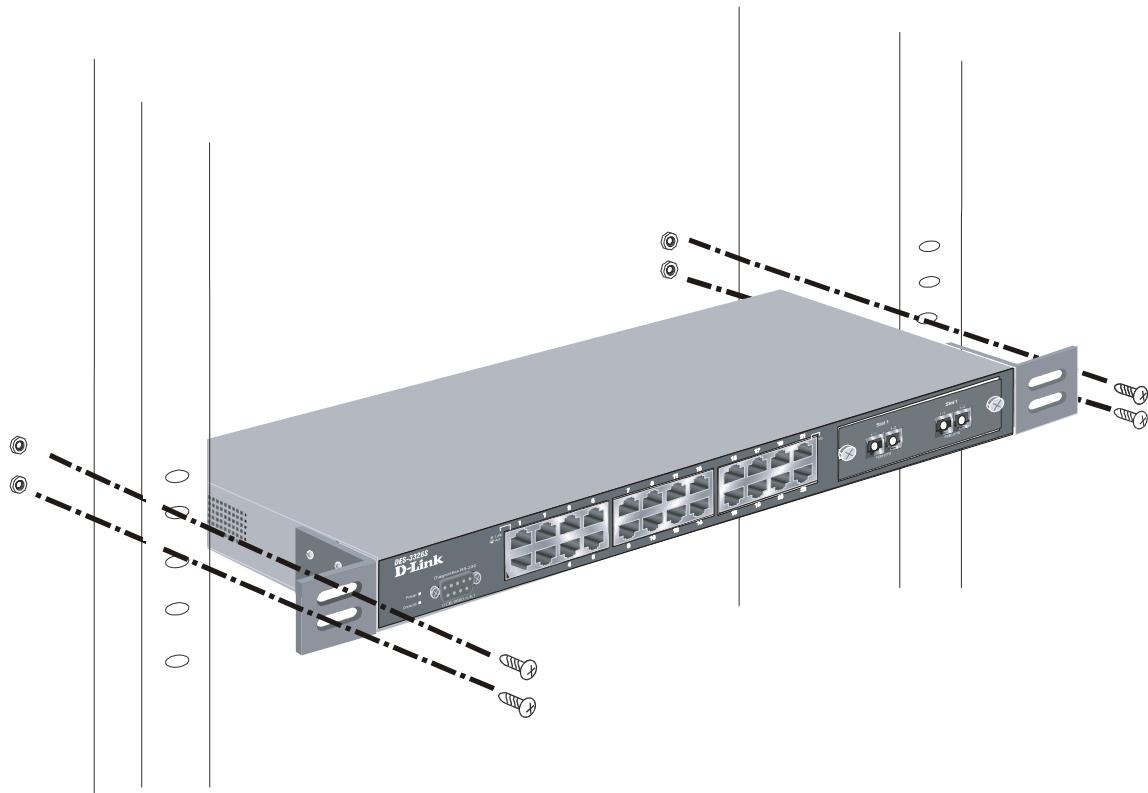
## Rack Installation

The DES-3226S can be mounted in an EIA standard-sized, 19-inch rack, which can be placed in a wiring closet with other equipment. To install, attach the mounting brackets on the Switch's side panels (one on each side) and secure them with the screws provided.



**Figure 2-2. Attaching the mounting brackets to the Switch**

Then, use the screws provided with the equipment rack to mount the Switch on the rack.



**Figure 2-3. Installing the Switch on an equipment rack**

## **Power on**

The DES-3226S Switch can be used with AC power supply 100-240 VAC, 50 - 60 Hz. The power Switch is located at the rear of the unit adjacent to the AC power connector and the system fan. The Switch's power supply will adjust to the local power source automatically and may be turned on without having any or all LAN segment cables connected.

After the power Switch is turned on, the LED indicators should respond as follows:

- All LED indicators will momentarily blink. This blinking of the LED indicators represents a reset of the system
- The power LED indicator is always on after the power is turned ON
- The console LED indicator will blink while the Switch loads onboard software and performs a self-test. will remain ON if there is a connection at the RS-232 port, otherwise this LED indicator is OFF
- The 100M LED indicator may remain ON or OFF depending on the transmission speed

## **Power Failure**

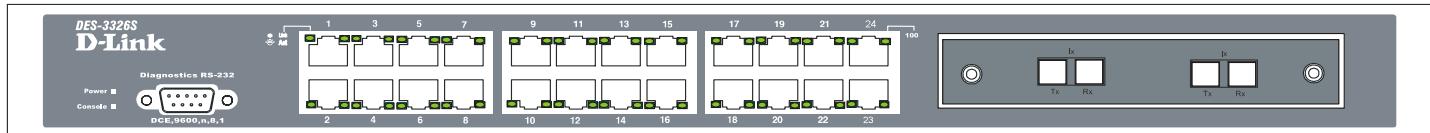
As a precaution in the event of a power failure, unplug the Switch. When the power supply is restored, plug the Switch back in.

## Identifying External Components

This chapter describes the front panel, rear panel, optional plug-in modules, and LED indicators of the DES-3226S.

### Front Panel

The front panel of the Switch consists of LED indicators, an RS-232 communication port, a slide-in module slot, and 24 (10/100 Mbps) Ethernet/Fast Ethernet ports.

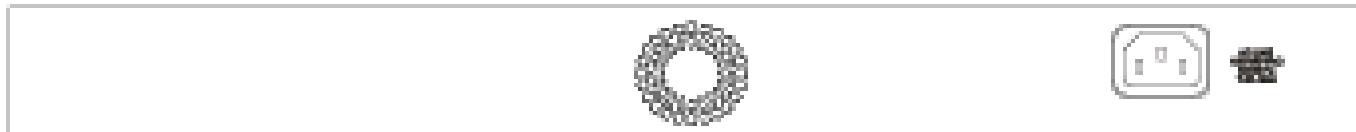


**Figure 3 - 1. Front panel view of the Switch**

- Comprehensive LED indicators display the status of the Switch and the network (see the *LED Indicators* section below).
- An RS-232 DCE console port for setting up and managing the Switch via a connection to a console terminal or PC using a terminal emulation program.
- A front-panel slide-in module slot for Gigabit Ethernet ports can accommodate a 2-port 1000BASE-T Gigabit Ethernet module, a 2-port 1000BASE-SX Gigabit Ethernet module, a 2-port 1000BASE-LX Gigabit Ethernet module, or a 2-port GBIC-based Gigabit Ethernet module.
- Twenty-four high-performance, NWay Ethernet ports all of which operate at 10/100 Mbps with Auto-MDIX function for connections to end stations, servers and hubs. All ports can auto-negotiate between 10Mbps or 100Mbps, full or half duplex, and flow control.

### Rear Panel

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

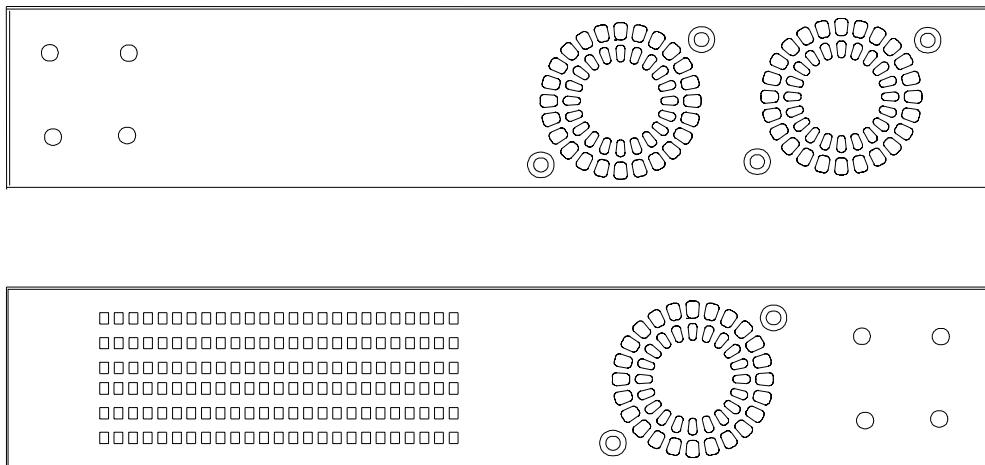


**Figure 3 - 2. Rear panel view of the Switch**

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. Supported input voltages range from 100 ~ 240 VAC at 50 ~ 60 Hz.

## Side Panels

The right side panel of the Switch contains two system fans (see the top part of the diagram below). The left side panel contains heat vents.



**Figure 3 - 3. Side panel views of the Switch**

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.

## Optional Plug-in Modules

The DES-3226S 24-port Fast Ethernet Switch is able to accommodate a range of optional plug-in modules in order to increase functionality and performance. These modules must be purchased separately.

### DES-132 2-port 100BASE-TX Module



**Figure 3 - 4. 100BASE-TX two-port module**

### Port Functions

- Fully compliant with IEEE802.3 10BASE-T, IEEE802.3u 100BASE-TX
- Supports auto-negotiation in the following operation:
- 10/100M operation
- Full/Half Duplex operation
- Flow control: IEEE 802.3x compliant Flow Control support for full-duplex. Back pressure Flow Control support for half-duplex mode.

### LED Indicators

<b>Speed</b>	Off – 10M Solid Green – 100M
<b>Link</b>	Off – No Link Solid Green – Link
<b>Active</b>	Off – No Activity Blinking Green – Activity

## **DES-131F/132F 1/2-port 100BASE-FX Module**



**Figure 3 - 5. 100BASE-FX two-port module**

### **Port Functions**

- Fully compliant with IEEE802.3u 100BASE-FX
- Supports auto-negotiation in the following operation: 100M / Full-duplex / Flow control
- IEEE 802.3x compliant Flow Control support for full-duplex

Connector: SC Type

Distance: 2km

### **LED Indicators**

<b>Link</b>	Off – No Link Solid Green – Link
<b>Active</b>	Off – No Activity Blinking Green – Activity

## **DES-131FL/132FL 1/2-port 100BASE-FX Module**



**Figure 3 - 6. 100BASE-FX module**

### **Port Functions**

- Fully compliant with IEEE802.3u 100BASE-FX
- Supports auto-negotiation in the following operation: 100M / Full-duplex / Flow control
- IEEE 802.3x compliant Flow Control support for full-duplex

Connector: SC type

Distance: 15km

### **LED Indicators**

<b>Link</b>	Off – No Link Solid Green – Link
<b>Active</b>	Off – No Activity Blinking Green – Activity

## **DES-132T 2-port 1000BASE-T Module**



**Figure 3 - 7. 1000BASE-T two-port module**

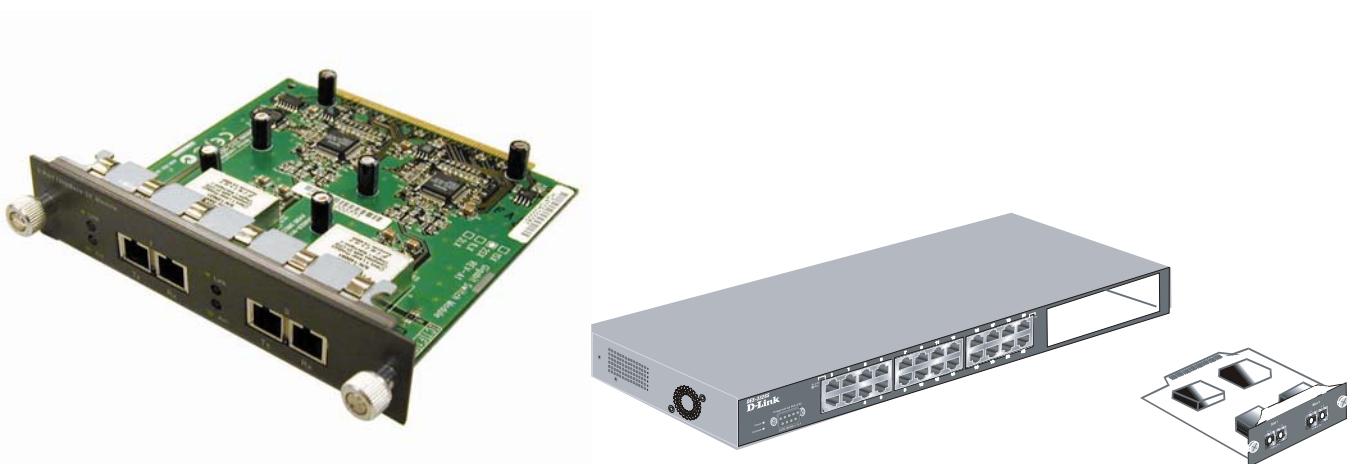
### **Port Functions**

- 2 1000BASE-T Gigabit Ethernet ports
- Fully compliant with IEEE802.3 10BASE-T, IEEE802.3u 100BASE-TX, and IEEE802.3ab 1000BASE-T
- Supports auto-negotiation in the following operation: 10/100/1000M / Full-duplex / Flow control
- IEEE 802.3x compliant Flow Control support for full-duplex

### **LED Indicators**

<b>Speed (1000M)</b>	Off – 10/100M Solid Green – 1000M
<b>Link</b>	Off – No Link Solid Green – Link
<b>Active</b>	Off – No Activity Blinking Green – Activity

## **DES-132G 2-port 1000BASE-SX Gigabit Ethernet Module**



**Figure 3 - 8. 1000BASE-SX two-port module**

### **Port Functions**

- 2 1000BASE-SX Gigabit Ethernet ports
- IEEE 802.3z 1000BASE-SX compliance
- Supports Full-duplex operations
- IEEE 802.3x compliant Flow Control support for full-duplex

Connector: SC Type

Distance: 550m

## **DEM-320S 2-port 1000BASE-SX Gigabit Ethernet Module**

### **Port Functions**

- 2 1000BASE-SX Gigabit Ethernet ports
- IEEE 802.3z 1000BASE-SX compliance
- Supports Full-duplex operations
- IEEE 802.3x compliant Flow Control support for full-duplex

Connector: SC Type

Distance: 550m

### **LED Indicators**

<b>Link</b>	Off – No Link Solid Green – Link
<b>Active</b>	Off – No Activity Blinking Green – Activity

## DES-132GL 2-port 1000BASE-LX Gigabit Ethernet Module



**Figure 3 - 9. 1000BASE-LX two-port module**

### Port Functions

- 2 1000BASE-LX Gigabit Ethernet ports
- IEEE 802.3z 1000BASE-LX compliance
- Supports Full-duplex operations
- IEEE 802.3x compliant Flow Control support for full-duplex
- Supports multi-mode fiber optic cable connections of up to 550 meters or 5 km single-mode fiber-optic cable connections.

Connector: SC Type

Distance: 5km

## DEM-320L 2-port 1000BASE-LX Gigabit Ethernet Module

### Port Functions

- 2 1000BASE-LX Gigabit Ethernet ports
- IEEE 802.3z 1000BASE-LX compliance
- Supports Full-duplex operations
- IEEE 802.3x compliant Flow Control support for full-duplex
- Supports single-mode fiber optic cable connections of up to 10 km

The 1000BASE-SX module allows connections using multi-mode fiber optic cable in the following configurations:

	62.5µm	50µm
Modal bandwidth (min. overfilled launch) Unit: MHz*km	200	500
Operating distance Unit: meters	275	550
Channel insertion loss Unit: dB	2.53	3.43

Connector: SC Type

Distance: 10km (9/125um)

### LED Indicators

<b>Link</b>	Off – No Link Solid Green – Link
<b>Active</b>	Off – No Activity Blinking Green – Activity

## DES-132GB 2-port GBIC-based Gigabit Ethernet Module



**Figure 3 - 10. GBIC two-port module**

### Port Functions

- 2 GBIC-based Gigabit Ethernet ports
- Allows multi-mode fiber optic connections of up to 550 m (SX and LX) and single-mode fiber optic connections of up to 5 km (LX only). GBIC modules are available in –SX and –LX fiber optic media.
- IEEE 802.3z compliance
- Supports full-duplex operations
- IEEE 802.3x compliant Flow Control support for full-duplex

## DEM-320GH 2-port GBIC-based Gigabit Ethernet Module

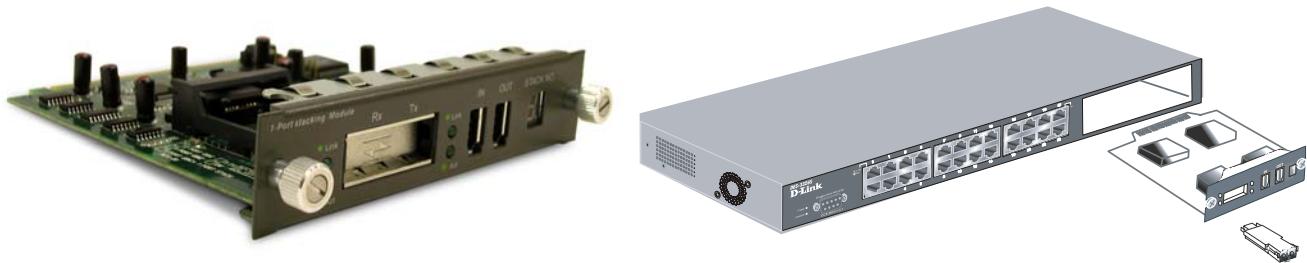
### Port Functions

- 2 GBIC-based Gigabit Ethernet ports
- Allows multi-mode fiber optic connections of up to 550 m (SX and LX) and single-mode fiber optic connections of up to 5 km (LX only). GBIC modules are available in –SX and –LX fiber optic media.
- IEEE 802.3z compliance
- Supports full-duplex operations
- IEEE 802.3x compliant Flow Control support for full-duplex

### LED Indicators

<b>Link</b>	Off – No Link Solid Green – Link
<b>Active</b>	Off – No Activity Blinking Green – Activity

## DES-332GS 1-port GBIC-Based Gigabit Ethernet Switch and stacking Module



**Figure 3 - 11. Stacking Module with one GBIC port**

### Port Functions

- 1 GBIC-Based Gigabit Ethernet port
- Allows multi-mode fiber optic connections of up to 550 m (SX and LX) and single-mode fiber optic connections of up to 5 km (LX only). GBIC modules are available in –SX and –LX fiber optic media.
- IEEE 802.3z 1000BASE-SX compliance
- Supports Full-duplex operations
- IEEE 802.3x compliant Flow Control support for full-duplex

### Stacking Port Function

- 1 transmitting port and 1 receiving port
- IEEE1394.b compliance
- Forwarding rate up to 965Mbps

The stacking ports are marked **IN** and **OUT**. The IEEE 1394 compliant cable must be connected from an **IN** port on one Switch to an **OUT** port on the next Switch in the stack. The last two Switches (at the top and bottom of the stack) must also be connected from the **IN** port on one Switch to the **OUT** port on the other Switch. In this way, a loop is made such that all of the Switches in the Switch stack have the **IN** stacking port connected to another Switch's **OUT** stacking port.

## DEM-320GS 1-port GBIC-Based Gigabit Ethernet Switch and stacking Module

### Port Functions

- 1 GBIC-Based Gigabit Ethernet port
- Allows multi-mode fiber optic connections of up to 550 m (SX and LX) and single-mode fiber optic connections of up to 5 km (LX only). GBIC modules are available in –SX and –LX fiber optic media.
- IEEE 802.3z 1000BASE-SX compliance
- Supports Full-duplex operations
- IEEE 802.3x compliant Flow Control support for full-duplex

### Stacking Port Function

- 1 transmitting port and 1 receiving port
- IEEE1394.b compliance
- Forwarding rate up to 965Mbps

### LED Indicators

<b>Link</b>	Off – No Link Solid Green – Link
<b>Active</b>	Off – No Activity Blinking Green – Activity

The optional Stacking Module allows up to eight DES-3226S Switches to be interconnected via their individual stacking modules. This forms an eight-Switch stack that can then be managed and configured as though the entire stack were a single Switch. The Switch stack is then accessed through a single IP address or alternatively, through the master Switch's serial port (via the management station's console and the Switch's Command Line Interface).

The stacking module's LED indicators are described below.

## LED Indicators

The LED indicators of the Switch include Power, Console, and Link/Act. The following shows the LED indicators for the Switch along with an explanation of each indicator.

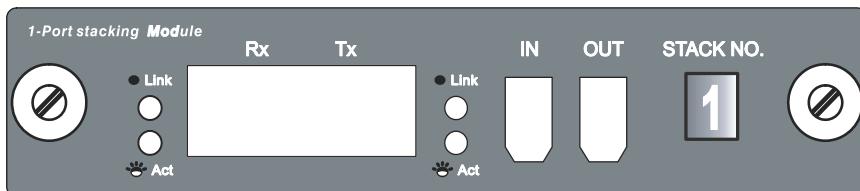


**Figure 3 - 12. The LED Indicators**

- **Power** This indicator on the front panel should be lit during the Power-On Self Test (POST). It will light green approximately 2 seconds after the Switch is powered on to indicate the ready state of the device.
- **Console** This indicator is lit green when the Switch is being managed via out-of-band/local console management through the RS-232 console port using a straight-through serial cable.
- **Act/Link/Speed** These indicators are located to the left and right of each port. The right side indicator will light when the port has a link of 100 Mbps; the Link indicator will not light for 10 Mbps links. The LEDs blink whenever there is reception or transmission (i.e. Activity--Act) of data occurring at a port.

## Stacking Module LED Indicators

The Switch's current order in the Switch stack is also displayed on the Stacking Module's front panel – under the **STACK NO.** heading:



**Figure 3 - 13. Stacking Module LED Indicators**

The **Link** and **Act** LEDs have the same function as the corresponding LEDs for the Switch's Ethernet ports. The **Link** LED lights to confirm a valid link, while the **ACT** LED blinks to indicate activity on the link.

The **Stack No.** seven-segment LED displays the unit number assigned to the Switch. The numeral **1** in the display indicates that the stacking module is in the process of determining the stack status and has not yet resolved the Switch's unit number.

If the master Switch fails, a new master Switch should be configured for the stack until the failure can be fixed. Any time the composition of a stacked Switch group changes, all Switches in the stack will reboot automatically and the master-slave relationship and stack number will be renegotiated. A link failure will require reconnecting the stacking ports to work around the failed link.

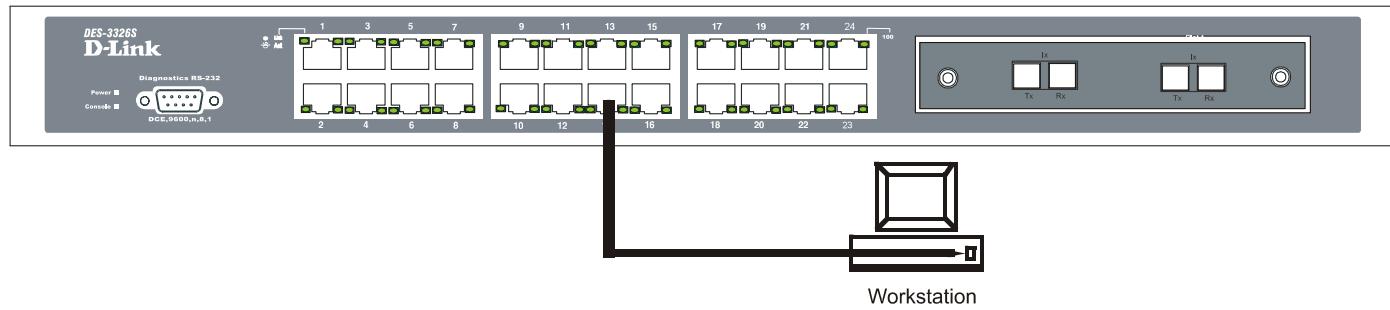
## Connecting the Switch

This chapter describes how to connect the DES-3226S to your Fast Ethernet network.

## Switch to End Node

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

An end node can be connected to the Switch via a two-pair Category 3, 4, 5 UTP/STP straight cable (be sure to use Category 5 UTP or STP cabling for 100 Mbps Fast Ethernet connections. Connections to 1000 Mbps Gigabit ports on the 1000BASE-T Module must also use Category 5e). The end node should be connected to any of the twenty-four ports of the DES-3226S.



**Figure 4 - 1. Switch connected to an End Node**

The LED indicators for the port the end node is connected to are lit according to the capabilities of the NIC. If LED indicators are not illuminated after making a proper connection, check the PC's LAN card, the cable, Switch conditions, and connections. The following LED indicator states are possible for an end node to Switch connection:

- The 100 LED indicator comes *ON* for a 100 Mbps and stays *OFF* for 10 Mbps.
- The Link/Act LED indicator lights up upon hooking up a PC that is powered on.

## Switch to Hub or Switch

These connections can be accomplished at any port in either straight-through cable or a crossover cable because the Switch supports Auto-MDIX function.



**NOTE:** Auto-MDIX function is not supported by the 100BASE-TX module.

- A 10BASE-T hub or Switch can be connected to the Switch via a two-pair Category 3, 4 or 5 UTP/STP cable.
- A 100BASE-TX hub or Switch can be connected to the Switch via a two-pair Category 5 UTP cable.
- A 1000BASE-T connections use two-pair Category 5e UTP cable.

## Switch Stack Connections

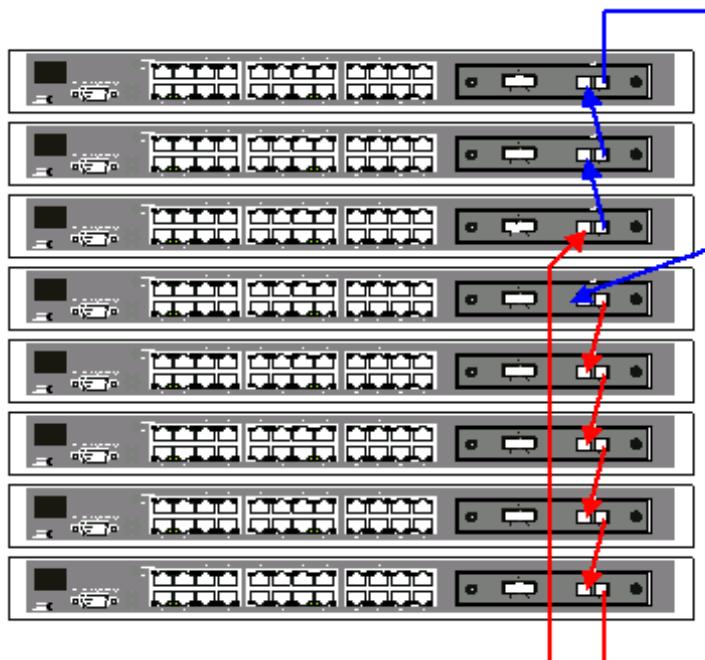
Up to eight DES-3226S Switches (with optional stacking modules installed) can be stacked into a Switch stack that can then be configured and managed as a single unit. The management agent of the master Switch can configure and manage all of the Switches in a Switch stack – using a single IP address (the IP address of the Master Switch).



**NOTE:** Stacking mode is configured using the CLI command **config stacking mode**. The default settings allow the Switch to function as a standalone device or as a member of a stacked group.

The stacking ports are marked **IN** and **OUT**. The IEEE 1394 compliant cable must be connected from an **IN** port on one Switch to an **OUT** port on the next Switch in the stack. The last two Switches (at the top and bottom of the stack) must also be connected from the **IN** port on one Switch to the **OUT** port on the other Switch. In this way, a loop is made such that all of the Switches in the Switch stack have the **IN** stacking port connected to another Switch's **OUT** stacking port.

An example stacking port interconnection is shown below:



**Figure 4 - 2. Switch Stack connections between optional stacking modules**



**NOTICE:** If a link between stacked Switches fails the stacked group must be connected to work around the failed link. As with any changes in the composition of the stacked Switch group, the new stacking relationship must be negotiated. Any change to the composition of a stacked Switch group or any failure of a stacking port will cause the entire stack to restart and negotiate the new stacking composition.

### 10BASE-T Device

For a 10BASE-T device, the Switch's LED indicators should display the following:

- 100 LED speed indicator is *OFF*.
- Link/Act indicator is *ON*.

### 100BASE-TX Device

For a 100BASE-TX device, the Switch's LED indicators should display the following:

- 100 LED speed indicator is *ON*.
- Link/Act is *ON*.

## Management Concepts

This chapter discusses many of the concepts and features used to manage the Switch, as well as the concepts necessary for the user to understand the functioning of the Switch. Further, this chapter explains many important points regarding these features. Configuring the Switch to implement these concepts and make use of its many features is discussed in detail in the next chapters.

## Local Console Management

A local console is a terminal or a workstation running a terminal emulation program that is connected directly to the Switch via the RS-232 serial console port on the front of the Switch. A console connection is referred to as an 'Out-of-Band' connection, meaning that console is connected to the Switch using a different circuit than that used for normal network communications. So, the console can be used to set up and manage the Switch even if the network is down.

Local console management uses the terminal connection to operate the console program built-in to the Switch. A network administrator can manage, control and monitor the Switch from the console program.

The DES-3226S contains a CPU, memory for data storage, flash memory for configuration data, operational programs, and SNMP agent firmware. These components allow the Switch to be actively managed and monitored from either the console port or the network itself (out-of-band, or in-band).

### Diagnostic (console) port (RS-232 DCE)

Out-of-band management requires connecting a terminal, such as a VT-100 or a PC running a terminal emulation program (such as HyperTerminal, which is automatically installed with Microsoft Windows) a to the RS-232 DCE console port of the Switch. Switch management using the RS-232 DCE console port is called *Local Console Management* to differentiate it from management performed via management platforms, such as D-View, HP OpenView, etc. *Web-based Management* describes management of the Switch performed over the network (in-band) using the Switch's built-in Web-based management program (see Chapter 6 – Web-based Network Management). The operations to be performed and the facilities provided by these two built-in programs are identical.

*The console port is set at the factory for the following configuration:*

- **Baud rate:** 9,600
- **Data width:** 8 bits
- **Parity:** none
- **Stop bits:** 1
- **Flow Control** None

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. If you still don't see anything, try pressing <Ctrl> + r to refresh the screen.

## Stacking vs. Standalone Operation (Release 4.01)

By default, the Switch configuration settings allow it to operate as a standalone device, or in a stacked group. It is not necessary to change any settings for the Switch to function in either capacity. However, it is useful to understand how the stacking mode operates in the Switch and the effects if any this may have on configuration settings in a Switch when its stacking status is changed.

Stacking mode is enabled by default and can be changed using the CLI command **config stacking mode**. If the Switch has stacking mode enabled and is properly connected to other DES-3226S Switches, a negotiation takes place upon starting up the Switches to determine how the Switch functions in the stack. For an all-DES-3226S stack, any time a change occurs in the structure or composition of a stacked Switch group the entire stack will restart and the negotiation process begins anew. When the stacking mode is disabled (**config stacking mode disable**), the Switch only allows standalone operation. If stacking mode is disabled on a Switch, it should be disconnected from a stacked group.



**NOTE:** The firmware for Release 4.01 allows stacking operation of the DES-3226S as a slave to the DGS-3212SR and DGS-3312SR in a star topology. See the example below for more information.

Stacking mode can be changed using the CLI. When a DES-3226S Switch stack is first assembled, it is advisable to determine which Switch will function as the master before placing the Switches in a rack and connecting them. If the Switch is used in a stacked group with the DGS-3212SR or DGS-3312SR, the DGS-3x12SR series Switch operates as the master and the DES-3226S Switches in the stacked group operate as slaves. The possible stacking configuration modes are as follows:

**Enabled:** Stacking mode is enabled by default. When enabled the Switch can operate as a standalone device or it can operate with other DES-3226S Switches in a properly connected stacked group. Stacking must be enabled for the Switch function in a stacked arrangement with other DES-3226S Switches or with a DGS-3212SR High-Density Layer 2 or DGS-3312SR Layer 3 Gigabit Ethernet Switch.

**Auto:** This is the default stacking mode setting for the DES-3226S. In auto stacking mode the Switch is eligible for stacking or it can operate as a standalone device. If a DES-3226S Switch stack is connected and all units are configured to operate in auto stacking mode, the master-slave relationships are determined automatically. For DES-3226S Switch stacks, the unit with the lowest MAC address becomes the master (stack number 1). The order in which slave devices appear logically in the stack (stack number 2+) is determined by how they are connected relative to the master Switch. The auto mode serves to first determine if the device is stacked or standalone, then if stacked, it determines which Switch is the master and the remaining stack numbers for the slave Switches.

**Master:** The auto mode described above may be overridden so that a properly connected Switch in a stack may be forced into master mode. Only one Switch in a stack may act as the master and all configuration settings for the stacked group - including stacking configuration - are saved in configuration files in the master Switch. The stack is managed as a single entity through the master. It may be convenient to place the master unit in the upper-most slot of a stacked group to visually distinguish it from the slave units. The master unit should be used to uplink the stack group to the backbone. If the master unit fails or is replaced for any reason, it is possible to load configuration files saved from the original master unit in order to continue operation with identical settings. See the example below for a description of how to swap the master unit of a stacked group. A Switch configured as the stack master will maintain this status regardless of any changes that occur in the composition of the stacked group. If for example a connection to a slave unit or a connection between two slave units were to fail, the entire stack will restart automatically. After restarting, the designated master unit retains its status.

**Slave:** The auto mode may be overridden to force the Switch to operate in slave mode. When the Switch is in slave mode, it is ineligible to function as a master and all configuration, is done through the master unit. A master Switch must be properly connected to the stack for a Switch to operate in slave mode.

**Disabled:** This forces the Switch to operate as a standalone device. In standalone mode the Switch functions as a standalone device even if a stacking module is installed. To force standalone operation it is necessary to use the CLI command **config stacking mode disable**. A Switch that has stacking mode disabled should never connect to another Switch through stacking ports.



**NOTICE:** Do not use stacking ports on a Switch that has the stacking mode disabled.

For DES-3226S Switch stacks, changes made to the composition of a Switch stack group, that is, adding new Switches or taking Switches out of the stack, require all Switches to restart. The new stacking order is negotiated to reflect the changes made to the group. If the master Switch has been configured to force master status it retains this status, likewise Switches forced to operate in slave mode retain the status after restarting. The restart occurs automatically if any stacking link is disconnected.

For star topology arrangements, the DGS-3212SR or DGS-3312SR does not restart when a link or Switch failure occurs. Only the effected Switch will restart if its link to the DGS-3x12SR series Switch fails. The remaining DES-3226S Switches continue to operate as before.

The command `show stacking` can be used to view stacking information. If stacking has been disabled, the stacking mode will be listed as Standalone.

## Managing Switch Stacks

Multiple DES-3226S Switches equipped with stacking modules may be connected in a stacking arrangement so that up to eight Switches are managed as a single unit with a single IP address. The Release 4.01 DES-3226S can connect to the DGS-3212SR or DGS-3312SR via the stacking port in a star topology. Up to eight Switches may be connected to the DGS-3x12SR and be managed as a slave device through the DGS-3x12SR series Switch.

The default stacking mode will establish a master Switch for the stack through a negotiation process that takes place when all devices are started up. In a DES-3226S stack, the Switches negotiate the master-slave relationship. Once the master Switch is determined, the remaining Switches function as slaves. The stack number of the slave Switches is determined by where it is actually positioned in the stack. This can be taken into account when you are placing the Switches in an equipment rack.

For star topology stacking arrangements with the DGS-3212SR or DGS-3312SR, the default settings of the DES-3226S assign slave status and the unit number is determined by the number of the port connected at the other end of the stacking connection.

Keep in mind the following important considerations for stacked Switch groups:

- All management of the Switches in the stack is done through the master Switch.
- The master Switch should be used to uplink to the Ethernet backbone.
- For DES-3226S stacks, the master Switch can be chosen automatically as each Switch in a connected stack competes for status. However, you can choose a specific device and force it to operate as the master. Use the CLI command **config stacking mode enabled master** for the selected Switch; leave the remaining Switches in the default auto-stacking mode.
- For DES-3226S stacks, if the link between any two Switches fails or is disconnected, or if any Switch in a stacked group fails, all of the Switches in the stack will automatically reboot. Since the stack is connected as a ring, the stack will need to be connected to work around the failed link. Change the cabling to bypass the failed link and allow the stack to reboot. The Switches will negotiate again since the composition of the stack has been altered. Read below for more information about changes in stacked Switch groups.
- A Switch stack has a single IP address – if the stacking link to a given Switch fails or is disconnected, that Switch will lose its status in the stack and reboot as a standalone device with the IP settings it had before becoming a member of the Switch stack.



**NOTE:** For Release 4.01 the DES-3226S maintains two separate configurations, one for standalone operation and another for stacked operation. Each configuration has identical IP settings, VLANs, link aggregation, QoS, etc. This dual system allows a Switch to change status from standalone to stacking enabled and keep its configuration settings.

## Changes to Switch Stack Structure

If Switches are added to or taken out of a stacked group of DES-3226S Switches it is necessary to change the composition of a Switch stack and rearrange the stacking connections. If a stacking link fails or if a member of a stacked group fails, the composition of the stack will necessarily change also. In such a case intervention is required to at least reconnect the stacking cable to bypass the failure. In addition to making changes to the cable links connecting the Switches in the stack, it may be necessary or desirable to change the stacking mode configuration of one or more units. A few examples presented below to help make the changes to cable connections for DES-3226S stacks and if necessary, to Switch stacking mode configuration settings.



**NOTE:** For a Switch that has already been configured with many settings already in place, it is a good idea to save the configuration files to a server before changing the stacking mode status. Configuration files can be saved using the CLI, SNMP manager or web manager interface.

## Convert a Standalone Switch to a Stacked Switch

A Switch that has previously acted in a standalone capacity may become a member of a stacked group simply by installing a stacking module and connecting it to a connected Switch stack. For this example, let's assume Switch A has been setup as a standalone device and has been functioning on the network. We want to join this Switch with another DES-3226S, Switch B, to form a 2-Switch stack. Many configuration settings including IP settings have already been set on Switch A so we will keep these and use them for the new stacked arrangement. Switch A is also uplinked to the backbone via the GBIC port in the stacking module. Switch A will stay in its position in the uppermost slot in the rack and all network connections will remain in place.

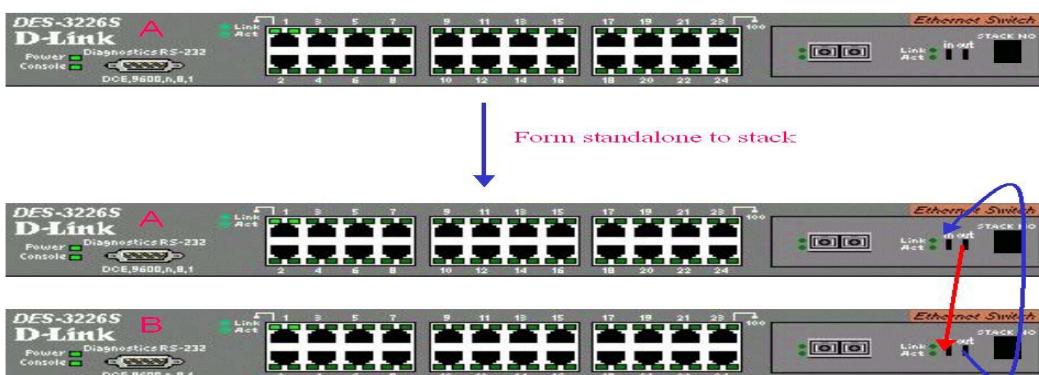
First, save the configuration files to a TFTP server so they may be reloaded if any problems occur. This should be done whether or not stacking mode is changed.

Since we want to keep the same IP address and all the other setting on the standalone Switch, this Switch will become the master of the stack and Switch B will be the slave. To make sure Switch A functions as the master we will enable stacking and override the auto function.

Use the CLI to enter the command: **config stacking mode enable master**

The stacking mode for Switch B is set to the default auto-stacking mode and therefore no changes are required. Switch B will lose configuration settings including its IP settings, so if you want to save these be sure to upload the configuration files before making the stacking connection.

Power off both devices and place Switch B under Switch A in the rack. It is not actually required that the slave device be placed under the master in the stack but it may be easier so that the master Switch may be instantly recognized. This may prove especially convenient where multiple Switch stacks are installed so it is always clear which unit should be used to uplink.

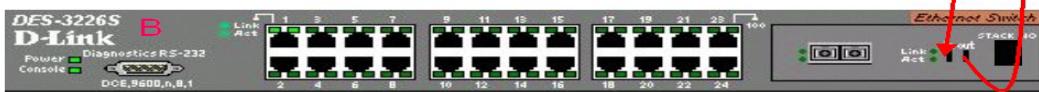
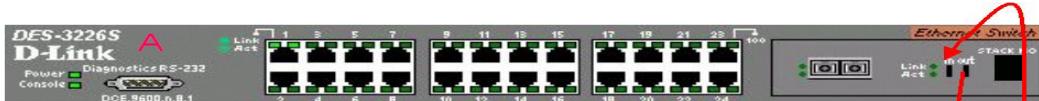


Both Switches are now powered off. Switch B is placed securely in the rack and connected to Switch A via the stacking ports. Both devices are powered on; they recognize the stacking connection and begin negotiating the stacking relationship. Switch A is configured to function as the master device. Switch B automatically assume slave status. Switch A will keep its IP settings and its other configurations remain unchanged. The stack may now be configured as a single entity.

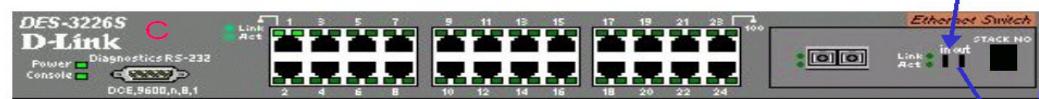
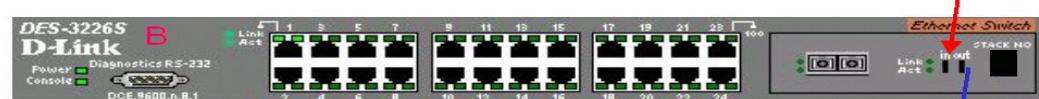
## Add a Switch to a Stack

Adding a new slave device to a Switch stack is a simple procedure. If you are swapping an existing Switch, label each Ethernet cable attached to the device being swapped so they can be placed in the same port number in the replacement device.

To add a new slave to a stack, place the new unit in the next available slot below the stack. Power off all Switches in the stack and make the necessary changes to the stacking cable connections. Use the illustrations below as a guide.



Switch C is added to the existing stack where Switch A is the designated master. Power off all devices and securely place Switch C in the slot beneath Switch B. Adjust stacking cable connections so the OUT port on Switch B connects the IN port on Switch C and the OUT port of Switch C connects to the IN port of Switch A.



Power on the entire stack. The new stacking arrangement is recognized and the new relationship is negotiated. Switch A retains status as the master of the stack, Switch C is in auto mode and therefore functions as a slave. The stack is ready for operation.

### **Swap a Master from a Stack**

Let's assume the stack arrangement in the previous example has a problem that requires the master unit, Switch A, to be replaced. In this case, we can preserve all the same configuration settings by downloading the previously saved configuration files to the replacement Switch.

Before disconnecting the network connections of the original master unit, label each Ethernet cable so they can be placed in the same port number in the replacement Switch. Then remove the device from the rack.

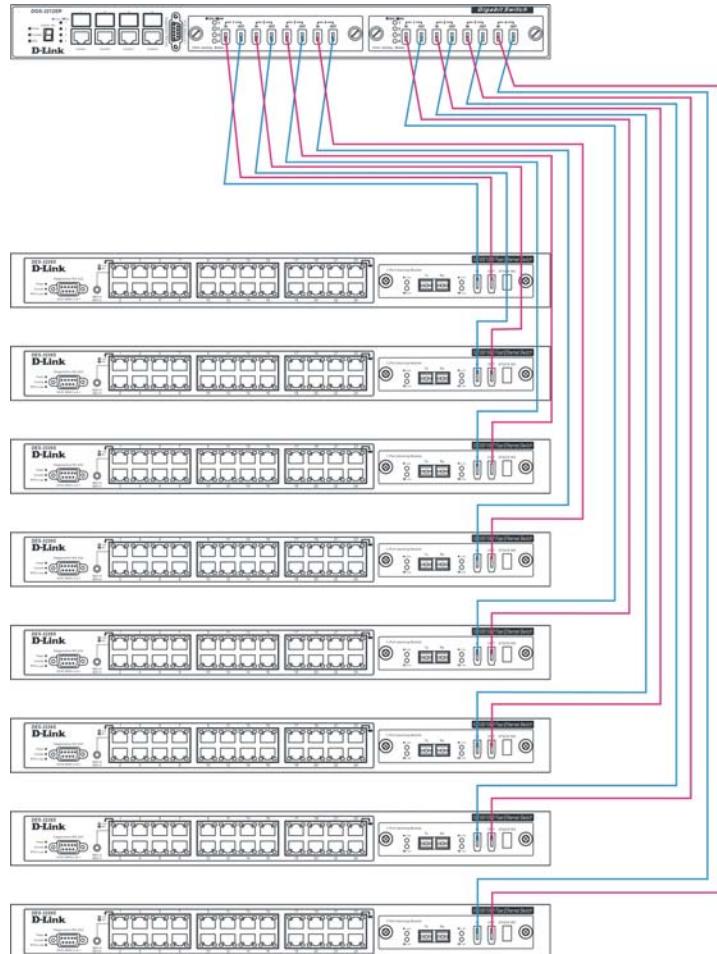
Place the replacement Switch in the same slot. Power on the new Switch and attach a console cable to it. Configure the new unit to be a master and save the settings. Connect the Ethernet cable needed to access the TFTP server containing the saved configuration files of the previous master unit. Download the saved configuration files, use the command:

**download configuration <ipaddr> <path\_filename>**

Save the new settings and power off the Switch. Now the stacking connections and Ethernet connections can be completed exactly as before. Reconnect the stacking cables and Ethernet connections and power on the entire stack. The stack should now function as before with all the configuration settings intact.

## Stacking with DGS-3212SR or DGS-3312SR

The DES-3226S Release 4.01 Switch can be arranged in a star topology and managed as slave devices through either the DGS-3212SR or DGS-3312SR Master Switch. Up to eight Switches can be connected to the DGS-3x12SR series Switch in this arrangement.



**Figure 5 - 1. DES-3226S Switches with DGS-3212SR**

Setting up a star topology with a DGS-3212SR or DGS-3312SR is a simple matter. Each DES-3226S connects to the master through the stacking port to a similar stacking port on a DGS-3x12SR series Switch equipped with one or two special stacking modules designed for the DGS-3x12SR series Switch. Each DES-3226S slave must be configured with stacking mode enabled. When stacked in a star topology arrangement with the DGS-3x12SR, the Switch will automatically assume slave status. The unit number is determined by the port number to which it is connected on the DGS-3x12SR master. The DGS-3x12SR must have a stacking module installed and have stacking mode enabled as well. Stacking for the DGS-3x12SR uses the identical CLI command: **config stacking mode enable**. Be sure to save the configuration change using the CLI command **save**.

Remember that for star topology arrangements, if the stacking link to a given Switch fails or is disconnected, that Switch will lose its status in the stack and reboot as a standalone device with the IP settings. The DGS-3212SR/DGS-3312SR and remaining slave units are not effected by the link failure.

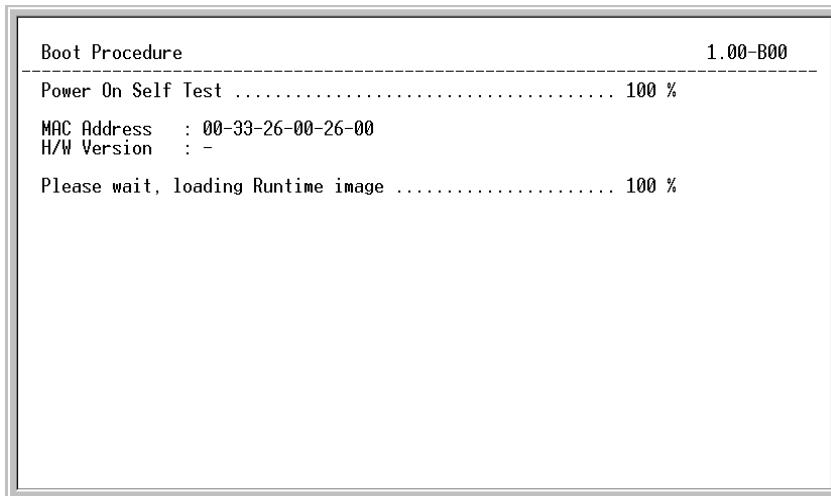


**NOTE:** The DES-3226S must have stacking mode enabled to be used with the DGS-3212SR or the DGS-3312SR in a star topology arrangement.

## Switch IP Address

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 from the initial boot console screen – shown below.



**Figure 5 - 2. Console Boot Screen**

The Switch's MAC address can also be found from the console program under the Switch Information menu item, as shown below.

### Setting an IP Address

The IP address for the Switch must be set before it can be managed with the web-based manager. The Switch IP address may 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 alternatively be set using the Command Line Interface (CLI) over the console serial port as follows:*

1. Starting at the command line prompt DES3226S4# – enter the commands **config ipif System ipaddress xxx.xxx.xxx.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.
2. Alternatively, you can enter DES3226S4# – enter the commands **config ipif system ipaddress 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.

Using this method, 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 web-based management agent.

# SNMP Network Management

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

## *SNMP performs the following functions:*

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

The DES-3226S has a software program called an ‘agent’ that processes SNMP requests, but the user program that makes the requests and collects the responses runs on a management station (a designated computer on the network). The SNMP agent and the user program both use the UDP/IP protocol to exchange packets.

## SNMP Versions 1, 2 and 3

The DES-3226S supports SNMP version 3 as well as versions 1 and 2. The chief difference between Version 3 (SNMP v.3) and Versions 1 and 2 (SNMP v.1 and SNMP v.2) is that it provides a substantially higher level of security than the previous versions.

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

SNMP v.3 uses a more sophisticated authentication process that is separated into two parts. One 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 (using HMAC-SHA-96 or HMAC-MD5 authentication levels).

## 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).

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

You can also specify which network managers may receive traps from the Switch. This can be done by entering a list of the IP addresses of authorized network managers. You may further specify the SNMP version to use for authentication. Up to four trap recipient IP addresses, and four corresponding SNMP community strings can be entered.

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

- Cold Start This trap signifies that the Switch has been powered up and initialized such that software settings are reconfigured and hardware systems are rebooted. A cold start is different from a factory reset in that configuration settings saved to non-volatile RAM used to reconfigure the Switch.
- Warm Start This trap signifies that the Switch has been rebooted, however the POST (Power On Self-Test) is skipped.
- Authentication Failure This trap signifies that someone has tried to logon to the Switch using an invalid SNMP community string. The Switch automatically stores the source IP address of the unauthorized user.

- Topology Change A Topology Change trap is sent by the Switch when any of its configured ports transitions from the Learning state to the Forwarding state, or from the Forwarding state to the Blocking state. The trap is not sent if a new root trap is sent for the same transition.
- Link Change Event This trap is sent whenever the link of a port changes from link up to link down or from link down to link up.
- Port Partition This trap is sent whenever the port state enters the partition mode (or automatic partitioning, port disable) when more than thirty-two collisions occur while transmitting at 10Mbps or more than sixty-four collisions occur while transmitting at 100Mbps.
- Broadcast/Multicast Storm This trap is sent whenever the port reaches the threshold (in packets per second) set globally for the Switch. Counters are maintained for each port, and separate counters are maintained for broadcast and multicast packets. The Switch's default setting is 128 kpps for both broadcast and multicast packets.

## MIBs

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

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

Read-write MIBs are variables usually related to user-customized configurations. Examples of these are the Switch's IP Address, Spanning Tree Algorithm parameters, and port status.

If you use a third-party vendors' SNMP software to manage the Switch, a diskette listing the Switch's propriety enterprise MIBs can be obtained by request. If your software provides functions to browse or modify MIBs, you can also get the MIB values and change them (if the MIBs' attributes permit the write operation). This process however can be quite involved, since you must know the MIB OIDs and retrieve them one by one.

## Forwarding and Filtering

The Switch enters the relationship between destination MAC or IP addresses and the Ethernet port or gateway router the destination resides on into its forwarding table. This information is then used to forward packets. This reduces the traffic congestion on the network, because packets, instead of being transmitted to all ports, are transmitted to the destination port only. Example: if Port 1 receives a packet destined for a station on Port 2, the Switch transmits that packet through Port 2 only, and transmits nothing through the other ports. This process is referred to as 'learning' the network topology.

### MAC Address Aging Time

The Aging Time affects the learning process of the Switch. Dynamic forwarding table entries, which are made up of the source MAC addresses and their associated port numbers, are deleted from the table if they are not accessed within the aging time.

The aging time can be from 10 to 1,000,000 seconds with a default value of 300 seconds. A very long aging time can result in dynamic forwarding table entries that are out-of-date or no longer exist. This may cause incorrect packet forwarding decisions by the Switch.

If the Aging Time is too short however, many entries may be aged out too soon. This will result in a high percentage of received packets whose source addresses cannot be found in the forwarding table, in which case the Switch will broadcast the packet to all ports, negating many of the benefits of having a Switch.

Static forwarding entries are not affected by the aging time.

### Filtering and Access Profile Masking

The DES-3226S Switch can use a form of manually configured packet filtering to segment the network and control communication between segments. It can also filter packets off the network for intrusion control. Filtering is done by setting up an Access Profile Mask.

The access profile mask uses information contained in packet headers to determine whether the packet is forwarded or filtered (i.e. dropped). The forwarding decision is made first by examining header information; looking at the VLAN or MAC address.

Additional criteria are applied to the forwarding decision. Depending on what header information is being examined, forwarding is permitted or denied based on the packet's source or destination, its protocol classification, DiffServ code, 802.1p level or VLAN.

## Routine Packet Filtering

**Some filtering is done automatically by the Switch in the course of other routing functions. These routine functions include:**

- Dynamic filtering as a function of automatic learning and aging of MAC addresses.
- The 802.1d and 802.1w Spanning Tree Protocols filter packets based on topology to prevent loops.
- Filtering done for VLAN integrity.

**Some filtering requires the manual entry of information into a filtering table:**

MAC address filtering – the manual entry of specific MAC addresses to be filtered from the network. Packets sent from one manually entered MAC address can be filtered from the network. The entry may be specified as either a source, a destination, or both.

## 802.1w Rapid Spanning Tree

The Switch implements two versions of the Spanning Tree Protocol, the Rapid Spanning Tree Protocol (RSTP) as defined by the IEE 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 function 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 two protocols is in the way ports transition to a forwarding state and the in the way this transition relates to the role of the port (forwarding or not forwarding) in the topology. RSTP combines 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 port state discarding there is no functional difference, the port is not active in the network topology. The table below compares how the two protocols differ regarding the port state transition.

Both 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 are sensitive to the status of the link. Ultimately this difference results 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 STP	802.1w RSTP	Forwarding?	Learning?
Disabled	Discarding	No	No
Blocking	Discarding	No	No
Listening	Discarding	No	No
Learning	Learning	No	Yes
Forwarding	Forwarding	Yes	Yes

Table 1. Comparing Port States

RSTP is capable of 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, all ports operating in full-duplex mode are considered to be P2P ports, unless manually overridden through configuration.

## 802.1d/802.1w Compatibility

RSTP can interoperate with legacy equipment and is capable of automatically adjusting BPDU packets to 802.1d format when necessary. However, any segment using 802.1 STP will not benefit from the rapid transition and rapid topology change detection of 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.

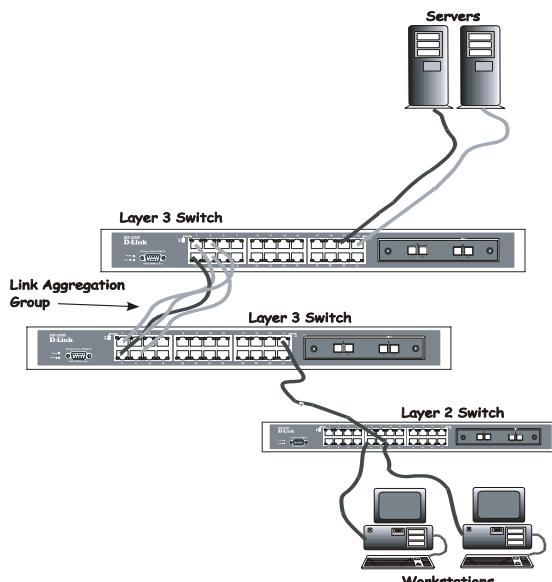
## Link Aggregation

Link aggregation is used to combine a number of ports together to make a single high-bandwidth data pipeline. The participating ports are called members of a link aggregation group, with one port designated as the **master port** of the group. Since all members of the link aggregation group must be configured to operate in the same manner, the configuration of the master port is applied to all members of the link aggregation group. Thus, when configuring the ports in a link aggregation group, you only need to configure the master port.

The DES-3226S supports link aggregation groups, which may include from 2 to 8 Switch ports each, except for a Gigabit link aggregation group which consists of the 2 (optional) Gigabit Ethernet ports of the front panel. These ports are the two 1000BASE-SX, -LX -TX or GBIC ports contained in a front-panel mounted module.

## Static vs. LACP Link Aggregation

DES-3226S Release 4.01 firmware supports the option of designating LACP compliant ports for link aggregation groups. IEEE 802.1ad Link Aggregation Control Protocol (LACP) is used to negotiate a dynamic aggregated link between this Switch and another network device. For static aggregated links (the default port setting for link aggregation is static), the linked Switches must be manually configured and do not allow dynamic changes to the aggregated port group. For dynamic aggregated links (designated LACP-compliant ports), the Switches must comply with LACP to allow negotiation of the aggregated link. Dynamic link aggregation can be negotiated if one port group is configured to be the “active” group while the other port group is designated as a “passive” group.



**Figure 5 - 3. Link Aggregation Group**

Data transmitted to a specific host (destination address) will always be transmitted over the same port in a link aggregation group. This allows packets in a data stream to arrive in the same order they were sent. A aggregated link connection can be made with any other Switch that maintains host-to-host data streams over a single link aggregate port. Switches that use a load-balancing scheme that sends the packets of a host-to-host data stream over multiple link aggregation ports cannot have an aggregated connection with the DES-3226S Switch.

## VLANs

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

### VLAN Implementation

The following rules are important to keep in mind when setting up VLANs on your network:

1. 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.
2. The DES-3226 supports only IEEE 802.1Q VLANs. The port untagging function can be used to remove the 802.1Q tag from packet headers to maintain compatibility with devices that are tag unaware.
3. The Switch's default is to assign all ports to a single 802.1Q VLAN named DEFAULT\_VLAN.
4. The DEFAULT\_VLAN has a VID = 1.
5. The DES-3226 supports Asymmetric VLANs. The member ports of VLANs can be overlapped. See the section on Asymmetric VLANs below.

### 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.

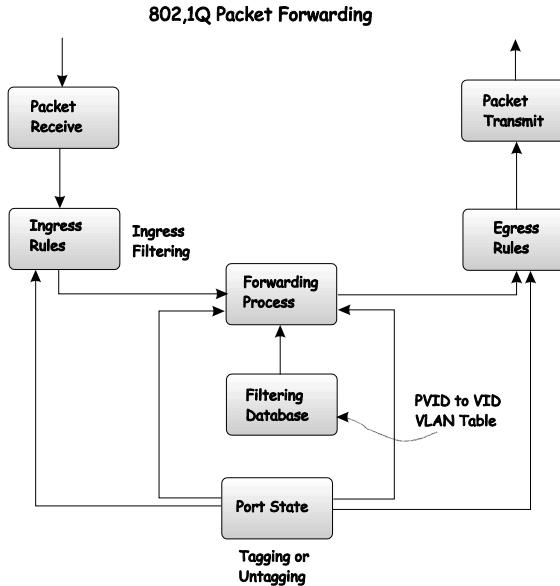
IEEE 802.1Q (tagged) VLANs are implemented on the DES-3226S Switch. 802.1Q VLANs require tagging, which enables the VLANs to span an entire network (assuming all Switches on the network are IEEE 802.1Q-compliant).

Any port can be configured as either *tagging* or *untagging*. The *untagging* feature of IEEE 802.1Q VLANs allow 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 VLAN compliant Switches through a single physical connection and allows Spanning Tree to be enabled on all ports and work normally.

### 802.1Q VLAN Packet Forwarding

Packet forwarding decisions are made based upon the following three types of rules:

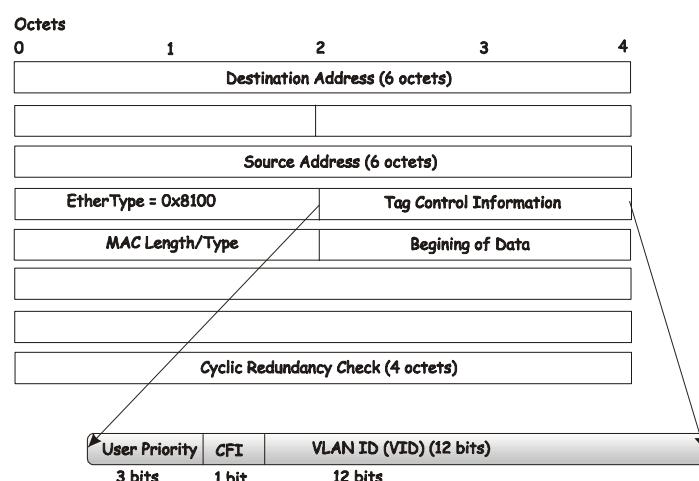
- Ingress rules – rules relevant to the classification of received frames belonging to a VLAN.
- Forwarding rules between ports – decides filter or forward the packet
- Egress rules – determines if the packet must be sent tagged or untagged.

**Figure 5 - 4. 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 contained in the packet originally is retained.

**IEEE 802.1Q Tag****Figure 5 - 5. 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.

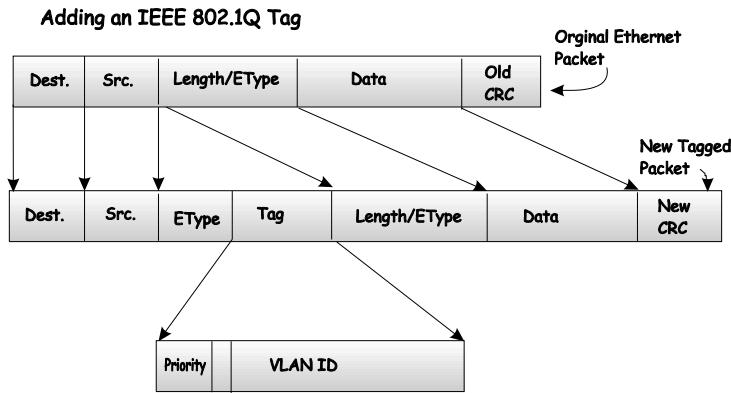


Figure 5 - 6. Adding an IEEE 802.1Q Tag

## 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 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.

## Asymmetric VLANs

The DES-3226S supports Asymmetric VLANs implementation for more efficient use of shared resources such as server or gateway devices. An asymmetric VLAN can be set up to allow a server (or several servers) to communicate with several clients through a single physical link on the Switch. At the same time however, the clients are not allowed to link to each other directly. For example, asymmetric VLANs can be set up so that the network email server can be accessed by all email clients. All email clients can send and receive data packets through the port connected to the email server, but they are not allowed to send and receive data to the remaining ports. The email server can freely associate with all ports, that is, all clients connected to the Switch.

The key difference between conventional 802.1q VLAN implementation or symmetric VLANs, and asymmetric VLANs is in how address mapping is handled. Symmetric VLANs use separate address tables so there is no address sharing between VLANs. Asymmetric VLANs can use a single, shared address table. Address sharing however takes place in only one direction. In the example above, the VLAN created for the port connected to the email server has the entire address table at its disposal so that any address can be mapped to its port (PVID).

# Multicasting

Multicasting is a group of protocols and tools that enable a single source point to send packets to groups of multiple destination points with persistent connections that last for some amount of time. The main advantage to multicasting is a decrease in the network load compared to broadcasting.

## Multicast Groups

Class D IP addresses are assigned to a group of network devices that comprise a multicast group. The four most significant four bits of a Class D address are set to “1110”. The following 28 bits is referred to as the ‘multicast group ID’. Some of the range of Class D addresses are registered with the Internet Assigned Numbers Authority (IANA) for special purposes. For example, the block of multicast addresses ranging from 224.0.0.1 to 224.0.0.225 is reserved for use by routing protocols and some other low-level topology discovery and maintenance protocols.

**IP Multicast Address Format**



**Figure 5 - 7. Class D Multicast Address**

Some of the reserved IP multicast addresses are as follows:

Address	Assignment
224.0.0.0	Base Address (reserved)
224.0.0.1	All Systems on this subnet
224.0.0.2	All Routers on this subnet
224.0.0.3	Unassigned
224.0.0.4	DVMRP Routers
224.0.0.5	OSPF IGP Routers
224.0.0.6	OSPF IGP Designated Routers
224.0.0.7	ST Routers
224.0.0.8	ST Hosts
224.0.0.9	All RIP2 Routers
224.0.0.10	All IGRP Routers
224.0.0.11	Mobile Agents
224.0.0.12	DHCP Servers and Relay Agents
224.0.0.13	All PIM Routers
224.0.0.14	RSVP Encapsulation
224.0.0.15	All CBT Routers
224.0.0.16	Designated Sbm
224.0.0.17	All Sbms
224.0.0.18	VRRP
224.0.0.19 through 224.0.0.225	Unassigned
224.0.0.21	DVMRP on MOSPF

**Table 2. Reserved Multicast Address Assignment**

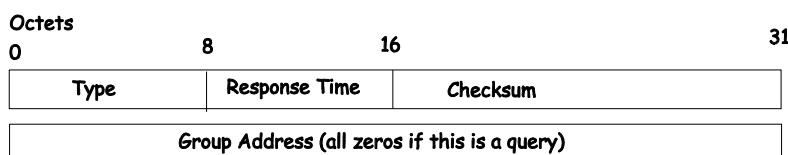
### Internet Group Management Protocol (IGMP)

End users that want to receive multicast packets must be able to inform nearby routers that they want to become a multicast group member of the group these packets are being sent to. The Internet Group Management Protocol (IGMP) is used by multicast routers to maintain multicast group membership. IGMP is also used to coordinate between multiple multicast routers that may be present on a network by electing one of the multicast routers as the ‘querier’. This router then keep track of the membership of multicast groups that have active members on the network. IGMP is used to determine whether the router should forward multicast packets it receives to the subnetworks it is attached to or not. A multicast router that has received a multicast packet will check to determine if there is at least one member of a multicast group that has requested to receive multicast packets from this source. If there is one member, the packet is forwarded. If there are no members, the packet is dropped.

### IGMP Versions 1 and 2

Users that want to receive multicast packets need to be able to join and leave multicast groups. This is accomplished using IGMP.

#### IGMP Message Format



**Figure 5 - 8. IGMP Message Format**

The IGMP Type codes are shown below:

Type	Meaning
0x11	Membership Query (if Group Address is 0.0.0.0)
0x11	Specific Group Membership Query (if Group Address is Present)
0x16	Membership Report (version 2)
0x17	Leave a Group (version 2)
0x12	Membership Report (version 1)

**Table 3. IGMP Type Codes**

Multicast routers use IGMP to manage multicast group memberships:

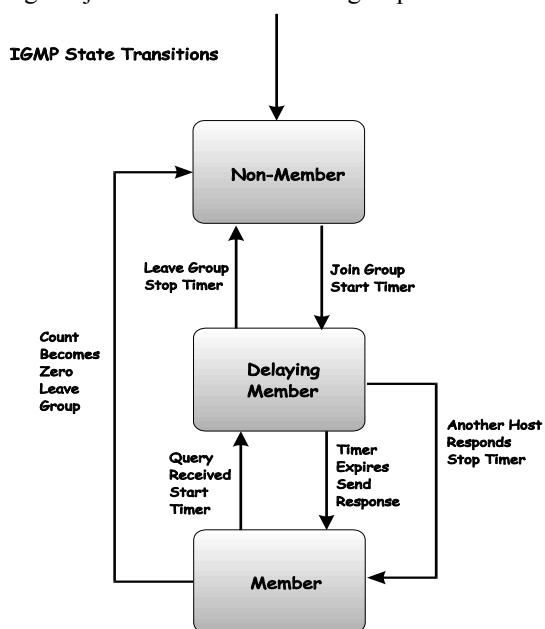
- An IGMP “report” is sent by a user’s computer to join a group
- IGMP version 1 does not have an explicit ‘leave’ message. Group members have an expiration timer, and if this timer expires before a query response is returned, the member is dropped from the group.
- IGMP version 2 introduces an explicit “leave” report. When a user wants to leave a group, this report is sent to the multicast router (for IGMP version 2).
- Multicast routers send IGMP queries (to the all-hosts group address: 224.0.0.1) periodically to see whether any group members exist on their subnetworks. If there is no response from a particular group, the router assumes that there are no group members on the network, and multicast packets are not forwarded.

The TTL field of query messages is set to 1 so that the queries do not get forwarded to other subnetworks.

IGMP version 2 introduces a few extensions to IGMP version 1 such as, the election of a single multicast querier for each network, explicit ‘leave’ reports, and queries that are specific to a particular multicast group.

The router with the lowest IP address is elected as the querier. The explicit group leave message is added to decrease latency, and routers can ask for membership reports from a particular multicast group ID.

The transition states a host will go through to join or leave a multicast group are shown in the diagram below.



**Figure 5 - 9. IGMP State Transitions**

# Web-Based Switch Management

## Introduction

The DES-3226S offers an embedded Web-based (HTML) interface allowing users to manage the Switch from anywhere on the network through a standard browser such as Netscape Navigator/Communicator or Microsoft Internet Explorer. The Web 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.



**NOTE:** This Web-based Management Module does not accept Chinese language input (or other languages requiring 2 bytes per character).

## Getting Started

The first step in getting started in using web-based management for your Switch is to secure a browser. A Web browser is a program which allows a person to read hypertext, for example, Netscape Navigator or Microsoft Internet Explorer. Follow the installation instructions for your browser.

The second step is to configure an IP interface on the Switch. This can be done manually through the console or automatically using BOOTP/DHCP.

## Configuring the Switch

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 with a Netmask 255.0.0.0.

In the page that opens, click on the **Login** hyperlink. This opens the management module's main page.

D-Link DES-3226S 10/100/1000 Fast Ethernet Switch - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://10.90.90.90/

**Login** to make a setup...

**10/100/1000 Mbps Layer 2 Switch**  
24 10/100 Mbps + 1 or 2 optional ports

Model No.: DES-3226S

**Layer 2 Switch**

This rack-mountable switch provides high-performance access to enterprise data servers and infrastructure.

The DES-3226S provides 24 10/100 Mbps ports and an optional module slot. Various optional modules are available. The DES-322GS module provides one GBIC Gigabit Ethernet port and 1 stacking port. The stacking port allows stacking of up to 8 DES-3226S switches to be interconnected so that all 8 switches can be managed as a single unit.

The optionally available modules are as follows:

Module Name	Provided Port Types
DES-332GS	1-port GBIC Gigabit Ethernet and 1 Stacking Port Module
DES-132	2-port 10/100BASE-T Ethernet Module
DES-132T	2-port 1000BASE-T Gigabit Ethernet Module
DES-132G	2-port 1000BASE-SX Gigabit Ethernet Module
DES-132GL	2-port 1000BASE-LX Gigabit Ethernet Module
DES-132GB	2-port GBIC-based Gigabit Ethernet Module
DES-131F	1-port 100BASE-FX Module (2km)
DES-132F	2-port 100BASE-FX Module (2km)
DES-131FL	1-port 100BASE-FL Module (15km)
DES-132FL	2-port 100BASE-FL Module (15km)
DEM-320S	2-port 1000BASE-SX Gigabit Ethernet Module
DEM-320L	2-port 1000BASE-LX Gigabit Ethernet Module
DEM-320GH	2-port GBIC-based Gigabit Ethernet Module
DEM-320GS	1-port GBIC Gigabit Ethernet and 1 Stacking Port Module

The 24 10/100 Mbps ports auto-sense the network speed of the computers, switches, and hubs that may be connected and can run at either 10 Mbps or 100 Mbps, and will auto-negotiate between full- and half-duplex.

IEEE 802.3x Flow Control allows your servers to directly connect to this switch for fast, reliable data transfer. At 200 Mbps full-duplex, this switch provides high-speed data pipes to your servers with minimum data transfer loss.

802.1Q VLANs allow you to set the subnet network traffic and improve performance and manageability.

Multiple Port Trunks - you can combine up to 8 10/100 Mbps ports into a trunk to create a 1600 Mbps full duplex aggregated bandwidth to connect to a server or another switch.

**Features**

- 24 10/100 Mbps + 1 or 2 optional ports.
- 10/100 Mbps auto-sensing ports run Ethernet and Fast Ethernet hardware seamlessly.
- Dedicated bandwidth for servers and workstations running bandwidth-intensive applications.
- Blazing 200 Mbps twisted-pair speed + 200 Mbps Gigabit in full-duplex mode.
- IEEE 802.3x Flow Control to guard against data transfer loss.
- VLANs to fine-tune traffic flow and setup security.
- Broadcast and Multicast Storm Control.
- IEEE 802.1D/1W
- IEEE 802.1Q Group VLAN Registration Protocol (GVRP) support.
- IEEE 802.1P QoS support.
- IEEE 802.1p Priority queuing support (4 priority queues).
- Port trunks for aggregated bandwidth.
- Custom filters allow you to set up access control and security.
- SNMPv1, SNMPv2, RMON, Console, and web-based management from diverse platforms.
- IEEE 802.1x Port-Based Network Access Control.
- Traffic Segmentation.
- Traffic bandwidth control (QoS).
- System log.

**Figure 6- 1. Welcome Page**

The Switch management features available in the web-based manager are explained below.

## Web-based Manager's User Interface

The user interface provides access to various Switch configuration and management screens, 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 3 distinct areas as described in the table.

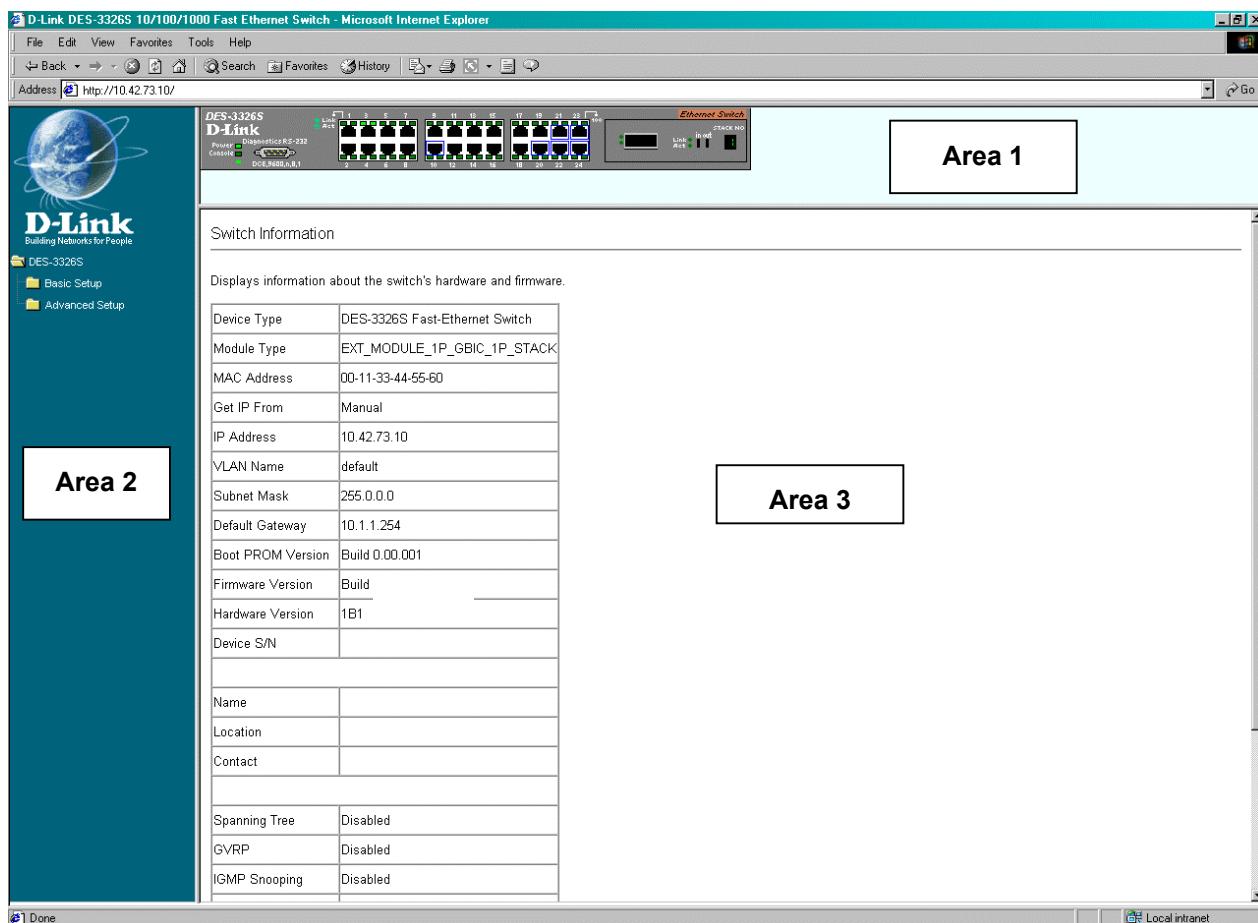


Figure 6 - 1. Main Web-Manager Screen

<b>Area</b>	<b>Function</b>
<b>1</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 the ports, expansion modules, management module, or the case.
<b>2</b>	Folders, subfolders and hyperlinks for the selection of command sets and menus.
<b>3</b>	Presents Switch information based on your selection and the entry of configuration data.

This section, arranged by topic, describes how to perform common monitoring and configuration tasks on the DES-3226S Switch using the Web-based Manager, you can perform any of the tasks described in the following sections.

## User Accounts Management

From the **Main Menu**, highlight **Setup User Accounts** and press Enter, then the **User Account Management** menu appears.

The screenshot shows a user interface titled "User Accounts". Below the title, a descriptive message reads: "Add, modify, and delete user accounts. User level privileges grant view rights." At the bottom of the interface are three buttons: "New", "Edit", and "Delete". Below these buttons is a table with two columns: "Username" and "Access Level". The table contains one row with the data: "Mike" in the Username column and "Admin" in the Access Level column. The "Admin" entry is highlighted with a red border.

	Username	Access Level
<input checked="" type="radio"/>	Mike	Admin

**Figure 6 - 2. User Accounts Control Table**

Click **New** to add a user.

The screenshot shows a user interface titled "User Accounts - Add". It contains four input fields: "Username" (set to "Mike"), "New Password" (set to "\*\*\*\*\*"), "Confirm New Password" (set to "\*\*\*\*\*"), and "Access Level" (set to "Admin"). At the bottom of the form are two buttons: "Back" and "Apply".

Username	Mike
New Password	*****
Confirm New Password	*****
Access Level	Admin

**Figure 6 - 3. User Accounts Control Table – Add**

1. Enter the new user name, assign an initial password, and then confirm the new password. Determine whether the new user should have **Admin** or **User** privileges.
2. Click on **APPLY** to make the user addition effective.
3. A listing of all user accounts and access levels is shown on the user accounts control table. This list is updated when **Apply** is executed.
4. Please remember that **Apply** makes changes to the Switch configuration for the *current session only*. All changes (including User additions or updates) must be entered into non-volatile ram using the **Save Changes** command on the **Main Menu** - if you want these changes to be permanent.

## 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:

<b>Switch Configuration</b>		<b>Privilege</b>	
<b>Management</b>		<b>Admin</b>	<b>User</b>
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	Ping Only	
Factory Reset	Yes	No	
Reboot Switch	Yes	No	
<b>User Account Management</b>			
Add/Update/Delete User Accounts	Yes	No	
View User Accounts	Yes	No	

**Table 4. Admin and User Privileges**

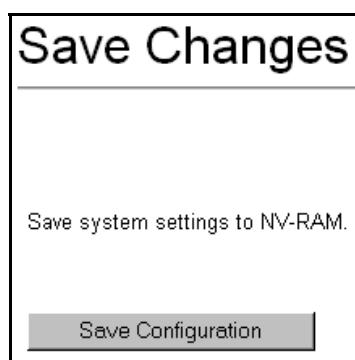
After establishing a User Account with **Admin**-level privileges, highlight **Save Changes** and press **Enter** (see below). The Switch will save any changes to its non-volatile ram and reboot. You can logon again and are now ready to continue configuring the Switch.

## Saving Changes

The DES-3226S has two levels of memory; normal RAM and non-volatile or NV-RAM. Configuration changes are made effective by highlighting **Apply** and pressing 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, highlight **Save Changes** from the **Main Menu**. The following screen will appear:



**Figure 6 - 4. Save Changes Screen**

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 6 - 5. 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.

## Factory Reset

The **Factory 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 with this option enabled, and **Save Changes** is not executed, the Switch will return to the last saved configuration when rebooted.

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.

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** (above) followed by **Save Changes**.

Factory Reset	
<input type="radio"/> <b>Reset</b>	All parameters are reset to default settings except IP address, user account and history log.
<input type="radio"/> <b>Reset Config</b>	All parameters are reset to default settings.
<input checked="" type="radio"/> <b>Reset System</b>	All parameters are reset to default settings. Then the switch will do factory reset, save, reboot.
<b>Apply</b>	

**Figure 6 - 6. Factory Reset Screen**

Click the **Apply** button to reset the Switch.

## Restart System

Use the menu below to restart the Switch.

Click to check the **Yes** option if you want to save the current configuration to non-volatile RAM before restarting the Switch.

Click the **No** option if you do not want to save the current configuration before restarting the Switch. In this case, all of the configuration information entered from the last time **Save Changes** was performed will be lost.



**NOTE:** Clicking the **Yes** option in the **Restart** menu is equivalent to executing **Save Changes** and then restarting the Switch.

Click the **Restart** button to restart the Switch.

**Restart System**

---

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

Do you want to save the settings?  Yes  No

**Restart**

**Figure 6 - 7. Restart System Screen**

## Basic Setup

The hyperlinked menus contained in the Basic Setup folder include:

- **Switch Information**
- **Basic Switch Setup**
- **Stacking Information**
- **Port Configuration**
- **Port Security Settings**
- **Multicast Port Filtering Mode**
- **Traffic Segmentation Table**
- **User Accounts**
- **Management Station Ip Address**
- **Serial Port Settings**

These menus are discussed below in this section with the exception of the User Accounts (see previous section on **User Accounts Management**).

The menus within subfolders in the Basic Setup folder are presented in separate sections including

- **SNTP SETTINGS**
- **NETWORK MANAGEMENT**
- **SWITCH UTILITIES**

## Switch Information

Click the **Switch Information** link in the Basic Setup folder to display basic information. Switch Information

Click the **Switch Information** link in the Basic Setup folder to display basic information.

The **Switch Information** window shows which (if any) external modules are installed, and the Switch's **MAC Address** (assigned by the factory and unchangeable). In addition, the **Boot PROM** and **Firmware Version** numbers are shown. This information is helpful to keep track of PROM and Firmware updates and to obtain the Switch's MAC address for entry into another network device's address table – if necessary.

The Switch's IP settings and system name, location and contact information are configured in the Basic Switch Setup menu.

Switch Information	
Displays information about the switch's hardware and firmware.	
Device Type	DES-3226S Fast-Ethernet Switch
Module Type	DES-332GS 1-port GBIC Gigabit Ethernet and 1 Stacking Port
MAC Address	00-01-02-03-04-00
Get IP From	Manual
IP Address	10.41.44.155
VLAN Name	default
Subnet Mask	255.0.0.0
Default Gateway	0.0.0.0
Boot PROM Version	Build 2.00.001
Firmware Version	Build 4.00-B27
Hardware Version	2B1
Device S/N	
Name	
Location	
Contact	
Spanning Tree	Disabled
GVRP	Disabled
IGMP Snooping	Disabled
TELNET	Enabled (TCP 23)
WEB	Enabled (TCP 80)
RMON	Enabled
Asymmetric VLAN	Enabled

**Figure 6 - 8. Switch Information – Basic Settings**

## Configuring the Switch's IP Address

The Switch needs to have an IP address assigned to it so that an In-Band network management system (for example, the Web Manager or Telnet) client can find it on the network. The **Basic Switch Setup** window allows you to change the settings for the Ethernet interface used for in-band communication.

The fields listed under the **Current IP Settings** heading are those that are currently being used by the Switch. Those fields listed under the **New Switch IP Setting** heading are those that will be used after clicking on the **Apply** button.

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

Click the **Basic Switch Setup** link (in the Basic Setup folder) to open the menu illustrated below.

### 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. If you want to access the Switch from a different subnet from the one it is installed on, enter the IP address of the gateway. If you will manage the Switch from the subnet on which it is installed, you can leave the default address in this field.
3. If no VLANs have been previously configured on the Switch, you can use the default VLAN – named **default**. 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 name of the VLAN containing the port where the management station will operate.

**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:** <Manual> pull-down menu to choose from *Manual*, *BOOTP*, or *DHCP*. This selects how the Switch will be assigned an IP address on the next reboot.

Basic Switch Setup	
Configure the switch's IP address and contact information.	
<b>Current Switch IP Settings</b>	
Get IP From	Manual
IP Address	10.42.73.10
Subnet Mask	255.0.0.0
Default Gateway	10.1.1.254
VLAN Name	default
<b>New Switch IP Settings</b>	
Get IP From	Manual <input type="button" value="▼"/>
IP Address	<input type="text" value="10"/> . <input type="text" value="42"/> . <input type="text" value="73"/> . <input type="text" value="10"/>
Subnet Mask	<input type="text" value="255"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/>
Default Gateway	<input type="text" value="10"/> . <input type="text" value="1"/> . <input type="text" value="1"/> . <input type="text" value="254"/>
VLAN Name	<input type="text" value="default"/>
Name	<input type="text"/>
Location	<input type="text"/>
Contact	<input type="text"/>
<input type="button" value="Apply"/>	

**Figure 6 - 9. Basic Switch Setup**

**NOTE:** The factory default IP address for the Switch is 10.90.90.90 with a subnet mask of 255.0.0.0 and a default gateway of 0.0.0.0.

The **New Switch IP Settings** options include:

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. The fields which require entries under this option are as follows:
<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 (a computer) will be allowed to manage the Switch using TCP/IP (in-band, or over the network). Management stations that are on VLANs other than the one entered in the VLAN Name field will not be able to manage the Switch in-band unless their IP addresses are entered in the Management Station IP Addresses field. The default VLAN is named default and contains all of the Switch's ports. There are no entries in the Management Station IP Addresses table, by default – so any management station can access the Switch.

In addition to IP settings, the Basic Switch Setup menu is also where you may enter optional settings to assign a name, location description and contact information for the network manager. This information appears in the Switch Information display in the web manager or when the **show switch** command is used in the CLI interface.

## Stacking Information

When DES-3226S Switches are properly interconnected in a stacked group, information about the stack is displayed in the **Stack Information** menu. This link is visible only when a Switch stack has been connected and the optional stacking modules are active.



**NOTE:** Stacking mode is configured using the CLI command **config stacking mode**. The default settings allow stacking with other DES-3226S Switches in a ring topology or with a DGS-3212SR or DGS-3312SR Switch in a star topology.

The Switch stack (up to 8 – total) is displayed in the upper right-hand corner of your web-browser. The icons are in the same order as their respective Unit numbers.

*To view the stacking information, click on the **Stacking Information** link from the **Basic Setup** folder:*

Stacking Information					
Unit ID	MAC Address	Start Port	Port Range	Mode	Version
1	00-00-00-22-22-00	1	26	AUTO	1
2	00-11-33-44-55-60	27	26	AUTO	1

**Figure 6 - 10. Stacking Information**

The **Unit ID** field displays the Switch's order in the stack. The Switch with a Unit ID of 1 is the Master Switch.

The **MAC Address** field displays the unique address of the Switch assigned by the factory.

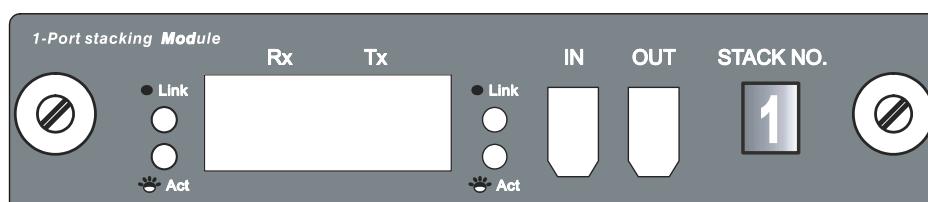
The **Start Port** field displays the first port assigned to the corresponding Switch in the Switch stack.

The **Port Range** field displays the total number of ports on the Switch. Note that the stacking port is included in the total count.

**Mode** displays the method used to determine the stacking order of the Switches in the Switch stack.

The **Version** field displays the version number of the stacking firmware.

The Switch's current order in the Switch stack is also displayed on the Stacking Module's front panel – under the **STACK NO.** heading:



**Figure 6 - 11. The Stacking Module's Front Panel**

The **Stack No.** seven-segment LED displays the Unit number assigned to the Switch. A **0** (a zero) in the display indicates that the stacking module is in the process of determining the stack status and has not yet resolved the Switch's Unit number.

The stacking order can be automatically configured using the Switch's MAC address – the lower the numerical value of a given Switch's MAC address, the lower the number in the stacking order the Switch will be assigned. The Switch with the lowest MAC address, will then become the Master Switch.

Alternatively, the stacking order can be manually assigned using the console's Command Line Interface (CLI).

You can use the **show stacking** command to display the current Switch stack information. The syntax of the **show stacking** command is as follows:

**show stacking {mode}**

Using the optional parameter **mode** displays only the stacking mode of the Switches in the Switch stack.

Entering the **show stacking** command with no parameters returns all of the relevant stacking information for all of the Switches in the stack:

DES-3226S: 4#show stacking Command: show stacking						
Unit ID	MAC Address	Start Port	Port Range	Mode	Version	
1	00-11-33-44-55-60	1	26	AUTO	1	
2	00-00-00-22-22-00	27	26	SLAVE		
Total Entries :2						
DES-3226S: 4#						

**Figure 6 - 12. Console CLI show stack Command**

The same Switch stack information is displayed in the console as is displayed in the web-based management agent.

The **config stacking mode** command allows you to configure the Switch stack manually.

The syntax of the **config stacking mode** command is as follows:

**config stacking mode [ disable | enable [master | auto | slave] ]**

One of the parameters **auto/master/slave/standalone** must be entered along with the **config stacking mode** command. These parameters have the following effects:

- disable** If stacking has been disabled, the Switch will operate as a standalone device regardless of whether or not it has a stacking module installed.
- enable** When the stacking mode is enabled the Switch may function in a properly connected and configured Switch stack. By default the Switch has the stacking mode enabled. When enabled the stacking mode can operate in master, slave or auto modes.
- auto** Switches in the stack will be assigned a unit ID using a comparison of the numerical value of the Switch's MAC address. The lowest MAC address in the Switch stack will become Unit 1 (the Master Switch), the next highest MAC address will become Unit 2, and so on. This is the Switch's default mode.
- master** The Switch that the management station is connected to (via the Switch's serial port) will become Unit 1 – the master Switch. This Switch will then be used to configure the Switch stack.
- slave** The Switch that the management station is connected to (via the Switch's serial port) will never become the Master Switch and will always be Unit 2 or higher. If multiple Switches in the stack are configured as **slave** Switches, their unit numbers are determined by the numerical value of their respective MAC addresses.

The following example configures the two Switches in a two-Switch stack to give the Switch with the lowest MAC address a Unit number greater than 1 (configured as a **slave**). The second Switch is configured to always have a Unit number of 1 (configured as the **master**):

With the management station's console connected to the serial port of the Switch with the MAC address 00-00-00-22-22-00, enter the following command at the prompt:

**config stacking mode slave**

This will configure the Switch with MAC address 00-00-00-22-22-00 to always have a Unit number greater than 1 (as a **slave**).

Now move the management station's console connection (via the serial port) to the Switch with MAC address 00-11-33-44-55-60, and enter the following command:

**config stacking mode master**

This will configure the Switch with MAC address 00-11-33-44-55-60 to always have a Unit number of 1 (as the **master**).

You can then use the **show stacking** command to verify the stacking configuration, as shown below:

```
DES-3226S: 4#config stacking mode master
Command: config stacking mode master
Success.

DES-3226S: 4#show stacking
Command: show stacking

Unit ID      MAC Address          Start Port   Port Range   Mode       Version
-----+-----+-----+-----+-----+-----+-----+
  1          00-11-33-44-55-60    1            26           MASTER     1
  2          00-00-00-22-22-00    27           26           SLAVE      1

Total Entries :2
DES-3226S: 4#
```

**Figure 6 - 13. config stacking Command**

## Configure Ports

Click the Port Configurations link in the Basic Setup folder:

For stacked switch installations, it will be necessary to select the Unit (switch) according to its logical position in the stack.

### Port Configurations

Enable or disable individual ports and set their speed and duplex state.

Unit

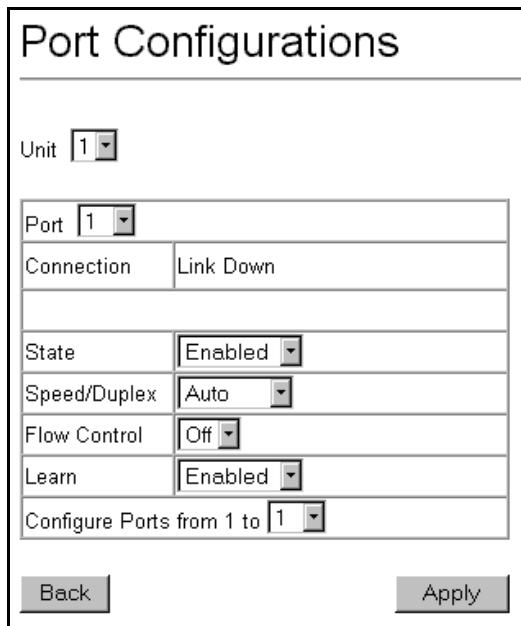
Figure 6 - 14. Choose Switch from stack

Click the selection button on the far left that corresponds to the port you want to configure and click the Edit button.

	Port	State	Setting	Connection	Learn
<input type="radio"/>	1	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	2	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	3	Enabled	Auto/Disabled	100M/Full/None	Enabled
<input type="radio"/>	4	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	5	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	6	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	7	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	8	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	9	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	10	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	11	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	12	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	13	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	14	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	15	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	16	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	17	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	18	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	19	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	20	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	21	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	22	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	23	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	24	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	25	Enabled	Auto/Disabled	Link Down	Enabled
<input type="radio"/>	26	Enabled	Auto/Disabled	Link Down	Enabled

Figure 6 - 15. Port Configurations

Click on the port you want to configure on the **Port Configurations** menu and then click the **Edit** button. This will open the following dialog box:



**Figure 6 - 16. Port Configurations – Edit**

The **Unit** drop-down dialog box allows you to select different Switches in a Switch stack, if you have the optional stacking module installed and the Switches in the stack are properly interconnected.

The **Port** drop-down dialog box allows different ports (on the currently selected Unit) to be selected for configuration.

Use the **State<Enabled>** pull-down menu to either enable or disable the selected port.

Use the **Flow Control<Off>** pull-down menu to either turn flow control on or off for the selected port.

Use the **Speed/Duplex<Auto>** pull-down menu to either select the speed and duplex/half-duplex state of the port. Auto – auto-negotiation between 10 and 100 Mbps devices, full- or half-duplex. The Auto setting allows the port to automatically determine the fastest settings the device the port is connected to can handle, and then to use those settings. The other options are *100M/Full*, *100M/Half*, *10M/Full*, and *10M/Half*. There is no automatic adjustment of port settings with any option other than *Auto*.

## Port Security

A given port's (or a range of port's) 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 **Learn <Disabled>** pull-down menu to *Enabled*, and clicking **Apply**.

To disable learning on a port provides added security because it prevents unauthorized computers from connecting to the Switch's locked ports and gaining access to the network. If a computer with source MAC addresses unknown to the Switch prior to locking the port attempts to forward packets through the learning disabled port, the packets are dropped.

The following fields can be set:

Parameter	Description
<b>State &lt;Enabled&gt;</b>	Toggle the State <Enabled> field to either enable or disable a given port.
<b>Speed/Duplex &lt;Auto&gt;</b>	Toggle the Speed/Duplex <Auto> field to either select the speed and duplex/full-duplex state of the port. Auto – auto-negotiation between 10 and 100 Mbps devices, full- or half-duplex. The Auto setting allows the port to automatically determine the fastest settings the device the port is connected to can handle, and then to use those settings. The other options are <b>100M/Full</b> , <b>100M/Half</b> , <b>10M/Full</b> , and <b>10M/Half</b> . There is no automatic adjustment of port settings with any option other than <i>Auto</i> .
<b>Flow Control: Auto</b>	Displays the flow control scheme used for the various port configurations. Ports configured for full-duplex use 802.3x flow control, half-duplex ports use backpressure flow control, and Auto ports use an automatic selection of the two.
<b>Learn &lt;Disabled&gt;</b>	Allows the selected port (or port's) dynamic MAC address learning to be locked such that new source MAC addresses can not be entered into the MAC address table for the locked port. It can be changed by toggling between <i>Disabled</i> and <i>Enabled</i> .

## Port Security Settings

Click the selection button on the far left that corresponds to the port you want to configure and click the Edit button.

Port Security Settings			
Unit	6		
<input type="button" value="Edit"/>			
Port	Admin State	Maximum Learning Address	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

Figure 6 - 17. Configure Port Security

Select the port you want to configure and click Edit. The Port Security Edit menu appears, notice that once this menu is available you may move to any port on any Switch in the stack to configure security for that port.

The dialog box is titled "Port Security Settings - Edit". It shows the following configuration:

Unit	6
Port	2
Admin State	Disabled
Maximum Learning Address	1
Lock Address Mode	DeleteOnReset
Configure Ports from 2 to	1

Buttons at the bottom include "Back" and "Apply".

**Figure 6 - 18. Port Security Settings**

Configure the following parameters for Port Security:

Parameter	Description
<b>Admin State &lt;Disabled&gt;</b>	Toggle Admin State to either enable or disable port security for the port.
<b>Max Learning Address &lt;1 &gt;</b>	Select the maximum number of addresses that may be learned for the port. The port can be restricted to 10 or less MAC addresses that are allowed for dynamically learned MAC addresses in the forwarding table.
<b>Lock Address Mode &lt;Delete On Reset&gt;</b>	Select <i>Delete On Timeout</i> to clear dynamic entries for the ports on timeout of the Forwarding Data Base (FDB). Specify <i>Delete On Reset</i> to delete all FDB entries, including static entries upon system reset or rebooting.
<b>Configure Ports from __ to __</b>	Use this to specify a consecutively numbered group of ports on the Switch for configuration.

## Traffic Segmentation

The traffic segmentation table is used to limit traffic flow from a single port to other ports on the Switch. It cannot be used to segment traffic between Switch units in a stack. For this it would be appropriate to use VLANs or a filtering method. This provides an additional tool to direct traffic flow without relying on the Master CPU.

Traffic Segmentation Table	
<input type="button" value="Edit"/>	
Port	Port List
	1 to 8 9 to 16 17 to 24 25 26
<input type="radio"/> 1	Unit 1 ***** *----- * *
<input type="radio"/> 2	Unit 1 ***** ----- *----- - -
<input type="radio"/> 3	Unit 1 ***** ----- *----- * *
<input type="radio"/> 4	Unit 1 ***** ----- *----- * *
<input type="radio"/> 5	Unit 1 ***** ----- *----- * *
<input type="radio"/> 6	Unit 1 ***** ----- *----- * *
<input type="radio"/> 7	Unit 1 ***** ----- *----- * *
<input type="radio"/> 8	Unit 1 ***** ----- *----- * *
<input type="radio"/> 9	Unit 1 ***** ----- *----- * *
<input type="radio"/> 10	Unit 1 ***** ----- *----- * *
<input type="radio"/> 11	Unit 1 ***** ----- *----- * *
<input type="radio"/> 12	Unit 1 ***** ----- *----- * *
<input type="radio"/> 13	Unit 1 ***** ----- *----- * *
<input type="radio"/> 14	Unit 1 ***** ----- *----- * *
<input type="radio"/> 15	Unit 1 ***** ----- *----- * *
<input type="radio"/> 16	Unit 1 ***** ----- *----- * *
<input type="radio"/> 17	Unit 1 ***** ----- *----- * *
<input type="radio"/> 18	Unit 1 ***** ----- *----- * *
<input type="radio"/> 19	Unit 1 ***** ----- *----- * *
<input type="radio"/> 20	Unit 1 ***** ----- *----- * *
<input type="radio"/> 21	Unit 1 ***** ----- *----- * *
<input type="radio"/> 22	Unit 1 ***** ----- *----- * *
<input type="radio"/> 23	Unit 1 ***** ----- *----- * *
<input type="radio"/> 24	Unit 1 ***** ----- *----- * *
<input type="radio"/> 25	Unit 1 ***** ----- *----- * *
<input type="radio"/> 26	Unit 1 ***** ----- *----- * *

**Figure 6 - 19. Traffic Segmentation Table**

Click the selection button on the far left that corresponds to the port you want to configure and click the Edit button. This will open the following dialog box:

Traffic Segmentation Table - Edit

Unit	1
Port	3
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
List	<input checked="" type="checkbox"/>

**Figure 6 - 20. Traffic Segmentation – Edit**

To configure Traffic Segmentation for a port, select the ports from the Port List that are allowed to receive forwarded frames from the port that is being configured. Click the Apply button to add the ports to the forward list.

## Serial Port Settings

The **Serial Port Settings** window allows the configuration of the Switch's serial port.

Click on the **Serial Port Settings** link from the **Basic Setup** folder.

**Serial Port Settings**

Configure the switch's serial port that is used for terminal sessions.

<b>Console Settings</b>	
Baud Rate	9600
Data Bits	8
Parity Bits	None
Stop Bits	1
Auto Logout	Never

**Figure 6 - 21. Serial Port Settings**

The following fields can then be set for the serial port:

Parameter	Description
<b>Baud Rate</b>	Set the serial bit rate used to communicate with a management station. The console baud rate is 9600 bits per second.
<b>Data Bits</b>	Displays the number of bits that make up a word when communicating with the management station. The console interface uses 8 data bits.
<b>Stop Bits</b>	Displays the number of bits used to indicate that a word has been completely transmitted. The console interface uses 1 stop bit.
<b>Auto-Logout</b>	This sets the time the interface can be idle before the Switch automatically logs-out the user. The options are <i>2 mins</i> , <i>5 mins</i> , <i>10 mins</i> , <i>15 mins</i> , or <i>Never</i> .

## SNTP and Time Settings

Use the Current Time Settings and Time Zone/DST Settings menus to configure the system time settings manual or use SNTP service.

### Current Time

The Current Time Settings menu is used to set system time. SNTP service can be enabled and configured here or use manual settings. The read-only information here includes:

- **System Boot Time** – Time elapsed since last boot up sequence.
- **Current Time** – Current System Time expressed HH:MM:SS
- **Time Source** – Source of time settings, SNTP or interneal system clock.

Current Time Settings	
<b>Current Time Status</b>	
System Boot Time	0 days 00:00:00
Current Time	0 days 00:01:54
Time Source	System Clock
<b>SNTP Settings</b>	
SNTP State	<input type="button" value="Disabled ▾"/>
SNTP Primary Server	<input type="text" value="0.0.0.0"/>
SNTP Secondary Server	<input type="text" value="0.0.0.0"/>
SNTP Poll Interval in Seconds	<input type="text" value="720"/>
<input type="button" value="Apply"/>	
<b>Set Current Time</b>	
Year	<input type="button" value="▼"/>
Month	<input type="button" value="▼"/>
Day	<input type="button" value="▼"/>
Time in HH MM SS	<input type="button" value="▼"/> <input type="button" value="▼"/> <input type="button" value="▼"/>
<input type="button" value="Apply"/>	

Figure 6 - 22. Time Settings

Configure the following settings in the Current Time Settings menu:

Parameter	Description
<b>SNTP State</b>	Enable or Disable SNTP service
<b>SNTP Primary Server</b>	Enter the IP address of the primary server the SNTP information will be taken from.
<b>SNTP Secondary Server</b>	Enter the IP address of the secondary server the SNTP information will be taken from in the event the primary server is unavailable.
<b>SNTP Polling Interval</b>	This is the interval between requests for updated SNTP information. The polling interval ranges from 30 to 99,999 seconds.
<b>Set Current Time</b>	
<b>Year</b>	Select the year for manual date setting.
<b>Month</b>	Select the month for manual date setting.
<b>Day</b>	Select the day of the month for manual date setting.
<b>Time in HH MM SS</b>	Set time for system clock using 24-hour time clock (military time) notation.

**Time Zone and DST Settings**

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
<b>Apply</b>	
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
<b>Apply</b>	
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
<b>Apply</b>	

**Figure 6 - 23. Time Zone/DST Settings**

Daylight Savings Time settings can be enabled and set using either a formula for Repeating DST settings or using a definitive date, Annual DST settings.

Parameter	Description
<b>DST State</b>	Enable or Disable the DST seasonal time adjustment for the Switch.
<b>DST Offset (in minutes)</b>	
<b>Time Zone Offset (+/- GMT)</b>	Choose to add (+) or subtract (-) time to adjust for time zone relative to GMT.
<b>DST Repeating Settings</b>	
<b>From Which Week (of the month)?</b>	Select the week of the month in which DST begins.
<b>From Which Day (of the week)?</b>	Select the day of the week in which DST begins.
<b>From Which Month?</b>	Select the month in which DST begins.
<b>From What Time HH:MM?</b>	Select the time of day to begin DST. Time is expressed using a 24-hour clock using the hour and minute only.
<b>To Which Week?</b>	Select the week of the month in which DST ends.
<b>To Which Day?</b>	Select the day of the week in which DST ends.
<b>To Which Month?</b>	Select the month in which DST ends.
<b>To What Time HH:MM?</b>	Select the time of day to end DST. Time is expressed using a 24-hour clock.
<b>DST Annual Settings</b>	
<b>From What Month?</b>	Select the month in which DST begins.
<b>From What Date?</b>	Choose the specific date (day of the month) to begin DST.
<b>From What Time?</b>	Select the time of day to begin DST. Time is expressed using a 24-hour clock using the hour and minute only.
<b>To What Month?</b>	Select the month in which DST ends.
<b>To What Date?</b>	Choose the specific date (day of the month) to begin DST.
<b>To What Time?</b>	Select the time of day to end DST. Time is expressed using a 24-hour clock.

# Network Management

The DES-3226S 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.

## SNMP Settings

The DES-3226S supports the Simple Network Management Protocol (SNMP) versions 1, 2c, and 3. The SNMP version used to monitor and control the Switch can be specified by the administrator. 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 View Table

The SNMP View Table is used to assign views to community strings that define which MIB objects can be accessed by an SNMP manager.

To delete an existing View Table entry, click the selection button on the far left that corresponds to the port you want to configure and click the Delete button. To create a new entry, click the New button, a separate menu will appear.

SNMP View Table			
Total Entries: 10			
	New	Delete	
<input type="radio"/>	comview1	1.3.2.5.4.9	Included
<input type="radio"/>	newview1	1.3.2.4.4	Excluded
<input type="radio"/>	restricted	1.3.6.1.2.1.1	Included
<input type="radio"/>	restricted	1.3.6.1.2.1.11	Included
<input type="radio"/>	restricted	1.3.6.1.6.3.10.2.1	Included
<input type="radio"/>	restricted	1.3.6.1.6.3.11.2.1	Included
<input type="radio"/>	restricted	1.3.6.1.6.3.15.1.1	Included
<input type="radio"/>	CommunityView	1	Included
<input type="radio"/>	CommunityView	1.3.6.1.6.3	Excluded
<input type="radio"/>	CommunityView	1.3.6.1.6.3.1	Included

Figure 6 - 24. SNMP View Table

SNMP View Table - Add

View Name	<input type="text"/>
Subtree	<input type="text"/>
View Type	<input type="button" value="Included"/>
<input type="button" value="Back"/>	<input type="button" value="Apply"/>

Figure 6 - 25. SNMP View Table – Add New

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</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 <i>Included</i> to include this object in the list of objects that an SNMP manager can access. Select <i>Excluded</i> to exclude this object from the list of objects that an SNMP manager can access.

## SNMP Group Table

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

SNMP Group Table						
Total Entries: 5						
						<input type="button" value="New"/> <input type="button" value="Delete"/>
	Group Name	Read View Name	Write View Name	Notify View Name	Security Model	Security Level
<input checked="" type="radio"/>	initial	restricted		restricted	SNMPv3	NoAuthNoPriv
<input checked="" type="radio"/>	ReadGroup	CommunityView		CommunityView	SNMPv1	NoAuthNoPriv
<input checked="" type="radio"/>	ReadGroup	CommunityView		CommunityView	SNMPv2	NoAuthNoPriv
<input checked="" type="radio"/>	WriteGroup	CommunityView	CommunityView	CommunityView	SNMPv1	NoAuthNoPriv
<input checked="" type="radio"/>	WriteGroup	CommunityView	CommunityView	CommunityView	SNMPv2	NoAuthNoPriv

**Figure 6 - 26. SNMP Group Table**

To delete an existing entry, click the selection button on the far left that corresponds to the port you want to configure and click the Delete button. To create a new entry, click the New button, a separate menu will appear.

SNMP Group Table - Add	
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	<input type="button" value="SNMPv1"/>
Security Level	<input type="button" value="NoAuthNoPriv"/>
<input type="button" value="Back"/>	<input type="button" value="Apply"/>

**Figure 6 - 27. SNMP Group – Add New**

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>	Use the pull-down menu to select the SNMP version. Select one of the following: <i>SNMPv1</i> – Specifies that SNMP version 1 will be used. <i>SNMPv2</i> – Specifies that SNMP version 2c will be used. The SNMP v2c supports both centralized and distributed network management strategies. It includes improvements in the Structure of Management Information (SMI) and adds some security features. <i>USM</i> – (User-based Security Module) Specifies that the SNMP version 3 will be used. <i>SNMP v3</i> provides secure access to devices through a combination of authentication and encrypting packets over the network.
<b>Security Level</b>	Use the pull-down menu to select the SNMP version: <i>NoAuthNoPriv</i> – Specifies that there will be no authorization and no encryption of packets sent between the Switch and a remote SNMP manager. <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. <i>AuthPriv</i> – Specifies that authorization will be required, and that packets sent between the Switch and a remote SNMP manger will be encrypted.

### SNMP Community Table

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.

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

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

SNMP Community Table			
Total Entries: 2			
<input type="button" value="New"/> <input type="button" value="Delete"/>			
Community Name	View Name	Access Right	
<input type="radio"/> private	CommunityView	read_write	
<input type="radio"/> public	CommunityView	read_only	

**Figure 6 - 28. SNMP Community Table**

To delete an existing entry, click the selection button on the far left that corresponds to the port you want to configure and click the Delete button. To create a new entry, click the New button, a separate menu will appear. Configure the parameters as desired and click the Apply button to add the new string to the SNMP Community Table.

**SNMP Community Table - Add**

Community Name	<input type="text"/>
View Name	<input type="text"/>
Access Right	<input type="button" value="read_only"/>

**Figure 6 - 29. SNMP Community Table – Add New**

Configure the following for the new SNMP Community entry:

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>	Use the pull-down menu to select the access right: read_only – Specifies that SNMP community members using the community string created with this command can only read the contents of the MIBs on the Switch. read_write – Specifies that SNMP community members using the community string created with this command can read from and write to the contents of the MIBs on the Switch.

## 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.

**Engine ID**

Engine ID 0x	<input type="text" value="800000ab03da1021000001"/>
--------------	---

**Figure 6 - 30. Engine ID**

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

## SNMP Host Table

Use the SNMP Host Table to set up trap recipients.

SNMP Host Table			
Total Entries: 1			
	New	Delete	
C	0.0.0.0	V1	public

**Figure 6 - 31. SNMP Host Table**

To delete an existing entry, click the selection button on the far left that corresponds to the port you want to configure and click the Delete button. To create a new entry, click the New button, a separate menu will appear.

SNMP Host Table - Add			
Host IP Address	<input type="text"/>	<input type="text"/>	<input type="text"/>
SNMP Version	<input type="button" value="V1"/>		
Community String / SNMPv3 User Name	<input type="text"/>		
<input type="button" value="Back"/>	<input type="button" value="Apply"/>		

**Figure 6 - 32. SNMP Host Table – Add New**

Parameter	Description
<b>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>	From the pull-down menu select: V1 – To specifies that SNMP version 1 will be used. V2 – To specify that SNMP version 2 will be used. V3 – To specify that the SNMP version 3 will be used.
<b>Community String or SNMP V3 User Name</b>	Type in the community string or SNMP V3 user name as appropriate.

## SNMP User Table

Use the SNMP User Table to create a new SNMP user and add the user to an existing SNMP group or to a newly created group.

SNMP User Table				
Engine ID: 0x800000ab03da1021000001				
Total Entries: 1				
<input type="button" value="New"/>	<input type="button" value="Delete"/>			
User Name	Group Name	SNMP Version	Auth-Protocol	PrivProtocol
C initial	initial	V3	None	None

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

To delete an existing entry, click the selection button on the far left that corresponds to the port you want to configure and click the Delete button. To create a new entry, click the New button, a separate menu will appear.

SNMP User Table - Add				
Engine ID: 0x800000ab03000102030400				
User Name	<input type="text"/>			
Group Name	<input type="text"/>			
SNMP Version	<input type="button" value="V1"/>	<input checked="" type="checkbox"/> encrypted		
Auth-Protocol	<input type="button" value="MD5"/>	<input type="text"/>		
PrivProtocol	<input type="button" value="None"/>	<input type="text"/>		
<input type="button" value="Back"/>	<input type="button" value="Apply"/>			

**Figure 6 - 34. SNMP User Table – Add New**

Parameter	Description
<b>User Name</b>	Type in the new SNMP V3 user name or community string for V1 or V2. This can be any alphanumeric name of up to 32 characters that will identify the new SNMP user.
<b>Group Name</b>	Type in the new SNMP V3 group name. Again, this can be any alphanumeric name of up to 32 characters that will identify the SNMP group the new SNMP user will be associated with.
<b>SNMP Version</b>	From the pull-down menu select: V1 – To specifies that SNMP version 1 will be used. V2 – To specify that SNMP version 2 will be used. V3 – To specify that the SNMP version 3 will be used.
If Encryption (V3 only) is checked configure also:	In the Space provided, type an alphanumeric sting of between 8 and 20 characters that will be used to authorize the agent to receive packets for the host.
<b>Auth-Protocol</b>	From the pull-down menu select: MD5 – To specify that the HMAC-MD5-96 authentication level will be used. SHA – To specify that the HMAC-SHA-96 authentication level will be used.
If Encryption (V3 only) is checked configure also:	In the Space provided, type an alphanumeric string of between 8 and 16 characters that will be used to encrypt the contents of messages the host sends to the agent.
<b>Priv-Protocol</b>	

# Switch Utilities

## TFTP Utilities

Trivial File Transfer Protocol (TFTP) services allow the Switch 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.



**NOTE:** To get the latest firmware for the Switch go to the D-Link website:  
[www.dlink.com](http://www.dlink.com).

### Update Firmware from Server

*To update the Switch's firmware, click on the Basic Setup folder and then the Switch Utilities folder and then the TFTP Services folder and finally click on the Download Firmware from TFTP Server link:*

Download Firmware from TFTP Server	
Upgrade the switch's firmware.	
Select Upgrade Unit	1 <input type="checkbox"/>
Server IP Address	0 . 0 . 0 . 0
Path \ Filename	
<input type="button" value="Download"/> <input type="button" value="Save Settings"/>	

**Figure 6 - 35. Download Firmware from Server**

Select which Switch of a Switch stack you want to update the firmware on. This allows the selection of a particular Switch from a Switch stack if you have installed the optional stacking module and have properly interconnected the Switches.

1. Enter the IP address of the TFTP server in the **Server IP Address** field.
2. The TFTP server must be on the same IP subnet as the Switch.
3. Enter the path and the filename to the firmware file on the TFTP server. Note that in the above example, the firmware file is in the root directory of the D drive of the TFTP server.
4. The TFTP server must be running TFTP server software to perform the file transfer. TFTP server software is a part of many network management software packages – such as NetSight, or can be obtained as a separate program.
5. Click **Download** to record the IP address of the TFTP server. Use the **Save Settings** to enter the address into NV-RAM.
6. Click **Start** to initiate the file transfer.

## Use Configuration File on Server

To download a configuration file for the Switch's, click on the Basic Setup folder and then the Switch Utilities folder and then the TFTP Services folder and finally click on the Download Configuration from TFTP Server link:

Configure the switch with a file from the TFTP server.

Server IP Address	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
Path \ Filename	<input type="text"/>
<input type="checkbox"/> Increment	
<input type="button" value="Download"/> <input type="button" value="Save Settings"/>	

**Figure 6 - 36. Use Configuration File on Server**

1. Enter the IP address of the TFTP server and specify the location of the Switch configuration file on the TFTP server.
2. Click **Save Settings** to record the IP address of the TFTP server.
3. Use **Save Changes** from the **Maintenance** menu to enter the address into NV-RAM.
4. Click **Start** to initiate the file transfer.

## Save Settings To Server

To download a configuration file for the Switch's, click on the Basic Setup folder and then the Switch Utilities folder and then the TFTP Services folder and finally click on the Upload Settings to TFTP Server link:

Save the switch's configuration to the TFTP server.

Server IP Address	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
Path \ Filename	<input type="text"/>
<input type="button" value="Upload"/> <input type="button" value="Save Settings"/>	

**Figure 6 - 37. Save Settings To TFTP Server**

Enter the IP address of the TFTP server and the path and filename of the settings file on the TFTP server and click **Save Settings**. Click **Upload** to initiate the file transfer.

## Save History Log to Server

To download a configuration file for the Switch's, click on the Basic Setup folder and then the Switch Utilities folder and then the TFTP Services folder and finally click on the Upload history Log to TFTP Server link:

Upload History Log to TFTP Server

Save the switch's history log to the TFTP server.

Server IP Address	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
Path \ Filename	<input type="text"/>

**Figure 6 - 38. Save Switch History to TFTP Server**

Enter the IP address of the TFTP server and the path and filename for the history log on the TFTP server. Click **Save Settings** to make the changes current. Click **Upload** to initiate the file transfer.

## Ping Test

Ping is a small program that sends data packets to the IP address you specify. The destination node then returns the packets to the Switch. This is very useful to verify connectivity between the Switch and other nodes on the network.

Ping Test

Enter an IP address of a node to ping, and then click **Start**.

Target IP Address	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
Number of Repetitions	<input checked="" type="radio"/> Infinite times <input type="radio"/> <input type="text"/> times (1 - 255)
Default Timeout	<input type="text"/> sec. (1 - 99)

**Figure 6 - 39. Ping Test Screen**

The **Infinite times** checkbox, in the **Number of Repetitions** field, tells ping to keep sending data packets to the specified IP address until the program is stopped.

## Advanced Setup

Advanced setup menus include menus used to setup VLANs, change QoS scheduling, configure link aggregation, adjust Spanning Tree and Rapid Spanning Tree configuration, setup 802.1x parameters, assign unicast and multicast forwarding and configure port mirroring.

### Configuring VLANs

*To create a new 802.1Q VLAN:*

The VLAN menu adds an entry to edit the VLAN definitions and to configure the port settings for IEEE 802.1Q VLAN support. Go to the **Advanced Setup** folder, select **VLAN Configurations**, and click the **802.1Q VLANs** link to open the following dialog box:

	VLAN ID (VID)	VLAN Name	Advertisement	Members
<input checked="" type="checkbox"/>	1	default	Enabled	1 to 8   9 to 16   17 to 24   25   26 Unit 1 UUUUUUUU   UUUUUUUU   UUUUUUUU   U   U

Figure 6 - 40. 802.1Q VLANs

To delete an existing 802.1Q VLAN, click the corresponding click-box to the left of the VLAN you want to delete from the Switch and then click the **Delete** button.

*To create a new 802.1Q VLAN, click the New button:*

VLAN ID (VID)	<input type="text"/>	<input type="checkbox"/> Auto Assign
VLAN Name	<input type="text"/>	
Advertisement	<input type="button" value="Enabled"/>	
Unit	1	
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	
Non-member	<input checked="" type="radio"/>	
Tagged	<input type="radio"/>	
Untagged	<input type="radio"/>	
Forbidden	<input type="radio"/>	

Figure 6 - 41. 802.1Q Static VLANs Entry Settings – Add

To edit an existing 802.1Q VLAN, click the corresponding click-box and then click the Edit icon to open the following dialog box:

VLAN ID (VID)	1
VLAN Name	default
Advertisement	Enabled

Unit	1
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
Non-member	<input type="radio"/> <input checked="" type="radio"/> <input type="radio"/>
Tagged	<input type="radio"/> <input checked="" type="radio"/> <input type="radio"/>
Untagged	<input checked="" type="radio"/> <input type="radio"/>
Forbidden	<input type="radio"/>

[Back](#) [Apply](#)

Figure 6 - 42. 802.1Q Static VLANs Entry Settings – Edit

The following fields can then be set in either the **Add** or **Edit** dialog boxes:

Parameter	Description
<b>VLAN ID (VID)</b>	Allows the entry of a VLAN ID in the Add dialog box, or displays the VLAN ID of an existing VLAN in the Edit dialog box. VLANs can be identified by either the VID or the VLAN name. The Auto Assign click box will instruct the Switch to assign VLAN IDs – in ascending numerical order starting with 1 – to each VLAN as it is created.
<b>VLAN Name</b>	Allows the entry of a name for the new VLAN in the Add dialog box, or for editing the VLAN name in the Edit dialog box.
<b>Advertisement</b>	Advertising can be enabled or disabled using this pull-down menu. Advertising allows members to join this VLAN through GVRP.
<b>Port</b>	Allows an individual port to be specified as member of a VLAN.
<b>Tagged/Untagged</b>	Allows an individual port to be specified as Tagging. A Check in the Tagged field specifies the port as a Tagging member of the VLAN. When an untagged packet is transmitted by the port, the packet header is changed to include the 32-bit tag associated with the VID (VLAN Identifier – see below). When a tagged packet exits the port, the packet header is unchanged.
<b>Untagged</b>	Allows an individual port to be specified as Untagged. When an untagged packet is transmitted by the port, the packet header remains unchanged. When a tagged packet exits the port, the tag is stripped and the packet is changed to an untagged packet.
<b>Egress</b>	Egress Member - specifies the port as being a static member of the VLAN. Egress Member Ports are ports that will be transmitting traffic for the VLAN. These ports can be either tagged or untagged.
<b>Forbidden</b>	Forbidden Non-Member - specifies the port as not being a member of the VLAN and that the port is forbidden from becoming a member of the VLAN dynamically.

The **Port VLAN ID (PVID)** 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.

### Port VLAN ID (PVID)

Configure whether the switch can exchange VLAN configuration information with other GVRP enabled switches.

To limit traffic to a single VLAN, configure the ports to check the PVID of incoming packets. Packets that don't match the port's PVID are dropped.

Unit

Port	PVID	GVRP	Ingress Checking
1	1	Disabled	Enabled
2	1	Disabled	Enabled
3	1	Disabled	Enabled
4	1	Disabled	Enabled
5	1	Disabled	Enabled
6	1	Disabled	Enabled
7	1	Disabled	Enabled
8	1	Disabled	Enabled
9	1	Disabled	Enabled
10	1	Disabled	Enabled
11	1	Disabled	Enabled
12	1	Disabled	Enabled
13	1	Disabled	Enabled

Port	PVID	GVRP	Ingress Checking
14	1	Disabled	Enabled
15	1	Disabled	Enabled
16	1	Disabled	Enabled
17	1	Disabled	Enabled
18	1	Disabled	Enabled
19	1	Disabled	Enabled
20	1	Disabled	Enabled
21	1	Disabled	Enabled
22	1	Disabled	Enabled
23	1	Disabled	Enabled
24	1	Disabled	Enabled
25	1	Disabled	Enabled
26	1	Disabled	Enabled

**Figure 6 - 43. Port VLAN ID (PVID)**

The following fields can be set:

Parameter	Description
<b>PVID</b>	A Port VLAN Identifier is a classification mechanism that associates a port with a specific VLAN and is used to make forwarding decisions for untagged packets received by the port. For example, if port #2 is assigned a PVID of 3, then all untagged packets received on port #2 will be assigned to VLAN 3. This number is generally the same as the VID# number assigned to the port in the Edit 802.1Q VLANs menu above.
<b>GVRP &lt;Disabled&gt;</b>	The Group VLAN Registration Protocol (GVRP) enables the port to dynamically become a member of a VLAN.
<b>Ingress Checking &lt;Disabled&gt;</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.

To enable or disable GVRP, globally, on the Switch:

Go to the **VLAN Configurations** link and click on the **Switch GVRP** link:

Switch GVRP

Enable or disable ports from dynamically joining VLANs.  
When GVRP is disabled, only statically configured ports can be members of a VLAN.

Switch GVRP

Figure 6 - 44. – Switch GVRP

Parameter	Description
<b>GVRP &lt;Disabled&gt;</b>	Group VLAN Registration Protocol (GVRP) – this enables and disables GVRP on the Switch without changing the port GVRP settings.

## Asymmetric VLANs

The DES-3226S supports Asymmetric VLANs implementation for more efficient use of shared resources such as server or gateway devices. An asymmetric VLAN can be set up to allow a server (or several servers) to communicate with several clients through a single physical link on the Switch. At the same time however, the clients are not allowed to link to each other directly. For example, asymmetric VLANs can be set up so that the network email server can be accessed by all email clients. All email clients can send and receive data packets through the port connected to the email server, but they are not allowed to send and receive data to the remaining ports. The email server can freely associate with all ports, that is, all clients connected to the Switch.

The key difference between conventional 802.1q VLAN implementation or symmetric VLANs, and asymmetric VLANs is in how address mapping is handled. Symmetric VLANs use separate address tables so there is no address sharing between VLANs. Asymmetric VLANs can use a single, shared address table. Address sharing however takes place in only one direction. In the example above, the VLAN created for the port connected to the email server has the entire address table at its disposal so that any address can be mapped to its port (PVID).

This feature can be enabled with the following important restrictions:

- Asymmetric VLAN support is limited to standalone Switches.
- Each participating port must be untagged.
- GVRP and IGMP Snooping is not supported.

When Asymmetric VLANs have been enabled, a unique PVID is assigned to all ports creating a separate VLAN for each port. Each port is still able to receive frames from the default VLAN. Asymmetric VLANs are disabled by default.

Asymmetric VLAN

Enable or disable the Asymmetric VLAN.

Asymmetric VLAN

Figure 6 - 45. Asymmetric VLANs (enable or disable)

To enable Asymmetric VLANs for a standalone Switch, select **Enabled** and click the **Apply** button.

## Configure QoS (Quality of Service)

The DES-3226S Switch supports 802.1p priority queuing. The Switch has 4 priority queues. These priority queues are numbered from 0 (Class 0) — the lowest priority queue — to 3 (Class 3) — the highest priority queue. The eight priority queues specified in IEEE 802.1p (p0 to p7) are mapped to the Switch's priority queues as follows:

- p1 and p2 are assigned to the Switch's Class 0 queue.
- p0 and p3 are assigned to the Switch's Class 1 queue.
- p4 and p5 are assigned to the Switch's Class 2 queue.
- p6 and p7 are assigned to the Switch's Class 3 queue.

Priority scheduling is implemented using two types of methods, strict priority and round-robin priority. If no changes are made to the QoS priority scheduling settings the method used is strict priority.

For strict priority-based scheduling, packets residing in the higher priority queues are transmitted first. Only when these queues are empty, are packets of lower priority allowed to be transmitted. Higher priority packets always receive preference regardless of the amount of lower priority packets in the buffer and regardless of the time elapsed since any lower priority packets have been transmitted. By default the Switch is configured to empty the buffer using strict priority.



**NOTICE:** The default QoS scheduling arrangement is a strict priority schedule. To customize scheduling to set up round-robin queue clearing, the MAX. Latency and MAX. Packets values need to be changed using the config scheduling command. See **config scheduling** below.

To use implement round-robin (weighted) priority, the Switch's four priority queues can be configured to reduce the buffer in a round-robin fashion - beginning with the highest priority queue, and proceeding to the lowest priority queue before returning to the highest priority queue.

The weighted-priority based scheduling alleviates the main disadvantage of strict priority-based scheduling – in that lower priority queues get starved of bandwidth – by providing a minimum bandwidth to all queues for transmission. This is accomplished by configuring the maximum number of packets allowed to be transmitted from a given priority queue and the maximum amount of time a given priority queue will have to wait before being allowed to transmit its accumulated packets. This establishes a Class of Service (CoS) for each of the Switch's four hardware priority queues.

The possible range for maximum packets is: 0 to 255 packets.

The possible range for maximum latency is: 0 to 255 (in increments of 16 microseconds each).

Remember that the DES-3226S has four priority queues (and thus four Classes of Service) for each port on the Switch.

### Configuring QoS Output Scheduling

Click the **Configure QoS** link on the **Advanced Setup** menu, and the click on the **QoS Output Scheduling** link:

QoS Output Scheduling		
Class	MAX. Packets	MAX. Latency (*16 microseconds)
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"/>

**Figure 6 - 46. QoS Output Scheduling**

The MAX. Packets field specifies the number of packets that a queue will transmit before surrendering the transmit buffer to the next lower priority queue in a round-robin fashion. The default value of 0 combined with the default MAX. Latency value of 0 will enforce a strict scheduling for output queues. The maximum value for MAX. Packets is 255.

The MAX. Latency field specifies the maximum amount of time—in multiples of 16 microseconds—that a queue will have to wait before being given access to the transmit buffer. The MAX. Latency is a priority queue timer. When it expires, it

overrides the round-robin queuing and gives the priority queue that it was set for access to the transmit buffer. The default value of 0 combined with the default MAX. Packets value of 0 will enforce a strict scheduling for output queues. The maximum value for MAX. Latency is 255.



**NOTE:** There is a small amount of additional latency introduced because the priority queue that is transmitting at the time the MAX. Latency time expires will finish transmitting its current packet before giving up the transmit buffer.

## Configuring 802.1p User Priority

The DES-3226S allows the assignment of a User Priority to each of the 802.1p priorities.

802.1p User Priority	
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 - 47. QoS Class of Traffic**

Once you have assigned a maximum number of packets and a maximum latency to a given Class of Service on the Switch, you can then assign this Class to each of the 8 levels of 802.1p priorities.

## Configuring Default Priority

The Switch allows the assignment of a default 802.1p priority to each port on the Switch.

Click on the **Default Priority** link:

**802.1p Default Priority**

Select priority based on port or disable priority based on per port basis.

Unit

Port	Default Priority
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0
16	0
17	0
18	0
19	0
20	0
21	0
22	0
23	0
24	0
25	0
26	0

**Figure 6 - 48. Priority Based on Port**

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.

## Bandwidth Control

The bandwidth control settings are used to place a ceiling on the transmitting and receiving data bit rates for any port.

To change the maximum allowed bandwidth for a given port:

In the Bandwidth Control Table, click the selection button in the far left column that corresponds to the port you want to configure and click the Edit button. A new dialog box used to edit bandwidth settings opens.

Bandwidth Control Table - Edit		
Port	12	
RX Rate	<input type="text"/> MBits	<input checked="" type="checkbox"/> No Limit
TX Rate	<input type="text"/> MBits	<input checked="" type="checkbox"/> No Limit
<input type="button" value="Back"/>		<input type="button" value="Apply"/>

**Figure 6 - 49. Edit Port Bandwidth**

To limit either the Rx or Tx rates, deselect the No Limit check box and type the desired rate. Rates can be expressed using whole numbers up to the maximum available rate for the port.

Bandwidth Control Table			
	Port	RX Rate (MBits)	TX Rate (MBits)
<input type="radio"/>	1	No Limit	No Limit
<input type="radio"/>	2	No Limit	No Limit
<input type="radio"/>	3	No Limit	No Limit
<input type="radio"/>	4	No Limit	No Limit
<input type="radio"/>	5	No Limit	No Limit
<input type="radio"/>	6	No Limit	No Limit
<input type="radio"/>	7	No Limit	No Limit
<input type="radio"/>	8	No Limit	No Limit
<input type="radio"/>	9	No Limit	No Limit
<input type="radio"/>	10	No Limit	No Limit
<input type="radio"/>	11	No Limit	No Limit
<input type="radio"/>	12	No Limit	No Limit
<input type="radio"/>	13	No Limit	No Limit
<input type="radio"/>	14	No Limit	No Limit
<input type="radio"/>	15	No Limit	No Limit
<input type="radio"/>	16	No Limit	No Limit
<input type="radio"/>	17	No Limit	No Limit
<input type="radio"/>	18	No Limit	No Limit
<input type="radio"/>	19	No Limit	No Limit
<input type="radio"/>	20	No Limit	No Limit
<input type="radio"/>	21	No Limit	No Limit
<input type="radio"/>	22	No Limit	No Limit
<input type="radio"/>	23	No Limit	No Limit
<input type="radio"/>	24	No Limit	No Limit
<input type="radio"/>	25	No Limit	No Limit
<input type="radio"/>	26	No Limit	No Limit

**Figure 6 - 50. Bandwidth Control Table**

## Port Mirroring

**To configure a port for port mirroring:**

Click the Mirroring link and then the Target Port Selection link:

Mirroring Configurations

Configure ports so that their traffic can be analyzed on the target port which has an analyzer attached.

Mirror Status:

Target Port: Unit:  Port:

Unit	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
Mirrored Port	<input checked="" type="checkbox"/>																									
None	<input checked="" type="radio"/>																									
Rx	<input checked="" type="radio"/>																									
Tx	<input checked="" type="radio"/>																									
Both	<input checked="" type="radio"/>																									

Apply

**Figure 6 - 51. Target Port Selection**

The target port is the port where information will be duplicated and sent for capture and network analysis. This is the port where a network analyzer would be attached to capture packets duplicated from the source port.

Up to 25 entries can be made to the port mirroring table, but it should be noted that a faster port (a 1000 Mbps Gigabit Ethernet port, for example) should not be mirrored to a slower port (one of the 24 100 Mbps Fast Ethernet port), because many packets will be dropped.

The following fields can be set:

Parameter	Description
<b>Source Port</b>	Allows the entry of the port number of the port to be mirrored. This port is the source of the packets to be duplicated and forwarded to the Target port.
<b>Direction &lt;Ingress&gt;</b>	This field can be toggled between <i>Either</i> , <i>Ingress</i> and <i>Egress</i> . <i>Ingress</i> mirrors only received packets, while <i>Egress</i> mirrors only transmitted packets.

# Forwarding and Filtering

## MAC Address Aging Time

The **MAC Address Aging Time** 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 Aging Time can be set to any value between **300** and **1,000,000** seconds.

*To configure the MAC Address Aging Time, click on the Forwarding folder and then the MAC Forwarding folder, then click on the MAC Address Aging Time link:*

MAC Address Aging Time

Set the time limit for how long a learned MAC address can remain in the table without being accessed.

MAC Address Aging Time (300 - 1000000 sec)

Apply

Figure 6 - 52. MAC Address Aging Time

## Unicast MAC Address Forwarding

MAC addresses can be statically entered into the Switch's MAC Address Forwarding Table. These addresses will never age out.

*To enter a MAC address into the Switch's forwarding table, click on the Forwarding folder and then the MAC Forwarding folder and then click the Unicast MAC Address Setting:*

Unicast MAC Address Settings

Configure how specific unicast MAC addresses are forwarded.

Total Entries: 1

New Edit Delete

	MAC Address	VLAN Name	Unit	Port	Type
<input checked="" type="radio"/>	aa-bb-cc-dd-ee-ff	default	1	1	Static

Figure 6 - 53. Unicast MAC Address Settings

To add a new MAC address to the MAC Address Forwarding Table, click the New button:

Unicast MAC Address Settings - Add	
MAC Address	<input type="text"/>
VLAN Name	<input type="text"/>
Type	Static <input type="button" value="▼"/>
Unit	1 <input type="button" value="▼"/>
Port	1 <input type="button" value="▼"/>

Figure 6 - 54. Unicast MAC Address Settings – Add

To edit an existing entry in the MAC address in the MAC Address Forwarding Table, click the Edit button:

Unicast MAC Address Settings - Edit	
MAC Address	aa-bb-cc-dd-ee-ff
VLAN Name	default
Type	Static <input type="button" value="▼"/>
Unit	1 <input type="button" value="▼"/>
Port	1 <input type="button" value="▼"/>

Figure 6 - 55. Unicast MAC Address Settings – Edit

The following fields can be set:

Parameter	Description
<b>MAC Address</b>	Allows the entry of the MAC address of an end station that will be entered into the Switch's static forwarding table when adding a new entry. Displays the currently selected MAC address when editing.
<b>VLAN Name</b>	Allows the entry of the VLAN Name of the VLAN the MAC address below is a member of – when editing. Displays the VLAN the currently selected MAC address is a member of – when editing an existing entry.
<b>Unit</b>	Allows the selection of a given Switch from a Switch stack – if you have the optional stacking module installed and have properly interconnected the Switches in a Switch stack.
<b>Port</b>	Allows the entry of the port number on which the MAC address entered above resides.

## Multicast MAC Address Forwarding

Multicast MAC addresses can be statically entered into the Switch's MAC Address Forwarding Table. These addresses will never age out.

**To enter a Multicast MAC address into the Switch's forwarding table, click on the Forwarding folder and then the MAC Forwarding folder and then click on the Multicast MAC Address Settings link:**

The screenshot shows a table with the following data:

MAC Address	VLAN Name	Port Map
01-00-5e-ff-dd-cc	default	Unit 1 -----

**Figure 6 - 56. Multicast MAC Address Settings**

**To add a new multicast MAC address to the Switch's forwarding table, click the New button:**

The screenshot shows a form with the following fields:

MAC Address	01-00-5e-ff-dd-cc																																																																																																						
VLAN Name	default																																																																																																						
Unit	1																																																																																																						
State	<table border="1"> <tr> <td>Port</td> <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> <td>26</td> </tr> <tr> <td>None</td> <td><input checked="" type="radio"/></td> </tr> <tr> <td>Egress</td> <td><input type="radio"/></td> </tr> <tr> <td>Forbidden</td> <td><input type="radio"/></td> </tr> </table>	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	None	<input checked="" type="radio"/>	Egress	<input type="radio"/>	Forbidden	<input type="radio"/>																																																																					
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																																																																													
None	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" 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"/>																																																																															
Forbidden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																																																																															

**Figure 6 - 57. Multicast MAC Address Settings – Add**

**To edit an existing entry to the Switch's forwarding table, click the entry's corresponding click-box and then click the edit button:**

The screenshot shows a form with the following fields:

MAC Address	01-00-5e-ff-dd-cc																																																																																																						
VLAN Name	default																																																																																																						
Unit	1																																																																																																						
State	<table border="1"> <tr> <td>Port</td> <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> <td>26</td> </tr> <tr> <td>None</td> <td><input checked="" type="radio"/></td> </tr> <tr> <td>Egress</td> <td><input type="radio"/></td> </tr> <tr> <td>Forbidden</td> <td><input type="radio"/></td> </tr> </table>	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	None	<input checked="" type="radio"/>	Egress	<input type="radio"/>	Forbidden	<input type="radio"/>																																																																					
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																																																																													
None	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" 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"/>																																																																															
Forbidden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																																																																															

**Figure 6 - 58. Multicast MAC Address Settings – Edit**

The following fields can be set:

Parameter	Description
<b>MAC Address:[ ]</b>	Allows the entry of the MAC address of an end station that will be entered into the Switch's static forwarding table.
<b>VLAN Name</b>	Allows the entry of the VLAN name of the VLAN the MAC address below is a member of – when adding a new entry to the table. Displays the VLAN name of the VLAN the MAC address is a member of – when editing an existing entry.
<b>Port: [ ]</b>	Allows the entry of the port number on which the MAC address entered above resides.
<b>None</b>	Specifies the port as being none.
<b>Egress</b>	Specifies the port as being a source of multicast packets originating from the MAC address specified above.
<b>Forbidden</b>	Forbidden Non-Member - specifies the port as not being a member of the VLAN and that the port is forbidden from becoming a member of the VLAN dynamically.

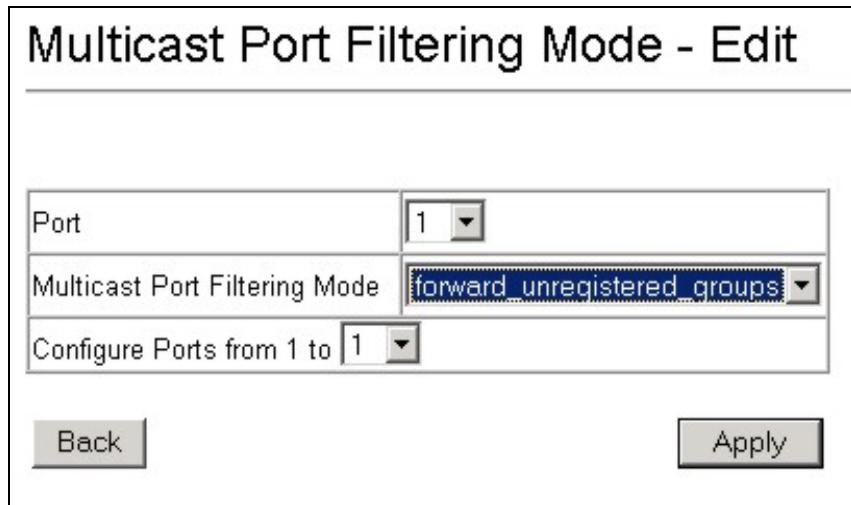
## Multicast Port Filtering

This command configures the multicast filtering and forwarding for specified ports.

Multicast Port Filtering Mode	
	Edit
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
15	forward_unregistered_groups
16	forward_unregistered_groups
17	forward_unregistered_groups
18	forward_unregistered_groups
19	forward_unregistered_groups
20	forward_unregistered_groups
21	forward_unregistered_groups
22	forward_unregistered_groups
23	forward_unregistered_groups
24	forward_unregistered_groups
25	forward_unregistered_groups
26	forward_unregistered_groups

Click the selection button on the far left that corresponds to the port you want to configure and click the Edit button. This will open the following dialog box:

**Figure 6 - 59. Multicast Port Filtering**



**Figure 6 - 60. Edit Multicast Port Filtering**

To configure Multicast Port Filtering, select the ports from the Port List. Click the Apply button to add the ports to the forward list.

Parameter	Description
Port	Select the port number to configure.
forward_all_groups	Forward all multicast packets, i.e. no filtering takes places since multicast packets from unregistered and registered multicast groups are forwarded in the specified port group.
forward_unregistered_groups	Forward only multicast packets from unregistered multicast groups. Multicast packets from registered groups are dropped.
filter_unregistered_groups	Filter all multicast packets from unregistered multicast groups. Multicast packets from registered groups are forwarded.
Configure Ports from __ to __	Use this to specify a consecutively numbered group of ports on the Switch for configuration.

## Broadcast/Multicast Storm Control

Broadcast and Multicast storms consist of broadcast or multicast packets that flood and/or are looped on a network causing noticeable performance degradation and, in extreme cases, network failure.

The DES-3226S allows some control over broadcast/multicast storms by setting thresholds on the number of broadcast/multicast packets received (in thousands of packets per second or Kpps), and then following a user-specified course of action when this threshold is exceeded.

### To configure Broadcast/Multicast storm control:

Click on the **Forwarding** folder, and then on the **MAC Forwarding** folder, and finally on the **Broadcast/Multicast Storm Control** link:

	Upper Threshold (Kpps)	Broadcast Storm Mode	Multicast Storm Mode	Destination Lookup Fail
<b>Group 1 [1-8]</b>	128	Disabled	Disabled	Disabled
<b>Group 2 [9-16]</b>	128	Disabled	Disabled	Disabled
<b>Group 3 [17-24]</b>	128	Disabled	Disabled	Disabled
<b>Group 4 [25]</b>	128	Disabled	Disabled	Disabled
<b>Group 5 [26]</b>	128	Disabled	Disabled	Disabled

**Apply**

**Figure 6 - 61. Broadcast/Multicast Storm Control**

Broadcast/Multicast storm control is applied to groups of ports on the DES-3226S. **Group 1** contains ports 1 through 8. **Group 2** contains ports 9 through 16. **Group 3** contains ports 17 through 24. **Group 4** and **Group 5** contain the ports on the optional plug-in module.

The **Upper Threshold (Kpps)** sets the rate of broadcast or multicast packets received on any of the ports in the corresponding port group that will trigger the action to be taken by the Switch, as detailed below. A range of thousands of packets received per second (Kpps) between 0 and 255 can be specified.

When any one of the ports contained within a given port group receives more broadcast or multicast packets per second than is specified in the **Upper Threshold (Kpps)** field, the Switch will take the actions specified in the **Broadcast Storm Mode**, **Multicast Storm Mode**, and the **Destination Lookup Fail** pull-down menus.

The **Broadcast Storm Mode** is **Enabled** or **Disabled** using the pull-down menu for the corresponding port group. When the **Broadcast Storm Mode** is enabled, and a port contained within the corresponding port group receives more broadcast packets than specified in the **Upper Threshold (Kpps)** field, the Switch will drop all broadcast packets received by any port in the port group until the rate of broadcast packets received by the port group falls.

The **Multicast Storm Mode** is **Enabled** or **Disabled** using the pull-down menu for the corresponding port group. When the **Multicast Storm Mode** is enabled, and a port contained within the corresponding port group receives more multicast packets than specified in the **Upper Threshold (Kpps)** field, the Switch will drop all multicast packets received by any port in the port group until the rate of multicast packets received by the port group falls.

The **Destination Lookup Fail** is **Enabled** or **Disabled** using the pull-down menu for the corresponding port group. When the **Destination Lookup Fail** is enabled, and a port contained within the corresponding port group receives more destination lookup failed packets than specified in the **Upper Threshold (Kpps)** field, the Switch will drop all destination lookup failed packets received by any port in the port group until the rate of destination lookup failed packets received by the port group falls.

# Spanning Tree

The Switch supports 802.1d Spanning Tree Protocol (STP) and 802.1w Rapid Spanning Tree Protocol (RSTP). RSTP is compatible with 802.1d STP however the advantages of rapid network convergence is lost if the Switch is connect to a segment that cannot support RSTP.

## STP Switch Settings

Spanning Tree Protocol operates on two levels: on the Switch level, the settings are globally implemented. On the port level, the settings are implemented on a per user-defined Group of ports basis.

Status	<input type="button" value="Disabled"/>
Max Age (6 - 40 sec)	20
Hello Time (1 - 10 sec)	2
Forward Delay (4 - 30 sec)	15
Priority (0 - 61440)	32768
STP Version	<input type="button" value="RSTP"/>
TX Hold Count (1 - 10)	3
Forwarding BPDU	<input type="button" value="Enabled"/>
<input type="button" value="Apply"/>	

Figure 6 - 62. STP Switch Settings

Configure the following parameters and click the Apply button to implement them:

Parameter	Description
Status <Disabled>	This field can be toggled between <i>Enabled</i> and <i>Disabled</i> using the pull-down menu. This will enable or disable the Spanning Tree Protocol (STP), globally, for the Switch.
Max Age: (6 - 40 sec) <20>	The Max. Age can be set from 6 to 40 seconds. At the end of the Max. Age, if a BPDU has still not been received from the Root Bridge, your Switch will start sending its own BPDU to all other Switches for permission to become the Root Bridge. If it turns out that your Switch has the lowest Bridge Identifier, it will become the Root Bridge.
Hello Time: (1 - 10 sec) <2>	The Hello Time can be set from 1 to 10 seconds. This is the interval between two transmissions of BPDU packets sent by the Root Bridge to tell all other Switches that it is indeed the Root Bridge.
Forward Delay: (4 - 30 sec) <15>	The Forward Delay can be from 4 to 30 seconds. This is the time any port on the Switch spends in the listening state while moving from the blocking state to the forwarding state.
Priority: (0 - 61440) <32768>	A Priority for the Switch can be set from 0 to 61440. This number is used in the voting process between Switches on the network to determine which Switch will be the root Switch. A low number indicates a high priority, and a high probability that this Switch will be elected as the root Switch.
STP Version <RSTP>	Choose RSTP (default) or STP Compatibility. Both versions use STP parameters in the same way. RSTP is fully compatible with IEEE 802.1d STP and will function with legacy equipment.
Tx Hold Count <3>	This is the maximum number of Hello packets transmitted per interval. The count can be specified from 1 to 10. Default value = 3.
Forwarding BPDU <Enabled>	This can enabled or disabled. When it is enabled it allows the forwarding of STP BPDU packets from other network devices when STP is disabled on the Switch. The default is enabled.



**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:

$$\text{Max. Age} \leq 2 \times (\text{Forward Delay} - 1 \text{ second})$$

$$\text{Max. Age} \geq 2 \times (\text{Hello Time} + 1 \text{ second})$$

## STP Port Settings

For stacked Switch installations, first select the Unit to be configured.

STP Port Settings								
<input type="button" value="Edit"/>								
Port	State	Cost	Priority	Edge	P2P	Status	Role	
○ 1	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 2	Enabled	*200000	128	No	Yes	Forwarding	NonStp	
○ 3	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 4	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 5	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 6	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 7	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 8	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 9	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 10	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 11	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 12	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 13	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 14	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 15	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 16	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 17	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 18	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 19	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 20	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 21	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 22	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 23	Enabled	*200000	128	No	Yes	Forwarding	NonStp	
○ 24	Enabled	*200000	128	No	Yes	Forwarding	NonStp	
○ 25	Enabled	*200000	128	No	Yes	Disabled	Disabled	
○ 26	Enabled	*200000	128	No	Yes	Disabled	Disabled	

**Figure 6 - 64. STP Port Settings**

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 on the basis of 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.

STP Port Settings - Edit		
Port	2	
State	Enabled	
Cost	200000	<input checked="" type="checkbox"/> Auto
Priority	128	
Migration	No	
Edge	No	
P2P	Yes	
Configure Ports from 2 to	1	
<input type="button" value="Back"/>	<input type="button" value="Apply"/>	

**Figure 6 - 63. Edit STP Port Settings**

The STP on the Switch level blocks redundant links between Switches (and similar network devices). The port level STP will block redundant links within an STP Group.

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

The following fields can be set:

Parameter	Description
<b>Cost</b>	A Port Cost can be set from 1 to 200000000. The lower the number, the greater the probability the port will be chosen to forward packets.  Default port cost: 100Mbps port = 200000 Gigabit ports = 20000
<b>Priority &lt;128&gt;</b>	A Port Priority can be from 0 to 240. The lower the number, the greater the probability the port will be chosen as the Root Port.
<b>Migration &lt;No&gt;</b>	Select Yes or No. Choosing Yes will enable the port to migrate from 802.1d STP status to 802.1w RSTP status. RSTP can coexist with standard STP, however the benefits of RSTP are not realized on a port where an 802.1d network connects to an 802.1w enabled network. Migration should be enabled (yes) on ports connected to network stations or segments that will be upgraded to 802.1w RSTP on all or some portion of the segment.
<b>Edge &lt;No&gt;</b>	Select True or False. Choosing true 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. False indicates the port does not have edge port status.
<b>P2P &lt;Yes&gt;</b>	Select True or False. Choosing true indicates a point-to-point (p2p) shared link. These 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.
<b>Configure Ports from __ to __</b>	A consecutive group of ports may be configured starting with the selected port.

## MAC Notification

MAC address notification is used to monitor MAC addresses learned and entered into the forwarding database.

### Global Settings

MAC Notification Global Settings	
State	Disabled
Interval (sec)	1
History Size	1
Apply	

**Figure 6 - 65. MAC Notification Global Settings**

Configure the following MAC notification global settings:

Parameter	Description
<b>State</b>	Enable or Disable MAC notification Switch-wide from the pull-down menu.
<b>Interval</b>	This is the time in seconds between notifications.
<b>History Size</b>	This is maximum number of entries listed in the history log used for notification. Up to 500 entries can be specified.

### MAC Notification Port Settings

Enable or disable MAC notification for ports with the menu below.

MAC Notification Port Settings	
<b>Edit</b>	
Port	State
1	Disabled
2	Disabled
3	Disabled
4	Disabled
5	Disabled
6	Disabled
7	Disabled
8	Disabled
9	Disabled
10	Disabled
11	Disabled
12	Disabled
13	Disabled
14	Disabled
15	Disabled
16	Disabled

**Figure 6 - 66. MAC Notification Port Settings**

To change MAC Notification settings for a port or a group of ports on the same Switch, select the first (lowest numbered) port from the list and click the Edit button, a separate menu will appear.

MAC Notification Port Settings - Edit	
Port	<input type="button" value="1"/>
State	<input type="button" value="Disabled"/>
Configure Ports from 1 to	<input type="button" value="1"/>
<input type="button" value="Back"/>	<input type="button" value="Apply"/>

**Figure 6 - 67. MAC Notification Port Settings - Edit**

Configure the following MAC notification global settings:

Parameter	Description
Port	Select the port or lowest number of the group of ports being configured.
State	Enable or Disable MAC notification for the port from the pull-down menu.
Configure Ports from __ to __	A consecutive group of ports may be configured starting with the selected port.

## Link Aggregation

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.

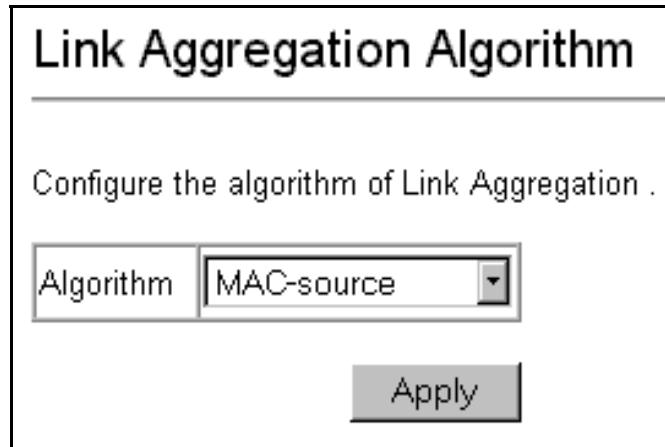
Link aggregation is most commonly used to link a bandwidth intensive network device or devices – such as a server – to the backbone of a network.

The Switch allows the creation of up to 6 link aggregation groups, each group consisting of up of up 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. A link aggregation group may not cross an 8-port boundary, starting with port 1 (a group may not contain ports 8 and 9, for example) and all of the ports in the group must be members of the same VLAN. Further, the aggregated links must all be of the same speed and should be configured as full-duplex.

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



**Figure 6 - 68. Link Aggregation Algorithm – Selection**

**Mac\_source** – Indicates that the Switch should examine the MAC source address.

**Mac\_destination** – Indicates that the Switch should examine the MAC destination address.

**Mac\_source\_dest** – Indicates that the Switch should examine the MAC source and destination addresses.

**IP\_source** – Indicates that the Switch should examine the IP source address.

**IP\_destination** – Indicates that the Switch should examine the IP destination address.

**IP\_source\_dest** – Indicates that the Switch should examine the IP source and destination addresses.

*To configure a link aggregation group, click on the Link Aggregation link from the Advanced Setup folder:*

Link Aggregation								
Group several ports together so that they can act as a single port.								
<input type="button" value="New"/> <input type="button" value="Edit"/> <input type="button" value="Delete"/>								
	Group ID	Type	Master Port	Port Members 1 to 8 9 to 16 17 to 24 25 26	Active Members 1 to 8 9 to 16 17 to 24 25 26	Status	Flooding Port	
<input type="radio"/>	1	LACP	Port 11	----- *----- ----- - -	----- ----- ----- - -	Enabled	-	
<input type="radio"/>	2	LACP	Port 1	*----- ----- *----- ----- - -	----- ----- ----- - -	Enabled	-	

**Figure 6 - 69. Link Aggregation**

*To add a new multicast MAC address to the Switch's forwarding table, click the New button:*

**Link Aggregation**

Group ID	2
Type	LACP
Master Port	Port: 1
Status	Enabled
Port	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Member	<input type="checkbox"/>

**Back** **Apply**

**Figure 6 - 70. Link Aggregation – New**

To edit an existing entry to the Switch's forwarding table, click the entry's corresponding click-box and then click the edit button:

**Link Aggregation**

Group ID	2
Type	LACP
Master Port	Port: 1
Status	Enabled
Port	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Member	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>

**Back** **Apply**

**Figure 6 - 71. Link Aggregation – Edit**

The following fields can be set:

Parameter	Description
<b>Group ID</b>	Allows the entry of a number used to identify the link aggregation group – when adding a new group. Displays the Group ID of the currently selected link aggregation group – when editing an existing entry.
<b>Type</b>	Select the type of link aggregation used for the group. If type is not specified the default type is Static. Aggregated ports may be either LACP or Static. LACP indicates the port group as LACP compliant so they can be connected to a n LACP compliant device. Static trunk groups are not able to adjust dynamically and both devices connected to the static trunk group must be manually configured if the composition of the group is changed.
<b>Master Port &lt;1&gt;</b>	The Master port of link aggregation group.
<b>Unit</b>	Allows the selection of a particular Switch in a Switch stack, if you have the optional stacking module installed and have properly interconnected the Switches in the Switch stack.
<b>Port Member</b>	Allows the specification of the ports that will make up the link aggregation group.
<b>Status &lt;Disabled&gt;</b>	This field can be toggled between Enabled and Disabled. This is used to turn a link aggregation group on or off. This is useful for diagnostics, to quickly isolate a bandwidth intensive network device or to have an absolute backup link aggregation group that is not under automatic control.

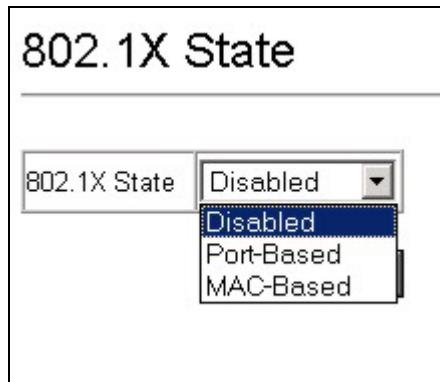
## 802.1X Configuration

The DES-3226S implements the server-side of the IEEE 802.1x Port-based Network Access Control. This mechanism is intended to allow only authorized users, or other network devices, access to network resources by establishing criteria for each port on the Switch that a user or network device must meet before allowing that port to forward or receive frames.

IEEE 802.1X operation must be enabled on the Switch before it will function. It will necessary to determine the whether to port-based or MAC-based 802.1x authorization (see below).

### 802.1X State

To use 802.1x on the Switch, choose the type of authorization to use and click the Apply button.



**Figure 6 - 72. 802.1X State**

Port-based Authorization means that ports configured for 802.1x function (see 802.1X Port Settings) are initialized based on the port number only and subject to any authorization parameters as configured.

MAC-based Authorization means that ports configured for 802.1x function (see 802.1X Port Settings) are initialized based on port number and MAC address, then subject to any authorization parameters configured. Additional configuration is required to list the MAC address in the authorization list and to specify the port from which request is made (see Initialize Ports below).

### 802.1X Port Settings

Existing 802.1X port settings are displayed and can be con figured using the menu below.

802.1X Port Settings														
802.1X State: Disabled														
Edit														
Port	Capability	Port Status	Pae State	Backend State	AdminCtrlDir	OperCtrlDir	Port Control	QuietPeriod (sec)	TxPeriod (sec)	SuppTimeout (sec)	ServerTimeout (sec)	MaxReq	ReAuthPeriod (sec)	ReAuthenticate
C 1	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 2	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 3	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 4	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 5	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 6	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 7	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 8	Authenticator	Authorized	Force_Authorized	Success	Both	Both	Force_Authorized	60	30	30	30	2	3600	Disabled
C 9	None	Authorized	Force_Authorized	Success	Both	Both	Force_Unauthorized	60	30	30	30	2	3600	Disabled
C 10	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 11	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 12	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 13	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 14	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 15	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 16	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 17	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 18	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 19	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 20	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 21	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 22	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 23	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 24	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 25	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled
C 26	None	Authorized	Force_Authorized	Success	Both	Both	Auto	60	30	30	30	2	3600	Disabled

**Figure 6 - 73. 802.1X Port Settings**

Click the selection button on the far left that corresponds to the port you want to configure and click the Edit button, a separate menu will appear.

Parameter	Description
<b>Port status</b>	Lists the current status of port, Authorized or Unauthorized.
<b>PAE State</b>	Displays the administrative control over the port's authorization status. Force Authorized forces the Authenticator of the port to become Authorized. Force Unauthorized forces the port to become Unauthorized.
<b>Backend State</b>	Shows the current state of the Backend Authenticator.
<b>OperCtlState</b>	This displays whether a controlled Port that is unauthorized will exert control over communication in both receiving and transmitting directions, or just the receiving direction.

**802.1X Port Settings - Edit**

Port	1
AdminCrlDir	Both
Port Control	Auto
TxPeriod (sec)	30
QuietPeriod (sec)	60
SuppTimeout (sec)	30
ServerTimeout (sec)	30
MaxReq	2
ReAuthPeriod (sec)	3600
ReAuthenticate	Disabled
Configure Ports from 1 to	
<input type="button" value="Back"/> <input type="button" value="Apply"/>	

**Figure 6 - 74. 802.1X Port Settings – Edit**

Configure the following 802.1x port settings:

Parameter	Description
<b>Port</b>	Port being configured for 802.1x settings.
<b>AdminCtlDir</b>	From the pull-down menu, select whether a controlled Port that is unauthorized will exert control over communication in both receiving and transmitting directions, or just the receiving direction.
<b>Port Control</b>	From the pull-down menu, select Force Authorized, Force Unauthorized or Auto – Force Authorized forces the Authenticator of the port to become Authorized. Force Unauthorized forces the port to become Unauthorized.
<b>Quiet Period</b>	Select the time interval between authentication failure and the start of a new authentication attempt.
<b>Tx Period</b>	Select the time to wait for a response from a supplicant (user) to send EAP Request/Identity packets.
<b>Support Timeout</b>	Select the time to wait for a response from a supplicant (user) for all EAP packets, except for the Request/Identity packets.
<b>Server Timeout</b>	Select the length of time to wait for a response from a Radius server.
<b>MaxReq</b>	Select the maximum number of times to retry sending packets to the supplicant.
<b>ReAuthPeriod</b>	Select the time interval between successive re-authentications.
<b>ReAuthenticate</b>	Enable or disable reauthentication.

## Port Capability

802.1X Port Capability Setting																																																																													
802.1X State		MAC-Based																																																																											
Authentication Protocol		Radius_EAP																																																																											
<input type="button" value="Edit"/> <table border="1"> <thead> <tr> <th></th> <th>Port</th> <th>Capability</th> </tr> </thead> <tbody> <tr><td><input type="radio"/></td><td>1</td><td>Authenticator</td></tr> <tr><td><input checked="" type="radio"/></td><td>2</td><td>Authenticator</td></tr> <tr><td><input type="radio"/></td><td>3</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>4</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>5</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>6</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>7</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>8</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>9</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>10</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>11</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>12</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>15</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>16</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>17</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>18</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>19</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>20</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>21</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>22</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>23</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>24</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>25</td><td>None</td></tr> <tr><td><input type="radio"/></td><td>26</td><td>None</td></tr> </tbody> </table>				Port	Capability	<input type="radio"/>	1	Authenticator	<input checked="" type="radio"/>	2	Authenticator	<input type="radio"/>	3	None	<input type="radio"/>	4	None	<input type="radio"/>	5	None	<input type="radio"/>	6	None	<input type="radio"/>	7	None	<input type="radio"/>	8	None	<input type="radio"/>	9	None	<input type="radio"/>	10	None	<input type="radio"/>	11	None	<input type="radio"/>	12	None	<input type="radio"/>	15	None	<input type="radio"/>	16	None	<input type="radio"/>	17	None	<input type="radio"/>	18	None	<input type="radio"/>	19	None	<input type="radio"/>	20	None	<input type="radio"/>	21	None	<input type="radio"/>	22	None	<input type="radio"/>	23	None	<input type="radio"/>	24	None	<input type="radio"/>	25	None	<input type="radio"/>	26	None
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<input type="button" value="Next"/>																																																																													

Click the selection button on the far left that corresponds to the port you want to configure and click the Next button. This will open the Port Capability Settings - Edit menu.

802.1X Port Capability Setting - Edit		
Port	<input type="button" value="1"/>	
Capability	<input type="button" value="Authenticator"/>	
Configure Ports from 1 to	<input type="button" value="1"/>	
<input type="button" value="Back"/> <input type="button" value="Apply"/>		

**Figure 6 - 75. 802.1x Port Capability Settings – Edit**

## Figure 6 - 76. 802.1x Port Capability Settings

To configure 802.1x Port Capability for a port, select the port to be configured and determine the (802.1x) port capability. Click the Apply button to configure the capability.

Parameter	Description
<b>Port</b>	Select the port or lowest number of the group of ports being configured.
<b>Capability</b>	Select the following: Authenticator – A user must pass the authentication process to gain access to the network. None – The port is not controlled by the 802.1x functions.
<b>Configure Ports from __ to __</b>	A consecutive group of ports may be configured starting with the selected port.

## Initialize Ports

Use this to initialize the 802.1x functions on a specified ports or for specified MAC addresses operating from a specified range of ports.

The dialog box is titled "Initialize Port(s)". It contains three input fields: "Port" set to 1, "Configure Ports from 1 to" set to 1, and "MAC Address" containing the value 00:00:00:00:00:00. An "Apply" button is at the bottom right.

**Figure 6 - 77. Initialize Ports**

Parameter	Description
<b>Port</b>	Select the port or lowest number of the group of ports being configured.
<b>Configure Ports from __ to __</b>	A consecutive group of ports may be configured starting with the selected port.
<b>MAC Address</b>	Specify the MAC address to add to the list for MAC based 802.1x initialization. Click the option box to insert a check mark before typing in the MAC address. This option can only be used if the authorization is MAC-based (see 802.1 State).

## Re-Authenticate Ports

802.1x ports must be periodically re-authenticated (when the re-authentication period lapses). Use this menu to determine if previously authenticated devices are re-authenticated based on either MAC address or port number.

The dialog box is titled "Reauthenticate Port(s)". It contains three input fields: "Port" set to 1, "Configure Ports from 1 to" set to 1, and "MAC Address" containing the value 00:00:00:00:00:00. An "Apply" button is at the bottom right.

**Figure 6 - 78. Reauthenticate Ports**

Parameter	Description
<b>Port</b>	Select the port or lowest number of the group of ports being configured.
<b>Configure Ports from __ to __</b>	A consecutive group of ports may be configured starting with the selected port.
<b>MAC Address</b>	Specify the MAC address to add to the list for re-authentication. Click the option box to insert a check mark before typing in the MAC address. This option can only be used if the authorization is MAC-based (see 802.1 State).

## Radius Server Settings

Use this menu to configure the settings the Switch will use to communicate with a Radius server. To add Radius server settings click the New button, a separate configuration menu appears. To edit an existing Radius settings index, select it and click the edit button

The screenshot shows a table titled "Radius Server Settings" with the following data:

	Index	IP Address	Key	AuthPortNumber	AcctPortNumber	Status
<input checked="" type="radio"/>	1	168.72.12.1	fy22lw67	1812	1813	Active

Total Entries: 1

New | Edit | Delete

**Figure 6 - 79. Radius Server Settings**

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

The screenshot shows the "Radius Server Settings - Add" form with the following fields:

Index	<input type="text" value="1"/>
IP Address	<input type="text" value="0.0.0.0"/>
Key	<input type="text"/>
AuthPortNumber	<input type="text" value="1812"/>
AcctPortNumber	<input type="text" value="1813"/>

Back | Apply

**Figure 6 - 80. Radius Server – Add New**

The screenshot shows the "Radius Server Settings - Edit" form with the following fields (values correspond to the entry in Figure 6-79):

Index	<input type="text" value="1"/>
IP Address	<input type="text" value="168.72.12.1"/>
Key	<input type="text" value="fy22lw67"/>
AuthPortNumber	<input type="text" value="1812"/>
AcctPortNumber	<input type="text" value="1813"/>

Back | Apply

**Figure 6 - 81. Edit Radius Server Settings**

Configure the following Radius server settings:

Parameter	Description
<b>Index</b>	Radius server settings index.
<b>IP Address</b>	Type in the IP address of the Radius server.
<b>Key</b>	Type the shared-secret key used by the Radius server and the Switch. Up to 32 characters can be used.
<b>AuthPortNumber</b>	Type the UDP port number for authentication requests. The default is 1812.
<b>AcctPortNumber</b>	Type the UDP port number for accounting requests (if accounting server is being used). The default is 1813.

## Access Profile Mask

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

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

Access Profile Mask Setting			
Total Entries: 3			
<input type="button" value="New"/> <input type="button" value="Edit Rule"/> <input type="button" value="Delete"/>			
Profile ID	Access Profile	Access Profile Mask	
<input type="radio"/> 10	IP	vlan / source_ip_mask 255.255.255.128 / destination_ip_mask 255.255.255.0 /	permit
<input type="radio"/> 60	Ethernet	802.1p /	permit
<input type="radio"/> 100	IP	dscp /	permit

Figure 6 - 82. Access Profile Mask Setting Table

Profile ID	<input type="text"/>	<input checked="" type="checkbox"/> Auto Assign
Access Profile	<input type="button" value="Ethernet"/>	
<input type="checkbox"/> VLAN		
<input type="checkbox"/> Source MAC Mask	<input type="text"/>	
<input type="checkbox"/> Destination MAC Mask	<input type="text"/>	
<input type="checkbox"/> 802.1p		
<input type="checkbox"/> Ethernet Type		
<input type="checkbox"/> permit	<input type="checkbox"/> deny	
<input type="button" value="Back"/>		<input type="button" value="Apply"/>

Figure 6 - 83. MAC Address Access Profile Mask Setting – Add

### To create an Access Profile Mask:

Click the New button in the Access Profile Mask Setting summary table page. A new menu is displayed. Use this to create an access profile and specify what criteria are used to examine frames. Once the profile has been created you can set up the rule applied to the profile as described later in this section.

Access Profile Mask Setting - Add			
Profile ID	<input type="text"/>	<input checked="" type="checkbox"/> Auto Assign	
Access Profile	<input type="button" value="IP"/>		
<input type="checkbox"/> VLAN			
<input type="checkbox"/> Source IP Mask	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Destination IP Mask	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> DSAC			
<input type="checkbox"/> Protocol	<input type="radio"/> ICMP: <input type="checkbox"/> Type <input type="checkbox"/> Code <input type="radio"/> IGMP: <input type="checkbox"/> Type <input type="radio"/> TCP: <input type="checkbox"/> Source Port Mask Ox <input type="text"/> <input type="checkbox"/> Destination Port Mask Ox <input type="text"/> <input type="radio"/> UDP: <input type="checkbox"/> Source Port Mask Ox <input type="text"/> <input type="checkbox"/> Destination Port Mask Ox <input type="text"/> <input type="radio"/> Protocol ID: <input type="checkbox"/> User Mask Ox <input type="text"/>		
<input type="checkbox"/> permit <input type="checkbox"/> deny			
<input type="button" value="Back"/>		<input type="button" value="Apply"/>	

Figure 6 - 84. IP Address Access Profile Mask – Add

Configure the following Access Profile Mask settings:

Parameter	Description
<b>Profile ID</b>	Type in a unique identifier number for this profile set or allow an ID to be automatically assigned by checking the Auto Assign option. This value can be set from 1 – 255.
<b>Access Profile</b>	Select profile based on Ethernet (MAC Address) or IP address. This will change the menu according to the requirements for the type of profile. Select Ethernet to instruct the Switch to examine the layer 2 part of each packet header. Select IP to instruct the Switch to examine the IP address in each frame's header.
<b>VLAN</b>	Selecting this option instructs the Switch to examine the VLAN part of each packet header and use this as the, or part of the criterion for forwarding.
<b>Source MAC/IP Mask</b>	Source MAC Mask - Enter a MAC address mask for the source MAC address. Source IP Mask - Enter an IP address mask for the source IP address.
<b>Destination MAC/IP Mask</b>	Destination MAC Mask - Enter a MAC address mask for the destination MAC address. Destination IP Mask - Enter an IP 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>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>Ethernet Type (for Ethernet Access Profiles only)</b>	Selecting this option instructs the Switch to examine the Ethernet type value in each frame's header.
<b>Protocol (for IP address Access Profiles only)</b>	Selecting this option instructs the Switch to examine the protocol type value in each frame's header. You must then specify what protocol(s) to include according to the following guidelines:  Select ICMP to instruct the Switch to examine the Internet Control Message Protocol (ICMP) field in each frame's header. Select Type to further specify that the access profile will apply an ICMP type value, or specify Code to further specify that the access profile will apply an ICMP cod value. Select IGMP to instruct the Switch to examine the Internet Group Management Protocol (IGMP) field in each frame's header. Select Type to further specify that the access profile will apply an IGMP type value Select TCP to use the TCP port number contained in an incoming packet as the forwarding criterion. Selecting TCP requires that you specify a source port mask and/or a destination port mask. Source Port Mask Ox - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff). Destination Port Mask Ox - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff). 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. Source Port Mask Ox - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff). Destination Port Mask Ox - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff).  <b>Permit/Deny</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.

**To establish the rule for a previously created Access Profile Mask:**

Select the Access Profile from the Access Profile Mask Setting Table and click the Edit Rule button.

Profile ID	10
Access Profile	IP
Access Profile Mask	
	permit

Total Entries: 0

New    Delete

Access Rule ID    Access Profile    Access Profile Rule    Priority    Replace DSCP

**Figure 6 - 85. Access Profile Rule Setting**

To create a new rule set for the access profile click the New button. A new menu is displayed. To remove a previously created rule, select it and click the Delete button.

Profile ID	60
Access Rule ID	
Access Profile	IP
<input type="checkbox"/> priority	<input type="checkbox"/> replace_priority
<input type="checkbox"/> replace_dscp	

Back    Apply

**Figure 6 - 86. Add Access Profile Rule**

Configure the following Access Profile Rule settings:

Parameter	Description
<b>Profile ID</b>	This is the identifier number for this profile set.
<b>Access Rule ID</b>	Type in a unique identifier number for this access. This value can be set from 1 – 255.
<b>priority</b>	Select this option to instruct the Switch to use the 802.1p priority value entered in the adjacent field for packets that meet the criteria. A number between 0 – lowest priority, and 7 – highest priority, can be entered.
<b>replace_priority</b>	Select this option to instruct the Switch to replace the 802.1p value (in a packet that meets the selected criteria). In this way, packets meeting the criteria can have their priority handling modified for use within the Switch, and then have a different priority value assigned when they leave the Switch.
<b>replace_dscp:</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.

## System Log Server

The Switch can send Syslog messages to up to four designated servers.

System Log Server						
Total Entries: 2						
	New	Edit	Delete			
<input type="radio"/> 1	10. 42. 2. 84	All	Local0	514	Enabled	
<input type="radio"/> 2	10. 41. 44. 88	Warning	Local1	514	Enabled	

**Figure 6 - 87. System Log Server list**

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

System Log Server - Add	
Index	<input type="text"/>
Server IP	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
Severity	<input type="button" value="Warning"/>
Facility	<input type="button" value="Local0"/>
UDP Port	<input type="text"/> 514
Status	<input type="button" value="Disabled"/>
<input type="button" value="Back"/>	<input type="button" value="Apply"/>

**Figure 6 - 88. System Log Server – Add menu**

Set the following parameters for Syslog service:

Parameter	Description
<b>Index</b>	Syslog server settings index (1-4).
<b>Server IP</b>	Type in the IP address of the Syslog server receiving the message.
<b>Severity</b>	Select the level of message sent, select: <i>Warning</i> , <i>Information</i> or <i>All</i> .
<b>Facility</b>	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 the Switch supports now. Numerical Facility Code 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 16 local use 0 (local0) 17 local use 1 (local1) 18 local use 2 (local2) 19 local use 3 (local3) 20 local use 4 (local4) 21 local use 5 (local5) 22 local use 6 (local6) 23 local use 7 (local7)
<b>UDP Port</b>	Type the UDP port number used for sending Syslog messages. The default is 514.
<b>Status</b>	Choose Enabled or Disabled to activate or deactivate this

## System Log State

To enable the System Log Server settings you have chosen select *Enabled* and click the Apply button in the System Log State menu.

**System Log State**

---

Enabled or Disabled sending syslog messages on the switch.

System Log State	<input type="button" value="Disabled"/>
<input type="button" value="Apply"/>	

Figure 6 - 89. System Log State menu

## IGMP Snooping Settings

**To configure IGMP Snooping:**

Click **IGMP Snooping Configurations** to open the following dialog box:

**IGMP Snooping Configurations**

Configure Internet Group Management Protocol snooping for an existing VLAN.

**Edit**

VLAN Name	Query Interval	Max Response Time	Robustness Variable	Last Member Query Interval	Querier State
<input checked="" type="radio"/> default	125	10	2	1	Disabled

Querier Setting Behavior	Host Timeout	Host Leave Timer	Route Timeout	State
Non-Querier	260	2	260	Disabled

**Figure 6 - 90. IGMP Snooping Configuration**

**To edit an IGMP Snooping entry on the Switch, select the entry on the IGMP Snooping Configurations screen and then click the edit button:**

**IGMP Snooping Configurations - Edit**

VLAN Name	default
Query Interval (1 - 65535)	125
Max Response (1 - 25)	10
Robustness Variable (1 - 255)	2
Last Member Query Interval (1 - 25)	1
Querier State	Disabled ▾
Host Timeout (1 - 16711450)	260
Host Leave Timer (0 - 16711450)	2
Route Timeout (1 - 16711450)	260
State	Disabled ▾

**Back** **Apply**

**Figure 6 - 91. IGMP Snooping Configuration**

The following fields can be set:

Parameter	Description
<b>VLAN Name</b>	Allows the entry of the name of the VLAN for which IGMP Snooping is to be configured.
<b>Query Interval</b>	Allows the entry of a value between 1 and 65500 seconds, with a default of 125 seconds. This specifies the length of time between sending IGMP queries.
<b>Max Response</b>	Sets the maximum amount of time allowed before sending an IGMP response report. A value between 1 and 25 seconds can be entered, with a default of 10 seconds.
<b>Robustness Variable</b>	A tuning variable to allow for sub-networks that are expected to lose a large number of packets. A value between 2 and 255 can be entered, with larger values being specified for sub-networks that are expected to lose larger numbers of packets.
<b>Last Member Query Interval</b>	Specifies the maximum amount of time between group-specific query messages, including those sent in response to leave group messages. The default is 1 second.
<b>Querier State</b>	This field can be Switched using the pull-down menu between <i>Disabled</i> and <i>Enabled</i> .
<b>Host Timeout</b>	Specifies the maximum amount of time a host can be a member of a multicast group without the Switch receiving a host membership report. The default is 260 seconds.
<b>Host Leave Timer</b>	Specifies the maximum amount of time between the Switch receiving a leave group message from a host, and the Switch issuing a group membership query. If the Switch does not receive a response from the group membership query before the Host Leave Timer expires, the host address is deleted from the Switch's forwarding table. The default is 2 seconds.
<b>Route Timeout</b>	Specifies the maximum amount of time a route will remain in the Switch's forwarding table without receiving a membership report. The default is 260 seconds.
<b>State &lt;Disabled&gt;</b>	This field can be Switched using the pull-down menu between <i>Disabled</i> and <i>Enabled</i> . This is used to enable or disable IGMP Snooping for the specified VLAN.

# Network Monitoring

The DES-3226S provides extensive network monitoring capabilities that can be viewed from the under **Network Monitoring** menu.

## Port Utilization

The **Port Utilization** window shows the percentage of the total available bandwidth being used on the port. Port utilization statistics may be viewed using a line graph or table format.

*To view the port utilization, click on the Network Monitoring folder and then the Statistics folder and then the Port Utilization link:*

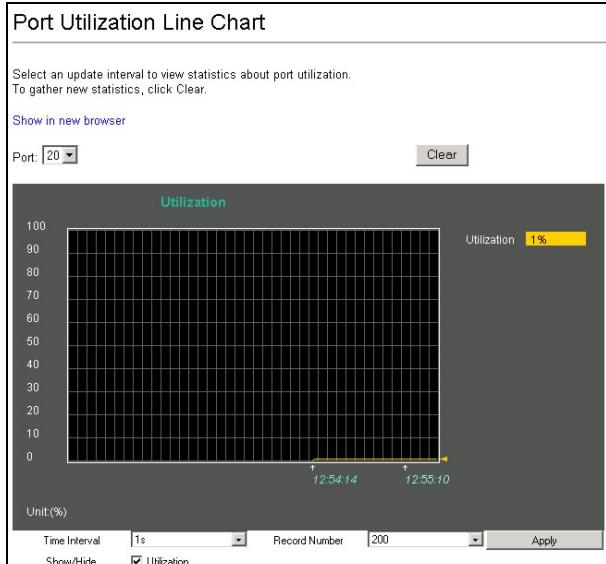


Figure 6 - 92. Port Utilization Line Chart

Port Utilization			
Select an update interval to view statistics about port utilization. To gather new statistics, click Clear.			
Show in new browser			
Unit	1	Refresh Interval	30 seconds
<input type="button" value="Clear"/>			
Port	TX/sec	RX/sec	%Utilization
1	0	0	0
2	0	0	0
3	15	49	1
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
Port	TX/sec	RX/sec	%Utilization
25	0	0	0
26	0	0	0

Figure 6 - 93. Port Utilization Table

Select the desired port by clicking on the front panel display. The **Update Interval** field sets the interval at which the error statistics are updated.

The following field can be set:

Parameter	Description
<b>Update Interval</b> <i>&lt;Suspend&gt;</i>	The time between updates received from the Switch, in seconds. <i>Suspend</i> stops the updates. The default is <i>Suspend</i> .

## Port Error Statistics

The **Port Error Packet Statistics** window displays the packet errors that the Switch can detect and displays the results on a per port basis.

To view the error statistics for a port, click on the **Port Error Packets** link:

**Port Error Packets**

Select a port and an update interval to view statistics about malformed and dropped packets.  
To gather new statistics, click Clear.

[Show in new browser](#)

Unit:  Port:  Interval:

RX Frames		TX Frames	
CRC Error	0	Excessive Deferral	0
Undersize	0	CRC Error	0
Oversize	0	Late Collision	0
Fragment	0	Excessive Collision	0
Jabber	0	Single Collision	0
Drop Packets	0	Collision	0

**Figure 6 - 94. Port Error Packet Statistics window**

Select the desired port by clicking on the front panel display. The **Update Interval** field sets the interval at which the error statistics are updated.

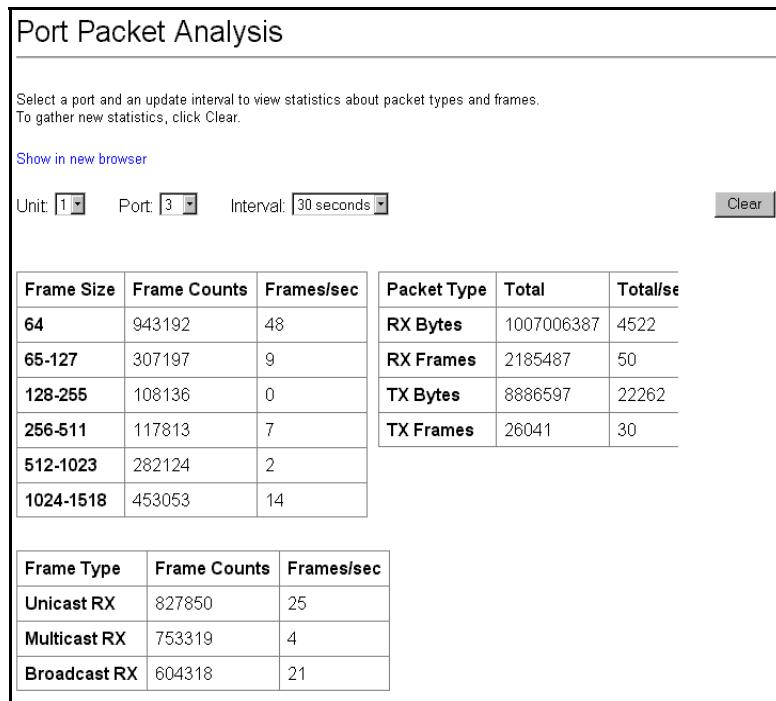
The port error packets fields from above are described below:

Parameter	Description
<b>Unit</b>	Allows the selection of a particular Switch in a Switch stack if you have installed the optional stacking module and have properly interconnected the Switches.
<b>Port</b>	Allows the selection of a particular port on the Switch.
<b>Update Interval &lt;Suspend&gt;</b>	The interval (in seconds) that the table is updated. The default is <i>Suspend</i> .
<b>RX Frames</b>	Received packets.
<b>CRC Error</b>	For 10 Mbps ports, the counter records CRC errors (FCS or alignment errors). For 100 Mbps ports, the counter records the sum of CRC errors and code errors (frames received with rxerror signal).
<b>Undersize</b>	The total number of frames received that were less than 64 octets long (excluding framing bits, but including FCS octets) and were otherwise well formed.
<b>Oversize</b>	The total number of frames received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed.
<b>Fragment</b>	The total number of frames received that were less than 64 octets in length (excluding framing bits, but including FCS octets) and had either an FCS or an alignment error.
<b>Jabber</b>	The total number of frames received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either an FCS or an alignment error.
<b>Drop Packets</b>	The total number of events in which packets were dropped due to a lack of resources.
<b>TX Frames</b>	Transmitted packets.
<b>Excessive Deferral</b>	The number of frames for which the first transmission attempt on a particular interface was delayed because the medium was busy.
<b>CRC Error</b>	For 10 Mbps ports, the counter records CRC errors (FCS or alignment errors). For 100 Mbps ports, the counter records the sum of CRC errors and code errors (frames received with rxerror signal).
<b>Late Collision</b>	Late Collisions. The number of times that a collision is detected later than 512 bit-times into the transmission of a packet.
<b>Excessive Collision</b>	Excessive Collisions. The number of frames for which transmission failed due to excessive collisions.
<b>Single Collision</b>	Single Collision Frames. The number of successfully transmitted frames for which transmission is inhibited by more than one collision.
<b>Collision</b>	An estimate of the total number of collisions on this network segment.

## Port Packet Analysis

The **Port Packet Analysis** window displays the size of packets received or transmitted by a given Switch port. In addition, statistics on the number and rate of unicast, multicast, and broadcast packets received by the Switch are displayed.

*To view an analysis of packets received or transmitted by a port, click on the Port Packet Analysis link:*



**Figure 6 - 95. Port Packet Analysis window**

The following fields from above are described in more detail:

Parameter	Description
<b>Update Interval</b> <i>&lt;Suspend&gt;</i>	The interval (in seconds) that the table is updated. The default is 2 seconds.
<b>Frames</b>	The number of packets (or frames) received or transmitted by the Switch with the size, in octets, given by the column on the right.
<b>Frames/sec</b>	The number of packets (or frames) transmitted or received, per second, by the Switch.
<b>Unicast RX</b>	Displays the number of unicast packets received by the Switch in total number (Frames) and the rate (Frames/sec).
<b>Multicast RX</b>	Displays the number of multicast packets received by the Switch in total number (Frames) and the rate (Frames/sec).
<b>Broadcast RX</b>	Displays the number of broadcast packets received by the Switch in total number (Frames) and the rate (Frames/sec).
<b>RX Bytes</b>	Displays the number of bytes (octets) received by the Switch in total number (Total), and rate (Total/sec).
<b>RX Frames</b>	Displays the number of packets (frames) received by the Switch in total number (Total), and rate (Total/sec).
<b>TX Bytes</b>	Displays the number of bytes (octets) transmitted by the Switch in total number (Total), and rate (Total/sec).
<b>TX Frames</b>	Displays the number of packets (frames) transmitted by the Switch in total number (Total), and rate (Total/sec).

## MAC Address Table

This allows the Switch's dynamic MAC address forwarding table to be viewed. When the Switch learns an association between a MAC address and a port number, it makes an entry into its forwarding table. These entries are then used to forward packets through the Switch.

*To view the MAC address forwarding table, from the Address Tables folder, click the MAC Address Table link:*

MAC Address Table											
To discover information about a MAC address, select a method for viewing MAC addresses, enter the required information, and click Browse.											
Browse All Table		Clear All Table									
<b>Browse Table By VLAN</b>											
VLAN Name <input type="text"/>		Browse									
<b>Browse Table By MAC Address</b>											
MAC Address <input type="text"/> 00-00-00-00-00-00		Browse									
<b>Browse Table By Port</b>											
Unit: <input type="text"/> 1 Port: <input type="text"/> 3		Browse Clear Table By Port									
Total Addresses in Table: 289											
Next											

**Figure 6 - 96. Browse Address Table – sequential window**

## GVRP Status

This allows the GVRP status for each of the Switch's ports to be viewed by VLAN. The GVRP status screen displays the ports on the Switch that are currently Egress or Untagged ports.

*To view the GVRP status table, click on the GVRP Status link:*

GVRP Status	
Displays information about the Group VLAN Registration Protocol.	
IEEE 802.1Q VLAN ID	1
Status	Permanent
Creation time since switch power up	07:27:56
Current 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 26 Unit 1 <input checked="" type="checkbox"/>
Current Untagged 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 Unit 1 <input checked="" type="checkbox"/>
Number of IEEE 802.1Q VLANs:	1

**Figure 6 - 97. GVRP Status**

## Router Ports

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 Router Port table, click on the Router Ports link:*

Router Ports

Enter a VLAN name and click Find to discover which ports are routing UDP multicast packets.

VLAN Name:  Find

S: Static router port    D: Dynamic router port

VLAN Name	Router Port
1 to 8 9 to 16 17 to 24 25 26	default Unit 1 ----- - -

**Figure 6 - 98. Browse Router Port**

**S** signifies a static router port, configured by the user.

**D** signifies a dynamically assigned router port, configured by the Switch.

## IGMP Snooping Status

This allows the Switch's IGMP Snooping table to be viewed. IGMP Snooping allows the Switch to read the Multicast Group IP address and the corresponding MAC address from IGMP packets that pass through the Switch. The ports where the IGMP packets were snooped are displayed, signified with an **M**. The number of IGMP reports that were snooped is also displayed in the Reports field.

*To view the IGMP Snooping table, click on the IGMP Snooping Status link:*

IGMP Snooping Status

Enter a VLAN name and click Find to discover the IGMP groups on the VLAN.

VLAN Name:  Find

Total Entries in the VLAN: 0

Multicast Group	MAC Address	Port Map	Reports
1 to 8 9 to 16 17 to 24 25 26			

**Figure 6 - 99. IGMP Snooping Status**

The following fields can be set or are displayed.

Parameter	Description
<b>Multicast Group</b>	The IP address of the multicast group.
<b>MAC Address</b>	The MAC address of the multicast group.
<b>Reports</b>	The total number of reports received for this group.

## Switch History

This allows the Switch History Log to be viewed. The Switch records all traps, in sequence, that identify events on the Switch. The time since the last cold start of the Switch is also recorded.

**To view the Switch history log:**

Click the **Switch History** link on the **Applications** menu:

Switch History		
Displays the log of switch events with the newest event at the top.		
Sequence	Time	Log Text
47	000d07h35m	Successful login through Web (Username: Mike)
46	000d07h12m	Successful login through Web (Username: Mike)
45	000d07h04m	Successful login through Web (Username: Mike)
44	000d06h56m	Successful login through Web (Username: Mike)
43	000d06h30m	Successful login through Web (Username: Mike)
42	000d06h18m	Port 3 link up, 100Mbps FULL duplex
41	000d06h18m	Port 3 link down
40	000d06h17m	Port 3 link up, 100Mbps FULL duplex
39	000d06h17m	Port 3 link down
38	000d06h15m	Successful login through Web (Username: Mike)
37	000d06h03m	Successful login through Web (Username: Mike)
36	000d05h50m	Successful login through Web (Username: Mike)
35	000d05h43m	Successful login through Web (Username: Mike)
34	000d05h30m	Successful login through Web (Username: Mike)
33	000d05h19m	Port 3 link up, 100Mbps FULL duplex
32	000d05h19m	Port 3 link down
31	000d05h19m	Port 3 link up, 100Mbps FULL duplex
30	000d05h19m	Port 3 link down
29	000d05h04m	Successful login through Web (Username: Mike)
28	000d04h52m	Successful login through Web (Username: Mike)

**Clear**

**Next**

**Figure 6 - 100. Switch History**

## Technical Specifications

Physical and Environmental	
<b>AC Input &amp; External Redundant Power Supply:</b>	100 – 120; 200 - 240 VAC, 50 60 Hz (internal universal power supply)
<b>Power Consumption:</b>	30 watts maximum
<b>DC fans:</b>	3 built-in 40 x 40 x10 mm fans
<b>Operating Temperature:</b>	0 to 40 degrees Celsius
<b>Storage Temperature:</b>	-40 to 70 degrees Celsius
<b>Humidity:</b>	Operating: 5% to 95% RH non-condensing; Storage: 0% to 95% RH non-condensing
<b>Dimensions:</b>	441 mm x 207 mm x 44 mm (1U), 19 inch rack-mount width
<b>Weight:</b>	2.5 kg
<b>EMI:</b>	FCC Class A, CE Class A, BSMI Class A, C-Tick Class A
<b>Safety:</b>	CSA International

General	
<b>Standards:</b>	IEEE 802.3 10BASE-T Ethernet IEEE 802.3u 100BASE-TX Fast Ethernet IEEE 802.3z 1000BASE-SX Gigabit Ethernet IEEE 802.3ab 1000BASE-T Gigabit Ethernet IEEE 802.1 P Q VLAN IEEE 802.3x Full-duplex Flow Control IEEE 802.3 Nway auto-negotiation
<b>Protocols:</b>	CSMA/CD
<b>Data Transfer Rates:</b> <b>Ethernet</b> <b>Fast Ethernet</b> <b>Gigabit Ethernet</b>	Half-duplex      Full-duplex 10 Mbps      20Mbps 100Mbps      200Mbps n a      2000Mbps
<b>Network Cables:</b> <b>10BASE-T:</b> <b>100BASE-TX:</b>	2-pair UTP Cat. 3,4,5 (100 m) EIA TIA- 568 100-ohm STP (100 m)  2-pair UTP Cat. 5 (100 m) EIA TIA-568 100-ohm STP (100 m)
<b>Number of Ports:</b>	24 x 10/100 Mbps NWay ports 2 Gigabit Ethernet (optional)

Performance	
<b>Transmission Method:</b>	Store-and-forward
<b>RAM Buffer:</b>	8 Megabytes per device
<b>Filtering Address Table:</b>	8K MAC address per device
<b>Packet Filtering Forwarding Rate:</b>	Full-wire speed for all connections. 148,800 pps per port (for 100Mbps) 1,488,000 pps per port (for 1000Mbps)
<b>MAC Address Learning:</b>	Automatic update.

# **D-Link® Offices**

<b>Australia</b>	<b>D-Link Australasia</b> 1 Giffnock Avenue, North Ryde, NSW 2113, Sydney, Australia TEL: 61-2-8899-1800 FAX: 61-2-8899-1868 TOLL FREE (Australia): 1300 766 868 TOLL FREE (New Zealand): 0800-900900 URL: <a href="http://www.dlink.com.au">www.dlink.com.au</a> E-MAIL: support@dlink.com.au & info@dlink.com.au
<b>Brazil</b>	<b>D-Link Brasil Ltda.</b> Rua Tavares Cabral 102 - Conj. 31 e 33 05423-030 Pinheiros, Sao Paulo, Brasil TEL: (5511) 3094 2910 to 2920 FAX: (5511) 3094 2921 URL: <a href="http://www.dlink.com.br">www.dlink.com.br</a>
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**U.S.A.**

**D-Link U.S.A.**

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E-MAIL: [tech@dlink.com](mailto:tech@dlink.com) & [support@dlink.com](mailto:support@dlink.com)

# Contacting 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 web site, or by phone.

## **Tech Support for customers within the United States:**

*D-Link Technical Support over the Telephone:*

(877) 453-5465

24 hours/ 7 days a week

*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)

When contacting technical support, please provide the following information:

- *Serial number of the unit*
- *Model number or product name*
- *Software type and version number*

Subject to the terms and conditions set forth herein, D-Link Systems, Inc. ("D-Link") provides this Limited Warranty:

- Only to the person or entity that originally purchased the product from D-Link or its authorized reseller or distributor, and
- Only for products purchased and delivered within the fifty states of the United States, the District of Columbia, U.S. Possessions or Protectorates, U.S. Military Installations, or addresses with an APO or FPO.

**Limited Warranty:** D-Link warrants that the hardware portion of the D-Link product described below ("Hardware") will be free from material defects in workmanship and materials under normal use from the date of original retail purchase of the product, for the period set forth below ("Warranty Period"), except as otherwise stated herein.

- Hardware (excluding power supplies and fans): One (1) year
- Power supplies and fans: One (1) year
- Spare parts and spare kits: Ninety (90) days

The customer's sole and exclusive remedy and the entire liability of D-Link and its suppliers under this Limited Warranty will be, at D-Link's option, to repair or replace the defective Hardware during the Warranty Period at no charge to the original owner or to refund the actual purchase price paid. Any repair or replacement will be rendered by D-Link at an Authorized D-Link Service Office. The replacement hardware need not be new or have an identical make, model or part. D-Link may, at its option, replace the defective Hardware or any part thereof with any reconditioned product that D-Link reasonably determines is substantially equivalent (or superior) in all material respects to the defective Hardware. Repaired or replacement hardware will be warranted for the remainder of the original Warranty Period or ninety (90) days, whichever is longer, and is subject to the same limitations and exclusions. If a material defect is incapable of correction, or if D-Link determines that it is not practical to repair or replace the defective Hardware, the actual price paid by the original purchaser for the defective Hardware will be refunded by D-Link upon return to D-Link of the defective Hardware. All Hardware or part thereof that is replaced by D-Link, or for which the purchase price is refunded, shall become the property of D-Link upon replacement or refund.

**Limited Software Warranty:** D-Link warrants that the software portion of the product ("Software") will substantially conform to D-Link's then current functional specifications for the Software, as set forth in the applicable documentation, from the date of original retail purchase of the Software for a period of ninety (90) days ("Software Warranty Period"), provided that the Software is properly installed on approved hardware and operated as contemplated in its documentation. D-Link further warrants that, during the Software Warranty Period, the magnetic media on which D-Link delivers the Software will be free of physical defects. The customer's sole and exclusive remedy and the entire liability of D-Link and its suppliers under this Limited Warranty will be, at D-Link's option, to replace the non-conforming Software (or defective media) with software that substantially conforms to D-Link's functional specifications for the Software or to refund the portion of the actual purchase price paid that is attributable to the Software. Except as otherwise agreed by D-Link in writing, the replacement Software is provided only to the original licensee, and is subject to the terms and conditions of the license granted by D-Link for the Software. Replacement Software will be warranted for the remainder of the original Warranty Period and is subject to the same limitations and exclusions. If a material non-conformance is incapable of correction, or if D-Link determines in its sole discretion that it is not practical to replace the non-conforming Software, the price paid by the original licensee for the non-conforming Software will be refunded by D-Link; provided that the non-conforming Software (and all copies thereof) is first returned to D-Link. The license granted respecting any Software for which a refund is given automatically terminates.

**Non-Applicability of Warranty:** The Limited Warranty provided hereunder for Hardware and Software portions of D-Link's products will not be applied to and does not cover any refurbished product and any product purchased through the inventory clearance or liquidation sale or other sales in which D-Link, the sellers, or the liquidators expressly disclaim their warranty obligation pertaining to the product and in that case, the product is being sold "As-Is" without any warranty whatsoever including, without limitation, the Limited Warranty as described herein, notwithstanding anything stated herein to the contrary.

**Submitting A Claim:** The customer shall return the product to the original purchase point based on its return policy. In case the return policy period has expired and the product is within warranty, the customer shall submit a claim to D-Link as outlined below:

- The customer must submit with the product as part of the claim a written description of the Hardware defect or Software nonconformance in sufficient detail to allow D-Link to confirm the same, along with proof of purchase of the product (such as a copy of the dated purchase invoice for the product) if the product is not registered.
- The customer must obtain a Case ID Number from D-Link Technical Support at 1-877-453-5465, who will attempt to assist the customer in resolving any suspected defects with the product. If the product is considered defective, the customer must obtain a Return Material Authorization ("RMA") number by completing the RMA form and entering the assigned Case ID Number at <https://rma.dlink.com/>.
- After an RMA number is issued, the defective product must be packaged securely in the original or other suitable shipping package to ensure that it will not be damaged in transit, and the RMA number must be prominently marked on the outside of the package. Do not include any manuals or accessories in the shipping package. D-Link will only replace the defective portion of the product and will not ship back any accessories.
- The customer is responsible for all in-bound shipping charges to D-Link. No Cash on Delivery ("COD") is allowed. Products sent COD will either be rejected by D-Link or become the property of D-Link. Products shall be fully insured by the customer and shipped to **D-Link Systems, Inc., 17595 Mt. Herrmann, Fountain Valley, CA 92708**. D-Link will not be held responsible for any packages that are lost in transit to D-Link. The repaired or replaced packages will be shipped to the customer via UPS Ground or any common carrier selected by D-Link. Return shipping charges shall be prepaid by D-Link if you use an address in the United States, otherwise we will ship the product to you freight collect. Expedited shipping is available upon request and provided shipping charges are prepaid by the customer.

D-Link may reject or return any product that is not packaged and shipped in strict compliance with the foregoing requirements, or for which an RMA number is not visible from the outside of the package. The product owner agrees to pay D-Link's reasonable handling and return shipping charges for any product that is not packaged and shipped in accordance with the foregoing requirements, or that is determined by D-Link not to be defective or non-conforming.

**What Is Not Covered:** The Limited Warranty provided herein by D-Link does not cover: Products that, in D-Link's judgment, have been subjected to abuse, accident, alteration, modification, tampering, negligence, misuse, faulty installation, lack of reasonable care, repair or service in any way that is not contemplated in the documentation for the product, or if the model or serial number has been altered, tampered with, defaced or removed; Initial installation, installation and removal of the product for repair, and shipping costs; Operational adjustments covered in the operating manual for the product, and normal maintenance; Damage that occurs in shipment, due to act of God, failures due to power surge, and cosmetic damage; Any hardware, software, firmware or other products or services provided by anyone other than D-Link; and Products that have been purchased from inventory clearance or liquidation sales or other sales in which D-Link, the sellers, or the liquidators expressly disclaim their warranty obligation pertaining to the product. While necessary maintenance or repairs on your Product can be performed by any company, we recommend that you use only an Authorized D-Link Service Office. Improper or incorrectly performed maintenance or repair voids this Limited Warranty.

**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 THE DURATION OF THE APPLICABLE WARRANTY PERIOD SET FORTH ABOVE. 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.

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**CE Mark Warning:** This is a Class B product. In a domestic 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 B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential 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. 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.**

# Registration

**Register your product online 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.

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