



DES-3226S

Layer 2 Switch

User's Guide

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RECYCLABLE

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1

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.

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 & Stack 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 Features

Features

- 8.8 Gbps switching fabric capacity
- Store and forward switching scheme.
- Full and half-duplex for both 10Mbps and 100Mbps connections. The front-port Gigabit Ethernet module operates at full-duplex only. Full-duplex allows the switch port to simultaneously transmit and receive data, and only works with connections to full-duplex capable end stations and switches. Connections to hubs must take place at half-duplex.
- Supports IEEE 802.3x flow control for full-duplex mode ports.
- Supports Back-pressure flow control for half-duplex mode ports.
- Auto-polarity detection and correction of incorrect polarity on the transmit and receive twisted-pair at each port.
- IEEE 802.3z compliant for all Gigabit ports (optional module).
- IEEE 802.3x compliant Flow Control support for all Gigabit ports (optional module).
- IEEE 802.3ab compliant for 100BASE-T (Copper) Gigabit ports (optional module).
- Data forwarding rate 14,880 pps per port at 100% of wire-speed for 10Mbps speed.

- Data forwarding rate 148,800 pps per port at 100% of wire-speed for 100Mbps speed.
- Data filtering rate eliminates all error packets, runts, etc. at 14,880 pps per port at 100% of wire-speed for 10Mbps speed.
- Data filtering rate eliminates all error packets, runts, etc. at 148,800 pps per port at 100% of wire-speed for 100Mbps speed.
- 8K active MAC address entry table per device with automatic learning and aging (300 to 1000000 seconds).
- 8 MB packet buffer per device.
- Broadcast and Multicast storm filtering.
- Supports Port Mirroring.
- Supports Port Trunking – up to six trunk groups (each consisting of up to eight ports) may be set up.
- 802.1d Spanning Tree support.
- 802.1Q Tagged VLAN support – up to 63 User-defined VLANs per device (one VLAN is reserved for internal use).
- GVRP – (GARP VLAN Registration Protocol) support for dynamic VLAN registration.
- 802.1p Priority support with 4 priority queues.
- IGMP Snooping support.

Traffic Classification and Prioritization

- Based on 802.1p priority bits
- 4 priority queues

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.
- 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.
- DHCP Client support.
- Password enabled.

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.

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.

2

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:

- One DES-3226S 24-port Fast Ethernet Layer 2 Switch
- Mounting kit: 2 mounting brackets and screws
- Four rubber feet with adhesive backing
- One AC power cord
- 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.

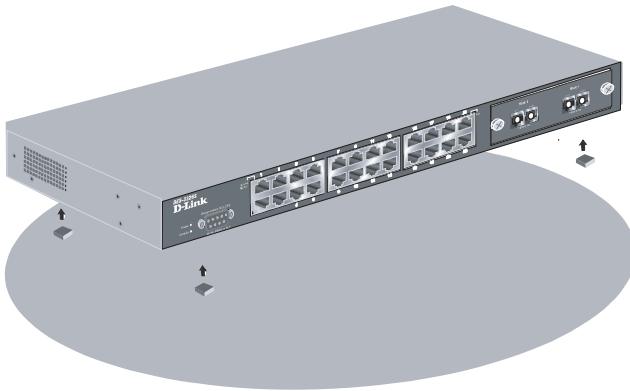


Figure 2-1. Installing rubber feet for desktop installation

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.

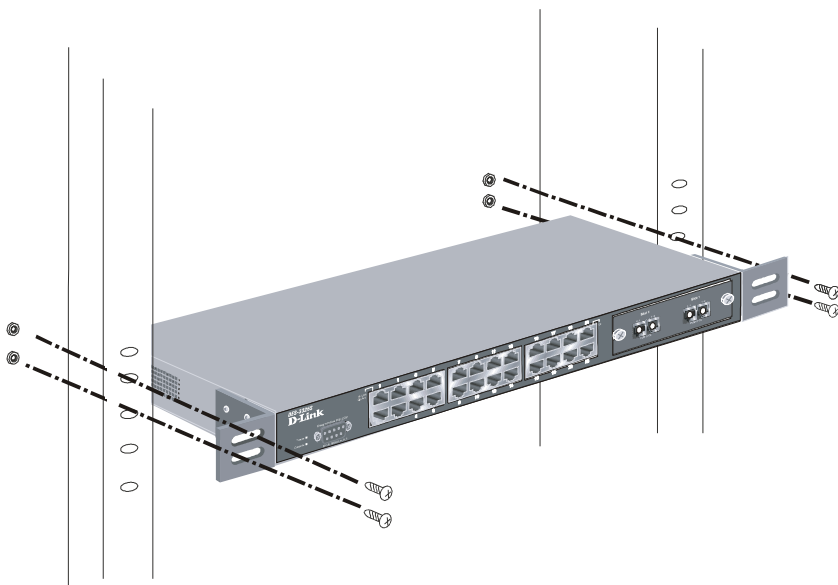


Figure 2-3. Installing the switch on an equipment rack

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.

3

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.

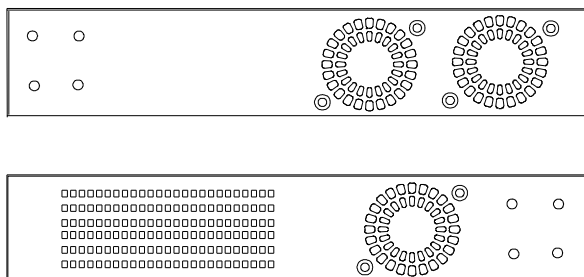


Figure 3-4. Side panel views of the Switch

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.

100BASE-FX Fiber Module (2 Km)

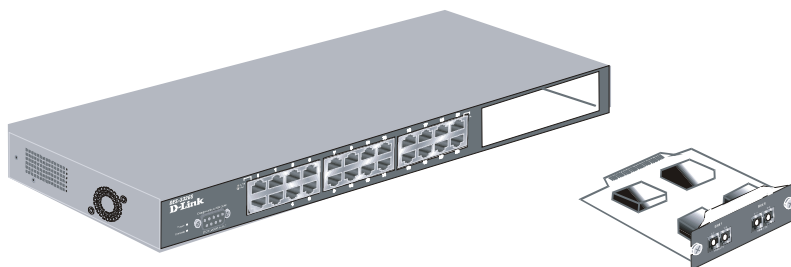


Figure 3-5. 100BASE-FX two-port module

- Front-panel module.
- Two 100BASE-FX (with SC type connector) Fiber ports.
- Fully compliant with IEEE802.3u.
- Support Full-duplex operation only.
- IEEE 802.3x compliant Flow Control support for full-duplex.

1000BASE-T Module

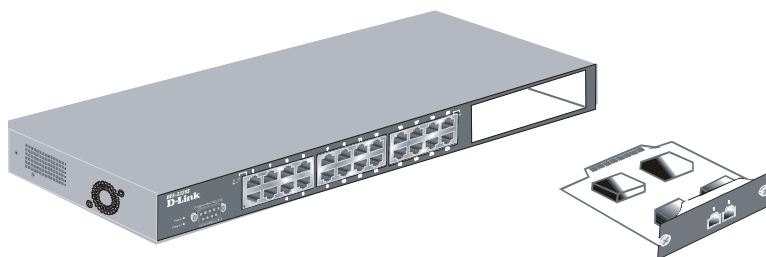


Figure 3-6. 1000BASE-TX two-port module

- Front-panel module.
- Connects to 1000BASE-T devices.
- Supports Category 5e UTP cable connections of up to 100 meters.

1000BASE-SX Fiber Module

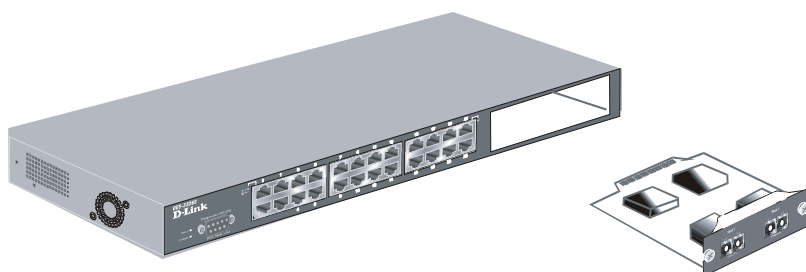


Figure 3-7. 1000BASE-SX two-port module

- Front-panel module.
- Connects to 1000BASE-SX devices at full-duplex.
- Allows connections using multi-mode fiber optic cable in the following configurations:

	62.5mm	50mm
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

1000BASE-LX Fiber Module

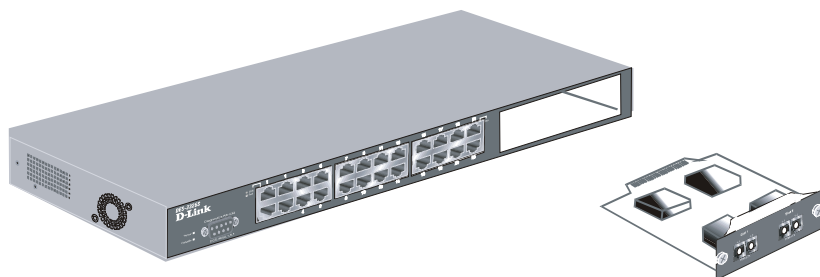


Figure 3-8. 1000BASE-LX two-port module

- Front-panel module.
- Connects to 1000BASE-LX devices at full-duplex.
- Supports multi-mode fiber-optic cable connections of up to 550 meters or 5 km single-mode fiber-optic cable connections.

GBIC Two-Port Module

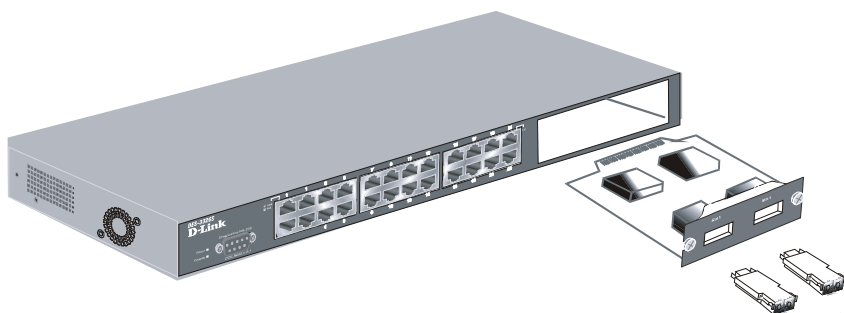


Figure 3-9. GBIC two-port module

- Front-panel module.
- Connects to GBIC devices at full duplex only.
- 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 802.3x compliant Flow Control for full-duplex.

Stacking Module with GBIC Port

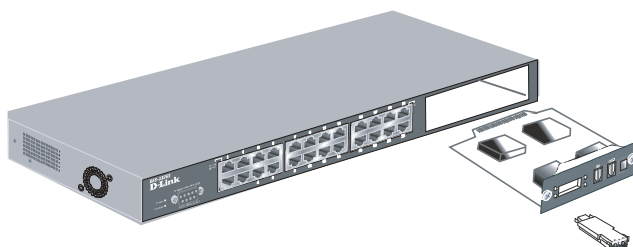


Figure 3-10. Stacking Module with one GBIC port

GBIC Port

- Front-panel module
- One Stacking port and one GBIC fiber port
- Connects to GBIC devices at full duplex only
- Allows multi-mode fiber optic connections of up to 550 m (SX) 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 802.3x compliant Flow Control for full-duplex

Stacking Port

- One transmitting port and one receiving port
- Use the connector of IEEE 1394b
- Data rate up to 1250 Mbps

- 7-segment LED display to indicate switch ID number within the switch stack

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).

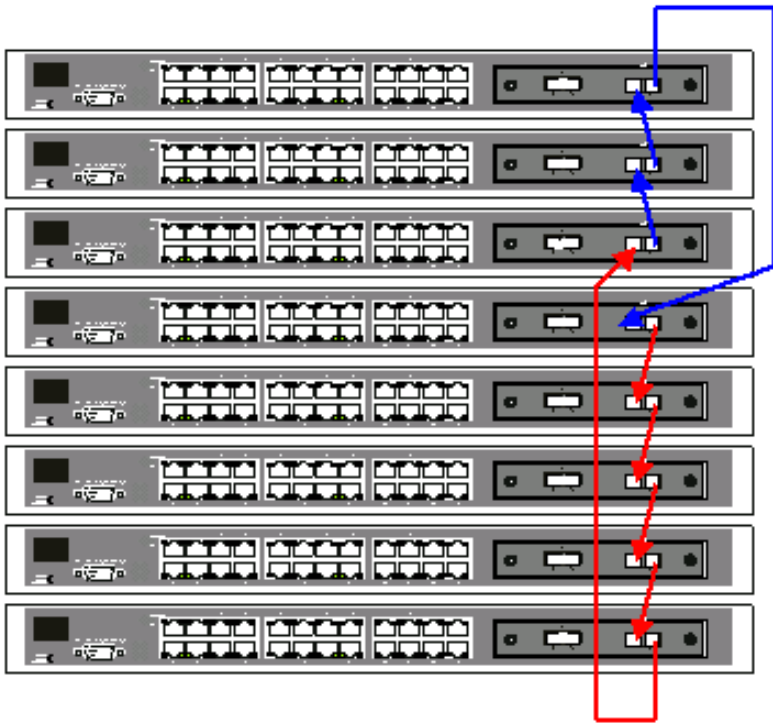


Figure 3-11. Up to 6 Switches in a Switch Stack

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.

The Stacking Module's LED indicators are described below.

Switch 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:

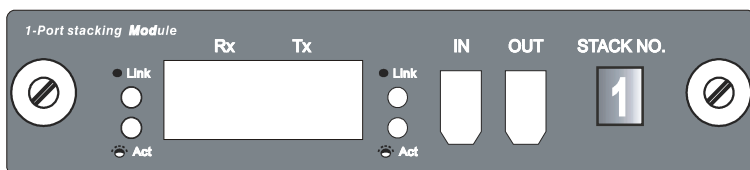


Figure 3-13. Stacking Module LED Indicators

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. 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. This is the Stacking Module's default mode.

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

4

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. The RJ-45 UTP ports on NICs and most routers are MDI-II. When using a normal straight-through cable, an MDI-II port must connect to an MDI-X port.

An end node can be connected to the Switch via a two-pair Category 5 UTP straight cable (be sure to use Category 5e UTP cabling for 100 Mbps Fast Ethernet connections). The end node should be connected to any of the twenty-four ports (2x - 24x) of the DES-3226S or to either of the two 100BASE-TX ports on the front-panel module that came preinstalled on the switch.

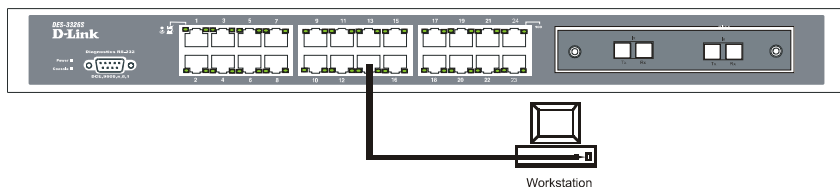


Figure 4-1. Switch connected to an End Node

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.

- 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 5e UTP cable.

Switch Stack Connections

Up to eight DES-3226S switches can be stacked, using the optional stacking module, into a switch stack that can then be configured and managed as a single unit. The Web-based 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).

The Command Line Interface (CLI) can be also be used to manage and configure all of the switches in a switch stack – from the serial port on the master switch.

The CLI can also be used to configure and manage the switch stack via the TELNET protocol – using a single IP address (the IP address of the Master Switch).

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:

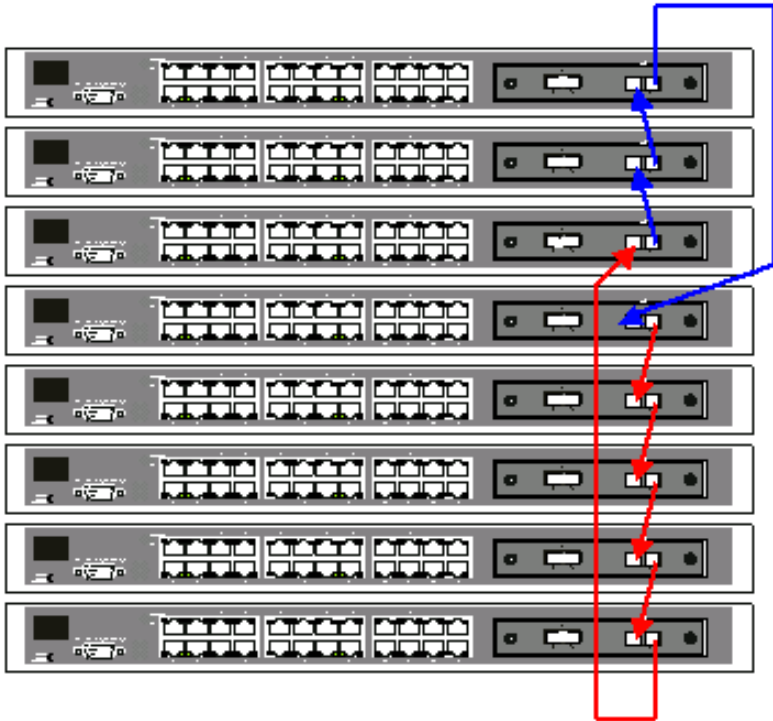


Figure 4-. Switch Stack connections between optional stacking modules

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*.

5

SWITCH MANAGEMENT AND OPERATING 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 (see Chapter 6 – Using the Console Interface). 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 7 – 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 hitting <Ctrl> + r to refresh the screen.

Managing Switch Stacks

The Switch is designed to be stacked in stacks of up to six Switches, all managed as a single unit with a single IP address. The stack order is *hardware-determined*, that is, the unique MAC address of each Switch determines where the Switch stands in the stack order. This fact can be taken into account when you are placing the Switches in the equipment rack. Administrators may find it convenient to place the Switches in the rack in the same order they appear logically in the Switch stack. However, you also may prefer to override the auto-detect stack order feature if for example, you add Switches to a stack that is already in place. Regardless of the method used to determine Switch stack order, remember some important points:

- All management of all the Switches in the stack is done through the Master Switch
- It is recommended that the Master Switch be used to uplink to the Ethernet backbone
- If the link between any two switches fails or is disconnected, all of the switches in the stack will automatically reboot
- A switch stack has a single IP address – if the link to a given switch fails or is disconnected, that switch will reboot with the IP settings it had before becoming a member of the switch stack

- If a new Master is elected, all Switches in the stack will automatically reboot. This includes situations where the new Master is determined by MAC address, for example, if the original Master is removed from the stack.
- The Master Switch can be chosen automatically. Switch software auto-detects the MAC address of each Switch in the stack. The Switch with the lowest value MAC address is elected to function as the Master. The remaining Switches are ordered according to the relative value of their respective MAC addresses (see the following example).

Determining the Switch Stack Order

The example below illustrates adding a single switch to an installed stack of 5 switches. Using the auto-stacking mode, five MAC addresses appear in the order listed in the table below:

Stack Order	MAC Address
1(Master)	001122334451
2	001122334452
3	001122334453
4	001122334454
5	001122334455
6	Not in use

Table 5-1. Switch Stack Order - First

Now let us suppose you wish to add another Switch to this stack. The new Switch has a MAC address 001122334450. After rebooting all the Switches in the stack, the newly added Switch becomes the Master Switch. The new automatically determined stack order becomes:

Stack Order	MAC Address
1(added Switch)	001122334450
2(original Master)	001122334451
3	001122334452
4	001122334453
5	001122334454
6	001122334455

Table 5-2. Switch Stack Order - Second

You can override the automatic stack order selection to use the original Master Switch as the Master of the new stack (read *Switch Stacking Information* in Chapter 6 for information on how to override the stack order auto-detect function).

To override the automatic selection of the stack order you must attach the serial cable to the newly added Switch (MAC address 001122334450). Now you can reconfigure the stack to place the original Master Switch (MAC address 001122334451) again into the number 1 position and the newly added Switch into the number 6 position.

After reconfiguration and restarting the Switches, the new stack order becomes:

Stack Order	MAC Address
1(original Master)	001122334451
2	001122334452
3	001122334453
4	001122334454
5	001122334455
6 (added Switch)	001122334450

Table 5-3. Switch Stack Order - Final

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.

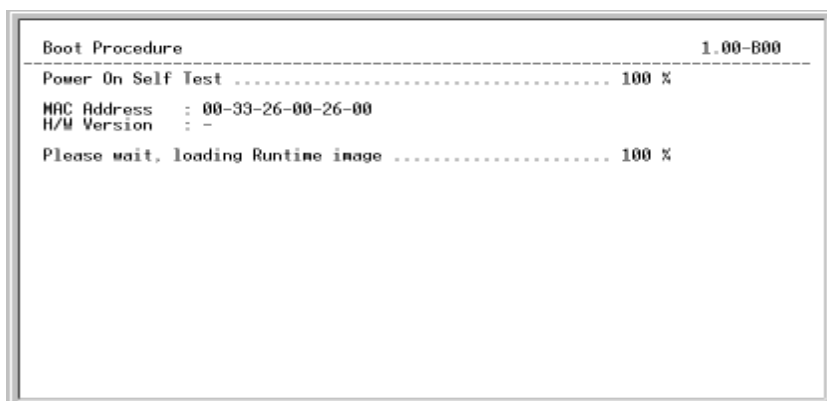


Figure 5-1. Console Boot Screen

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.xxx/yyy.yyy.yyy.yyy`. Where the x's represent the IP address to be assigned to the IP interface named System and the y's represent the corresponding subnet mask.
2. Alternatively, you can enter DES3226S4# – enter the commands `config ipif system ipaddress xxx.xxx.xxx.xxx/z`. Where the x's represent the IP address to be assigned to the IP interface named System and the z represents the corresponding number of subnets in CIDR notation.

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.

Traps

Traps are messages that alert you 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 network manager (trap recipient).

Trap recipients are special users of the network who are given certain rights and access in overseeing the maintenance of the network. Trap recipients will receive traps sent from the Switch;

they must immediately take certain actions to avoid future failure or breakdown of the network.

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

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

The following are trap types 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.
- **New Root** This trap indicates that the Switch has become the new root of the Spanning Tree, the trap is sent by the switch soon after its election as the new root. This implies that upon expiration of the Topology Change Timer the new root trap is sent out immediately after the Switch's election as the new root.

- **Topology Change (STP)** 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 Up** This trap is sent whenever the link of a port changes from link down to link up.
- **Link Down** This trap is sent whenever the link of a port changes from link up to link down.

SNMP

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 D-View.

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.

Authentication

The authentication protocol ensures that both the router SNMP agent and the remote user SNMP application program discard packets from unauthorized users. Authentication is accomplished using 'community strings', which function like passwords. The remote user SNMP application and the router SNMP must use the same community string. SNMP community strings of up to 32 characters may be entered under the *Remote Management Setup* menu of the console program.

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 by entering a list of the IP addresses of authorized network managers. Up to four trap recipient IP addresses, and four corresponding SNMP community strings can be entered.

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

The following are trap types 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.
- **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.

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-Identity (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.

Packet Forwarding

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 300 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

The switch uses a filtering database to segment the network and control communication between segments. It can also filter packets off the network for intrusion control. Static filtering entries can be made by MAC Address or IP Address filtering.

Each port on the switch is a unique collision domain and the switch filters (discards) packets whose destination lies on the

same port as where it originated. This keeps local packets from disrupting communications on other parts of the network.

For intrusion control, whenever a switch encounters a packet originating from or destined to a MAC address or an IP Address entered into the filter table, the switch will discard the packet.

Some filtering is done automatically by the switch:

- Dynamic filtering – automatic learning and aging of MAC addresses and their location on the network. Filtering occurs to keep local traffic confined to its segment.
- Filtering done by the Spanning Tree Protocol, which can filter packets based on topology, making sure that signal loops don't occur.
- Filtering done for VLAN integrity. Packets from a member of a VLAN (VLAN 2, for example) destined for a device on another VLAN (VLAN 3) will be filtered.

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.
- IP address filtering – the manual entry of specific IP addresses to be filtered from the network (switch must be in IP Routing mode). Packets sent from one manually entered IP address to another can be filtered from the network. The entry may specified as either a source, a destination, or both (switch must be in IP Routing mode).

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. Table 5-7 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 5-5. 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 parts 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.

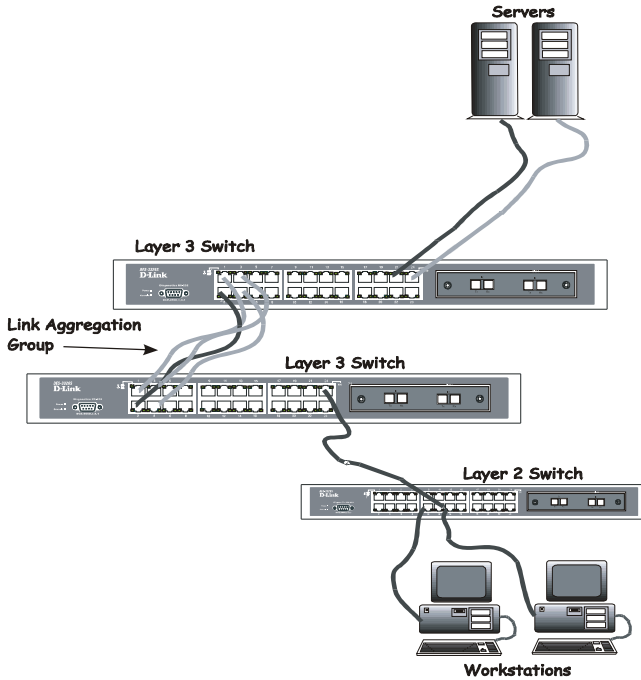


Figure 5-2. Link Aggregation Group

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 a 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.

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-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.

802.1Q Packet Forwarding

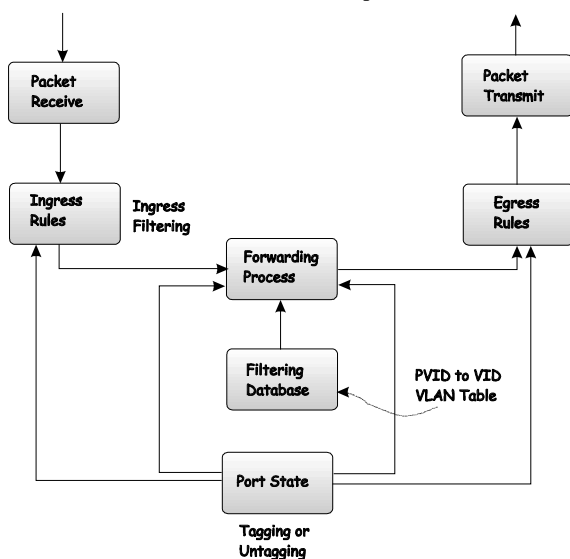


Figure 5-3. IEEE 802.1Q Packet Forwarding

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.

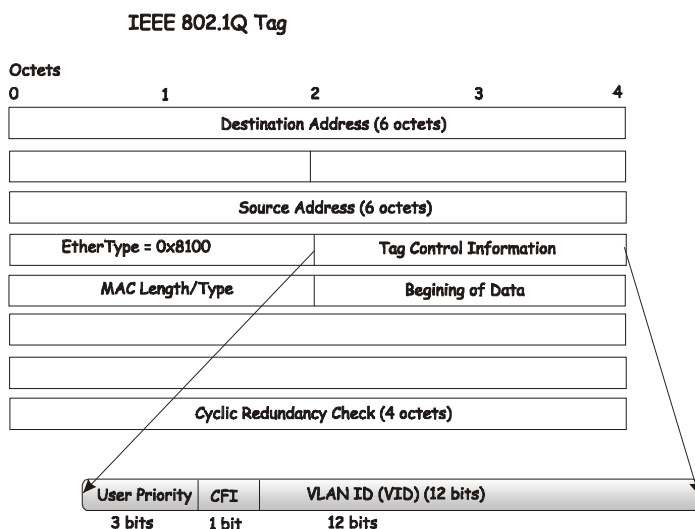


Figure 5-4. IEEE 802.1Q Tag

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.

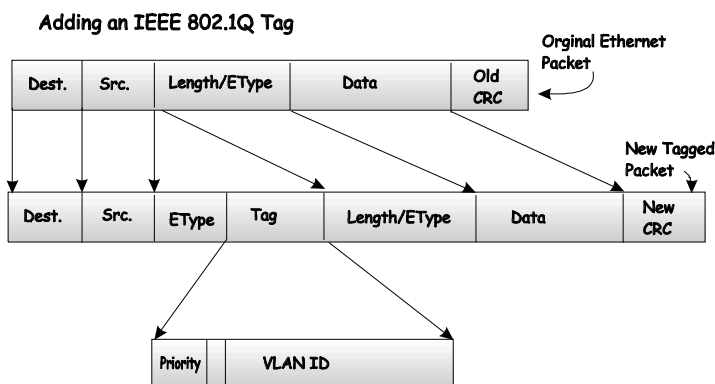


Figure 5-5. Adding an IEEE 802.1Q Tag

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.

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 5-6. 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 5-6. 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

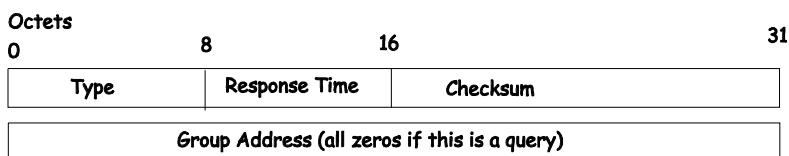


Figure 5-7 IGMP Message Format

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 5-7. 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.

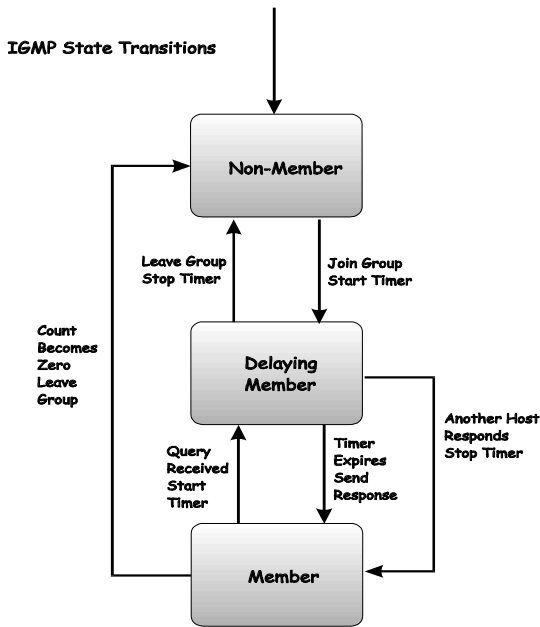


Figure 5-8 IGMP State Transitions

6

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.

Management

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

Note: The Factory default IP address for the switch is 10.90.90.90.

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



Figure 6 - 1. Login Button

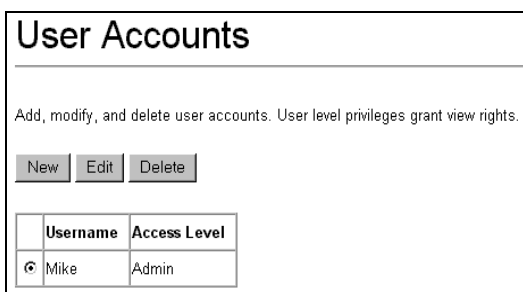
This opens the management module's main page.

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

Configuring the Switch

User Accounts Management

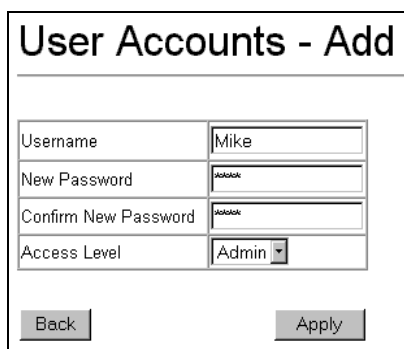
From the Main Menu, highlight Setup User Accounts and press Enter, then the User Account Management menu appears.



	Username	Access Level
☐	Mike	Admin

Figure 6 - 2. User Accounts Control Table

Click New to add a user.



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:

<i>Switch Configuration</i>	<i>Privilege</i>	
<i>Management</i>	<i>Admin</i>	<i>User</i>
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
<i>User Account Management</i>		
Add/Update/Delete User Accounts	Yes	No

View User Accounts	Yes	No
--------------------	-----	----

Table 6-1. 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:

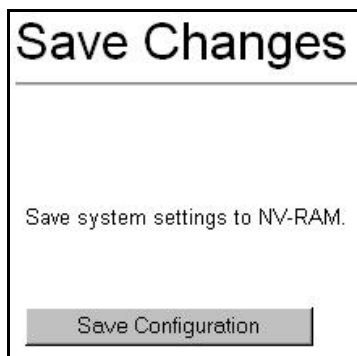


Figure 6 - 4. Save Changes Screen

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

☐

Reset

All parameters are reset to default settings except IP address, user account and history log.

☐

Reset Config

All parameters are reset to default settings.

☒

Reset System

All parameters are reset to default settings. Then the switch will do factory reset, save, reboot.

Apply

Figure 6 - 6. Factory Reset Screen

Click the Apply button to reset the switch.

Restart System

The following menu is used to restart the switch.

Clicking the Yes click-box will instruct the switch to save the current configuration to non-volatile RAM before restarting the switch.

Clicking the No click-box instructs the switch not to save the current configuration before restarting the switch. All of the configuration information entered from the last time Save Changes was executed, will be lost.

Note: clicking Yes is equivalent to executing Save Changes and then restarting the switch.

Click the Restart button to restart the switch.

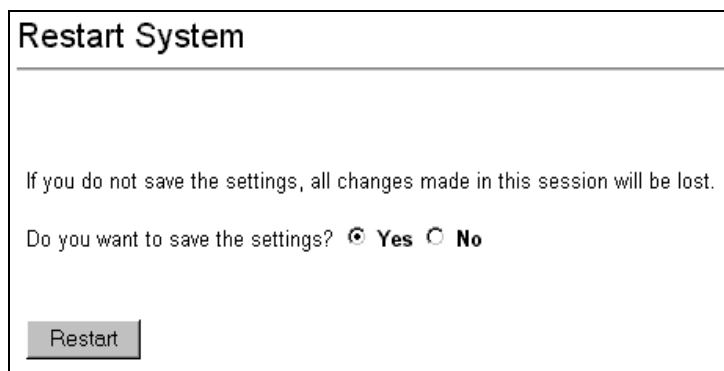


Figure 6 - 7. Restart System Screen

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.

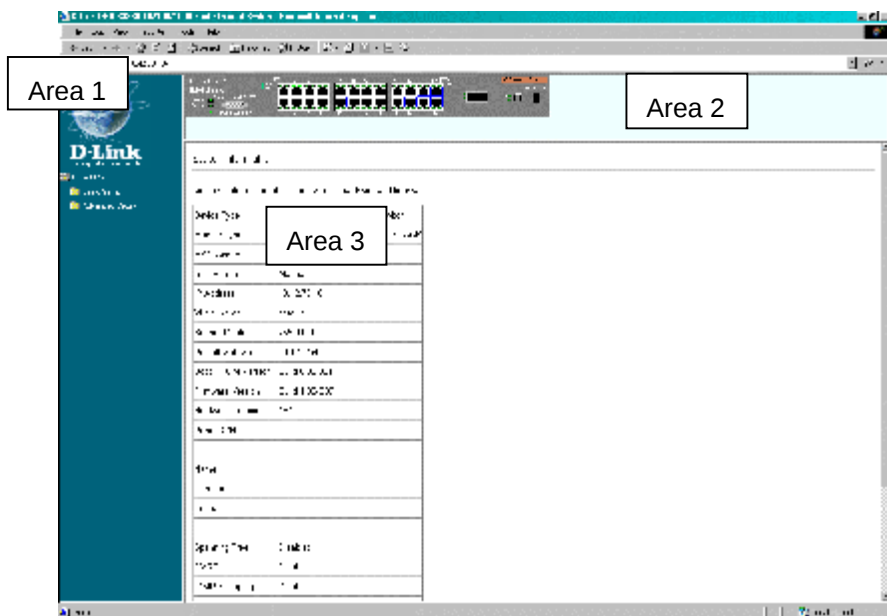


Figure 6 - 8. Main Web-Manager Screen

Area	Function
1	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.
2	Allows the selection of commands.
3	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.

Setting Up The Switch

Basic Setup

This section will help prepare the Switch user by describing the Switch Information – Basic Settings, IP Address, Configure Port, and Switch Settings windows.

Switch Information

Click the Switch Information link in the Configuration 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	DA-10-21-00-00-01
Get IP From	Manual
IP Address	10.34.55.14
VLAN Name	default
Subnet Mask	255.0.0.0
Default Gateway	0.0.0.0
Boot PROM Version	Build 0.00.001
Firmware Version	Build 1.00-B21
Hardware Version	1B1
Device S/N	
Name	
Location	
Contact	
Spanning Tree	Disabled
GVRP	Disabled
IGMP Snooping	Disabled
TELNET	Enabled (TCP 23)
WEB	Enabled (TCP 80)
RMON	Disabled

Figure 6 - 9. Switch Information – Basic Settings

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.

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 from the Main Menu to open the following dialog box.

Basic Switch Setup	
Configure the switch's IP address and contact information.	
Current Switch IP Settings	
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
New Switch IP Settings	
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
Name	
Location	
Contact	
Apply	

Figure 6 - 10. Basic Switch Setup

Note: the switch's factory default IP address is 10.90.90.90 with a subnet mask of 255.0.0.0 and a default gateway of 0.0.0.0.

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

Select Manual from the Get IP From drop-down menu.

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.

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 VLAN name of the VLAN that contains the port that the management station will access the switch on.

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 (or startup).

The New Switch IP Settings options are:

Parameter	Description
BOOTP	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.

DHCP	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.
Manual	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:
Subnet Mask	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.
Default Gateway	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.

VLAN Name

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.

Stacking Information

To change a switch's default stacking configuration (for example, the order in the stack), you must use the console Command Line Interface.

The number of switches in the switch stack (up to 8 – total) are displayed in the upper right-hand corner of you web-browser. The icons are in the same order as their respective Unit numbers, with the Unit 1 switch corresponding to the icon in the upper left-most corner of the icon group.

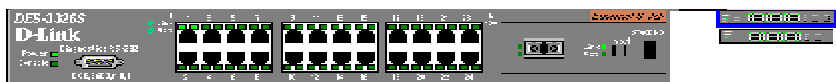


Figure 6 - 11. Switch Stack Display

In this case, there are two switches in the switch stack. The Unit 1 (master) switch is on top and highlighted in blue. The Unit 2 (slave) switch is below and not highlighted. To select a switch in the switch stack to configure, simply click on the corresponding switch's icon.

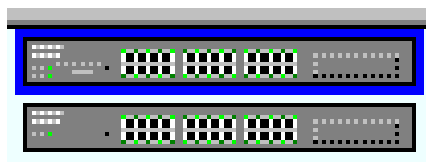


Figure 6 - 12. Switch Stack Icons

Here, the switch Unit 2 (slave) has been selected.

When the up to 6 DES-3226S switches are properly interconnected through their optional Stacking Modules, information about the resulting switch stack is displayed under the Stack Information link. This link is visible only when a switch stack has been connected and the optional Stacking Modules are active.

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 - 13. 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:

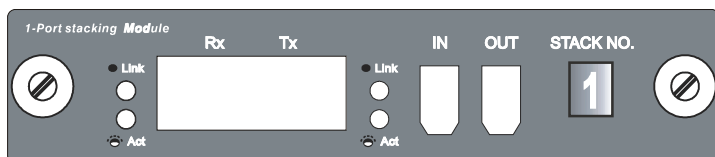


Figure 6 - 14. The Stacking Module's Front Panel

Notice the Link and Act LEDs. These 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. 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/version}
```

Using the optional parameter `mode` displays only the stacking mode of the switches in the switch stack.

Using the optional parameter `version` displays only the stacking firmware version 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	MASTER	1
2	00-00-00-22-22-00	27	26	SLAVE	1

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

Figure 6 - 15. 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 stack command allows you to configure the switch stack manually.

The syntax of the config stacking command is as follows:

```
config stacking mode [auto/master/slave/standalone]
```

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

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. |
| standalone | This command effectively removes the switch connected to the management station (via the switch's serial port) from the switch stack. The switch will be assigned a Unit number of 1 and cannot be managed as part of the switch stack. When a switch in a switch stack is configured as standalone, stacking information is still passed over the stacking link to other switches in the stack. |

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 lowest MAC address, enter the following command at the prompt:

```
config stacking mode slave
```

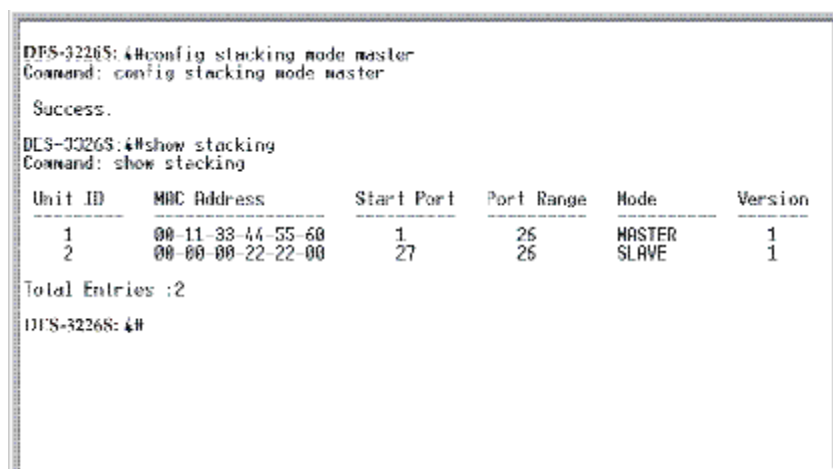
This will configure the switch with MAC address 00-00-00-22-22-00 to always have a Unit number greater than 1 (as a slave).

Now you will have to 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:~#config stacking mode master
Command: config stacking mode master

Success.

DES-3226S:~#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

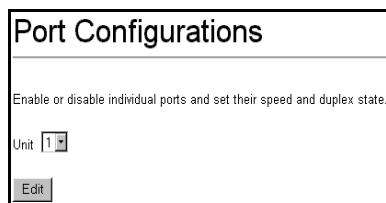
```
Total Entries :2
DES-3226S:~#
```

Figure 6 - 16. 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

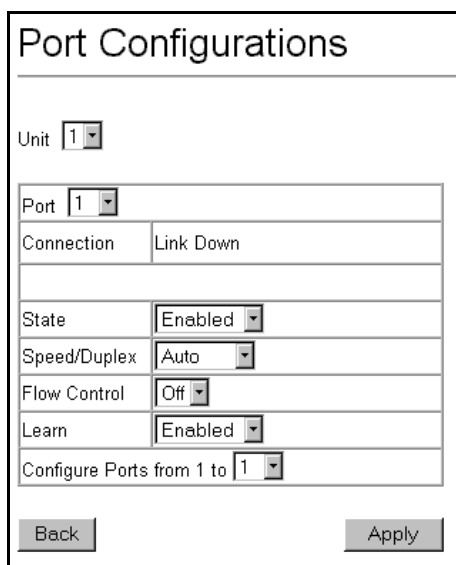
Figure 6 - 17. Choose switch from stack

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
☐	1	Enabled	Auto/Disabled	Link Down	Enabled
☐	2	Enabled	Auto/Disabled	Link Down	Enabled
☐	3	Enabled	Auto/Disabled	100M/Full/None	Enabled
☐	4	Enabled	Auto/Disabled	Link Down	Enabled
☐	5	Enabled	Auto/Disabled	Link Down	Enabled
☐	6	Enabled	Auto/Disabled	Link Down	Enabled
☐	7	Enabled	Auto/Disabled	Link Down	Enabled
☐	8	Enabled	Auto/Disabled	Link Down	Enabled
☐	9	Enabled	Auto/Disabled	Link Down	Enabled
☐	10	Enabled	Auto/Disabled	Link Down	Enabled
☐	11	Enabled	Auto/Disabled	Link Down	Enabled
☐	12	Enabled	Auto/Disabled	Link Down	Enabled
☐	13	Enabled	Auto/Disabled	Link Down	Enabled
☐	14	Enabled	Auto/Disabled	Link Down	Enabled
☐	15	Enabled	Auto/Disabled	Link Down	Enabled
☐	16	Enabled	Auto/Disabled	Link Down	Enabled
☐	17	Enabled	Auto/Disabled	Link Down	Enabled
☐	18	Enabled	Auto/Disabled	Link Down	Enabled
☐	19	Enabled	Auto/Disabled	Link Down	Enabled
☐	20	Enabled	Auto/Disabled	Link Down	Enabled
☐	21	Enabled	Auto/Disabled	Link Down	Enabled
☐	22	Enabled	Auto/Disabled	Link Down	Enabled
☐	23	Enabled	Auto/Disabled	Link Down	Enabled
☐	24	Enabled	Auto/Disabled	Link Down	Enabled
☐	25	Enabled	Auto/Disabled	Link Down	Enabled
☐	26	Enabled	Auto/Disabled	Link Down	Enabled

Figure 6 - 18. 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:



The image shows a 'Port Configurations' dialog box. At the top, it has a title bar. Below the title bar, there is a 'Unit' label followed by a dropdown menu showing '1'. Below this is a 'Port' label followed by a dropdown menu showing '1'. Underneath the 'Port' dropdown is a table with two columns: 'Connection' and 'Link Down'. The 'Link Down' column contains the text 'Link Down'. Below the table, there are several rows of configuration options, each with a label and a dropdown menu: 'State' with 'Enabled', 'Speed/Duplex' with 'Auto', 'Flow Control' with 'Off', 'Learn' with 'Enabled', and 'Configure Ports from 1 to' with '1'. At the bottom of the dialog box, there are two buttons: 'Back' on the left and 'Apply' on the right.

Connection	Link Down
	Link Down

State: Enabled

Speed/Duplex: Auto

Flow Control: Off

Learn: Enabled

Configure Ports from 1 to: 1

Back Apply

Figure 6 - 19. 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 and MAC Address Learning

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.

This is a security feature that prevents unauthorized computers (with source MAC addresses unknown to the switch prior to locking the port (or ports) from connecting to the switch's locked ports and gaining access to the network.

The following fields can be set:

Parameter	Description
State <Enabled>	Toggle the State <Enabled> field to either enable or disable a given port.
Speed/Duplex <Auto>	Toggle the Speed/Duplex <Auto> field 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*.

Flow Control: Auto 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.

Lock <Disabled> 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 *Disabled* and *Enabled*.

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	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 - 20. 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.



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

Figure 6 - 21. Port Security Settings

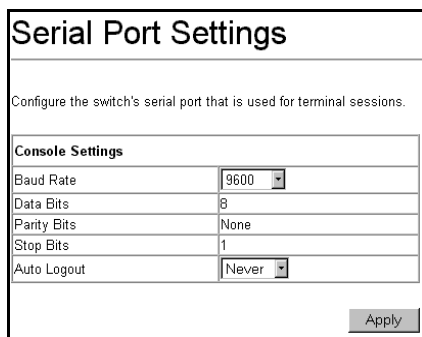
Configure the following parameters for Port Security:

Parameter	Description
Admin State <Disabled>	Toggle Admin State to either enable or disable port security for the port.
Max Learning Address <1 >	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.
Lock Address Mode <Delete On Reset>	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.
Configure Ports from __ to __	Use this to specify a consecutively numbered group of ports on the switch for configuration.

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.



The image shows a 'Serial Port Settings' window. At the top, it says 'Configure the switch's serial port that is used for terminal sessions.' Below this is a section titled 'Console Settings' containing five rows of configuration fields: 'Baud Rate' with a dropdown menu showing '9600', 'Data Bits' with a text field showing '8', 'Parity Bits' with a text field showing 'None', 'Stop Bits' with a text field showing '1', and 'Auto Logout' with a dropdown menu showing 'Never'. An 'Apply' button is located at the bottom right of the window.

Figure 6 - 22. Serial Port Settings

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

Parameter	Description
Baud Rate	Displays the serial bit rate used to communicate with a management station. The console baud rate is 9600 bits per second.
Data Bits	Displays the number of bits that make up a word when communicating with the management station. The console interface uses 8 data bits.
Stop Bits	Displays the number of bits used to indicate that a word has been completely transmitted. The console interface uses 1 stop bit.
Auto-Logout	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> .

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.

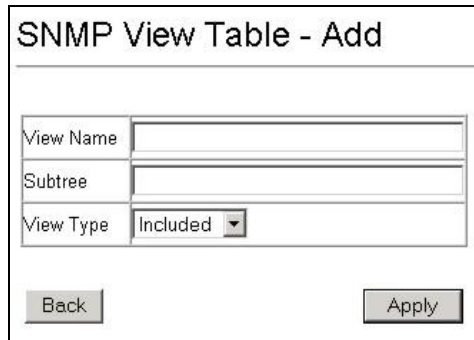
SNMP View Table

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			
	View Name	Subtree	View Type
☐	comview1	1.3.2.5.4.9	Included
☐	newview1	1.3.2.4.4	Excluded
☐	restricted	1.3.6.1.2.1.1	Included
☐	restricted	1.3.6.1.2.1.11	Included
☐	restricted	1.3.6.1.6.3.10.2.1	Included
☐	restricted	1.3.6.1.6.3.11.2.1	Included
☐	restricted	1.3.6.1.6.3.15.1.1	Included
☐	CommunityView	1	Included
☐	CommunityView	1.3.6.1.6.3	Excluded
☐	CommunityView	1.3.6.1.6.3.1	Included

Figure 6 - 23. SNMP View Table



The image shows a web form titled "SNMP View Table - Add". It contains three input fields: "View Name" (a text box), "Subtree" (a text box), and "View Type" (a dropdown menu with "Included" selected). At the bottom of the form are two buttons: "Back" and "Apply".

Figure 6 - 24. SNMP View Table – Add New

Parameter	Description
View Name	Type an alphanumeric string of up to 32 characters. This is used to identify the new SNMP view being created.
Subtree	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.
View Type	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						
New Delete						
Group Name	Read View Name	Write View Name	Notify View Name	Security Model	Security Level	
☐ Initial	restricted		restricted	SNMPv3	NoAuthNoPriv	
☐ ReadGroup	CommunityView		CommunityView	SNMPv1	NoAuthNoPriv	
☐ ReadGroup	CommunityView		CommunityView	SNMPv2	NoAuthNoPriv	
☐ WriteGroup	CommunityView	CommunityView	CommunityView	SNMPv1	NoAuthNoPriv	
☐ WriteGroup	CommunityView	CommunityView	CommunityView	SNMPv2	NoAuthNoPriv	

Figure 6 - 25. 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

Read View Name

Write View Name

Notify View Name

Security Model

SNMPv1

Security Level

NoAuthNoPriv

Back

Apply

Figure 6 - 26. SNMP Group – Add New

Parameter	Description
Group Name	Type an alphanumeric string of up to 32 characters. This is used to identify the new SNMP group of SNMP users.
Read View Name	This name is used to specify the SNMP group created can request SNMP messages.
Write View Name	Specify a SNMP group name for users that are allowed SNMP write privileges to the switch's SNMP agent.
Notify View Name	Specify a SNMP group name for users that can receive SNMP trap messages generated by the switch's SNMP agent.
Security Model	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> – Specifies that the SNMP version 3 will be used. SNMP v3

	provides secure access to devices through a combination of authentication and encrypting packets over the network.
Security Level	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.

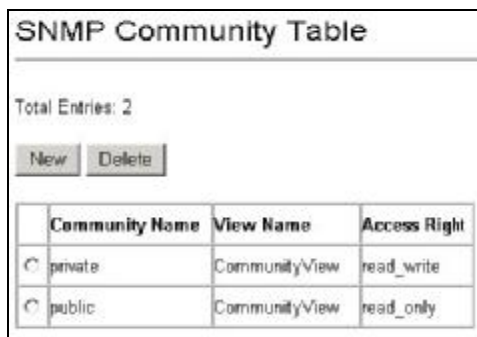
SNMP Community Table

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

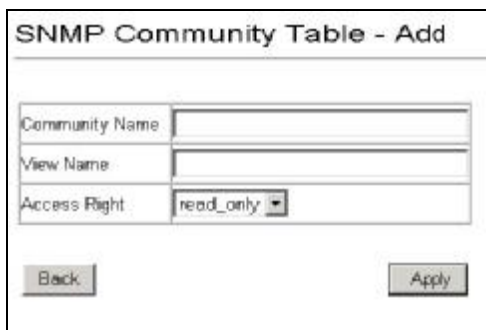


The screenshot shows a web interface titled "SNMP Community Table". Below the title, it says "Total Entries: 2". There are two buttons: "New" and "Delete". Below these is a table with three columns: "Community Name", "View Name", and "Access Right". The table contains two entries: one for "private" with "CommunityView" and "read_write", and another for "public" with "CommunityView" and "read_only".

	Community Name	View Name	Access Right
☐	private	CommunityView	read_write
☐	public	CommunityView	read_only

Figure 6 - 27. 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.



The screenshot shows a web interface titled "SNMP Community Table - Add". It contains three input fields: "Community Name", "View Name", and "Access Right". The "Access Right" field is a dropdown menu currently showing "read_only". At the bottom, there are two buttons: "Back" and "Apply".

Community Name	
View Name	
Access Right	read_only

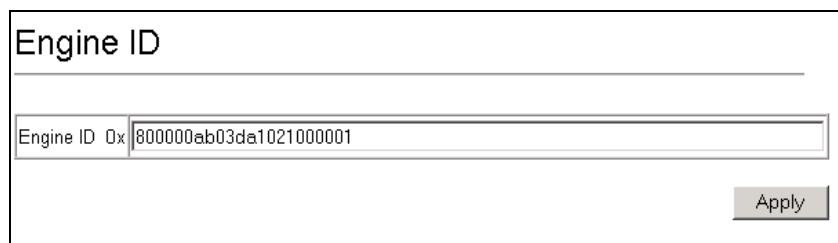
Figure 6 - 28. SNMP Community Table – Add New

Configure the following for the new SNMP Community entry:

Parameter	Description
Community Name	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.
View Name	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.
Access Right	Use the pull-down menu to select the access right: <code>read_only</code> – Specifies that SNMP community members using the community string created with this command can only read the contents of the MIBs on the switch. <code>read_write</code> – 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.



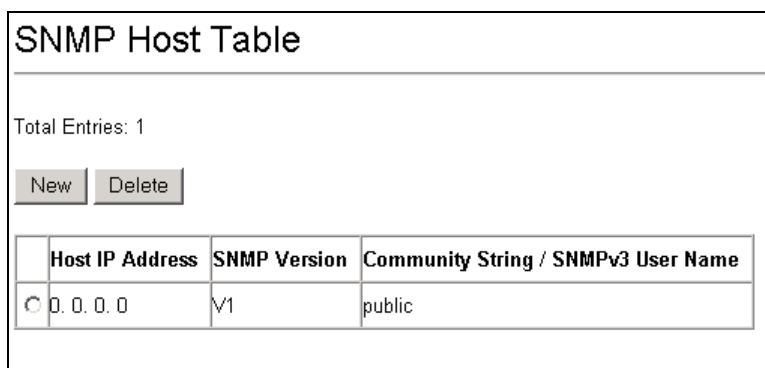
The interface shows a title 'Engine ID' at the top. Below it is a large text input field. Inside this field, there is a smaller box containing the text 'Engine ID 0x' followed by the hexadecimal string '800000ab03da1021000001'. At the bottom right of the interface is an 'Apply' button.

Figure 6 - 29. 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.

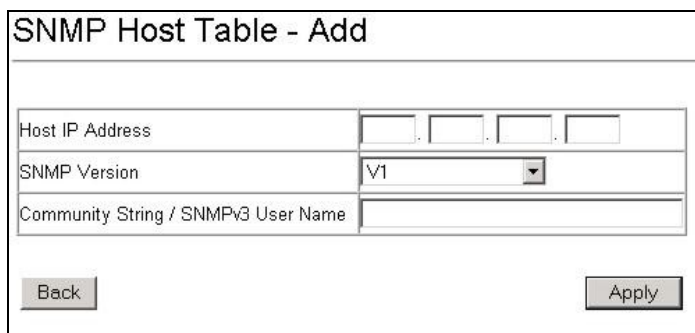


The interface is titled 'SNMP Host Table'. Below the title, it says 'Total Entries: 1'. There are two buttons: 'New' and 'Delete'. Below these is a table with three columns: 'Host IP Address', 'SNMP Version', and 'Community String / SNMPv3 User Name'. The table contains one entry with a radio button selected next to the IP address '0.0.0.0', 'V1' for the version, and 'public' for the community string.

	Host IP Address	SNMP Version	Community String / SNMPv3 User Name
☒	0.0.0.0	V1	public

Figure 6 - 30. 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.

The image shows a web-based form titled "SNMP Host Table - Add". It contains three input fields: "Host IP Address" with four separate boxes for each octet, "SNMP Version" with a pull-down menu currently showing "V1", and "Community String / SNMPv3 User Name" with a single text box. At the bottom left is a "Back" button and at the bottom right is an "Apply" button.

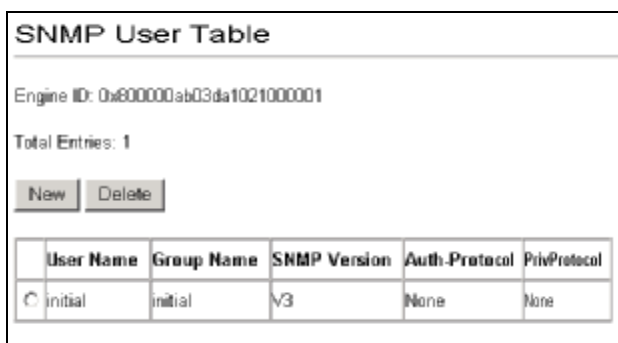
SNMP Host Table - Add	
Host IP Address	. . .
SNMP Version	V1 ▾
Community String / SNMPv3 User Name	
Back Apply	

Figure 6 - 31. SNMP Host Table – Add New

Parameter	Description
IP Address	Type the IP address of the remote management station that will serve as the SNMP host for the switch.
SNMP Version	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.
Community String or SNMP V3 User Name	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.



The screenshot shows the 'SNMP User Table' interface. At the top, it displays 'Engine ID: 0x800000ab03da1021000001' and 'Total Entries: 1'. Below this are two buttons: 'New' and 'Delete'. A table with five columns is shown: 'User Name', 'Group Name', 'SNMP Version', 'Auth-Protocol', and 'PrivProtocol'. The table contains one entry with the following values: 'initial' for User Name, 'initial' for Group Name, 'V3' for SNMP Version, 'None' for Auth-Protocol, and 'None' for PrivProtocol.

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

Figure 6 - 32. 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.



The screenshot shows the 'SNMP User Table - Add' interface. It displays 'Engine ID: 0x800000ab03000102030400'. Below this are several input fields: 'User Name', 'Group Name', 'SNMP Version' (a dropdown menu showing 'V1' and a checkbox for 'encrypted'), 'Auth-Protocol' (a dropdown menu showing 'MD5' and an adjacent input field), and 'PrivProtocol' (a dropdown menu showing 'None' and an adjacent input field). At the bottom are two buttons: 'Back' and 'Apply'.

Figure 6 - 33. SNMP User Table – Add New

Parameter	Description
User Name	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.
Group Name	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.
SNMP Version	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:	
Auth-Protocol	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. 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:

Priv-Protocol	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.
---------------	--

To create a new 802.1Q VLAN:

802.1Q VLANs

Configure 802.1Q VLANs by assigning ports a membership status.
Tagged ports can belong to more than one 802.1Q VLAN.

Total Entries: 1

[New](#) [Edit](#) [Delete](#)

	VLAN ID (VID)	VLAN Name	Advertisement	Members
C	1	default	Enabled	Unit 1 UUUUUUUU UUUUUUUU UUUUUUUU U U

Figure 6 - 34. 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:

802.1Q VLANs - Add

VLAN ID (VID)		☐ Auto Assign
VLAN Name		
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	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Tagged	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Untagged	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Forbidden	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Figure 6 - 35. 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:

802.1Q VLANs - Edit

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	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Tagged	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Untagged	☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒
Forbidden	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Figure 6 - 36. 802.1Q Static VLANs Entry Settings – Edit

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

Parameter	Description
VLAN ID (VID)	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.
VLAN Name	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.
Advertisement	Advertising can be enabled or disabled using this pull-down menu. Advertising allows members to join this VLAN through GVRP.
Port	Allows an individual port to be specified as member of a VLAN.
Tagged/Untagged	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.

Untagged	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.
Egress	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.
Forbidden	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 VPID of incoming packets. Packets that don't match the port's VPID 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 - 37. Port VLAN ID (PVID)

The following fields can be set:

Parameter	Description
PVID	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.
GVRP <Disabled>	The Group VLAN Registration Protocol (GVRP) enables the port to dynamically become a member of a VLAN.
Ingress Checking <Disabled>	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

Disabled ▾

Apply

Figure 6 - 38. – Switch GVRP

Parameter	Description
GVRP <disabled>	Group VLAN Registration Protocol (GVRP) – this enables and disables GVRP on the switch without changing the port GVRP settings.

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 — the lowest priority queue — to 3 — the highest priority queue. The eight priority queues specified in IEEE 802.1p (Q0 to Q7) are mapped to the switch's priority queues as follows:

Q1 and Q0 are assigned to the switch's Q0 queue.

Q3 and Q2 are assigned to the switch's Q1 queue.

Q5 and Q4 are assigned to the switch's Q2 queue.

Q7 and Q6 are assigned to the switch's Q3 queue.

The switch's four priority queues are emptied 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.

For strict priority-based scheduling, any packets residing in the higher priority queues are transmitted first. Only when these queues are empty, are packets of lower priority transmitted.

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.

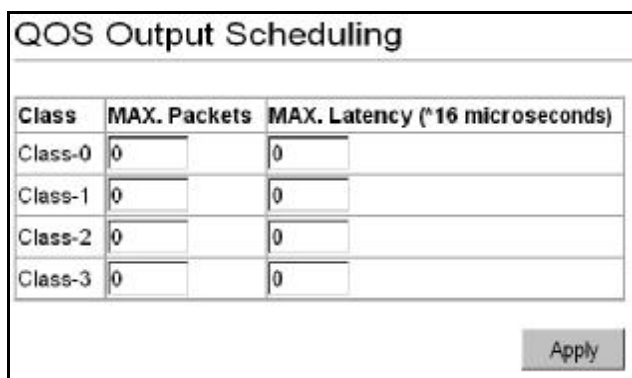
The possible range for maximum packets is: 0 to 255 packets.

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 then click on the QOS Output Scheduling link:



Class	MAX. Packets	MAX. Latency (*16 microseconds)
Class-0	0	0
Class-1	0	0
Class-2	0	0
Class-3	0	0

Apply

Figure 6 - 39. 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 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 and gives the priority queue that it was set for access to the transmit buffer.

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 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

Port	Default Priority
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

Apply

Figure 6 - 40. 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.

Configuring 802.1p User Priority

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

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

Apply

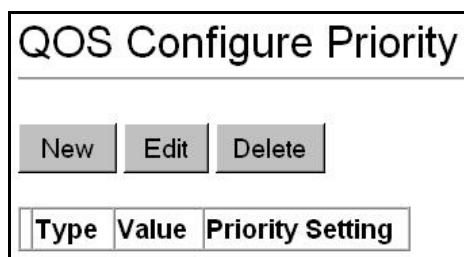
Figure 6 - 41. QOS Class of Traffic

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.

QOS Configuring Priority

The DES-3226S allows you to configure how forwarded packet's priority value will be changed or maintained by the switch prior to transmitting the packet. You can specify how a packet's priority value will be written by the switch by DSCP, 802.1p, TCP or UDP port number, IP address, or MAC address.

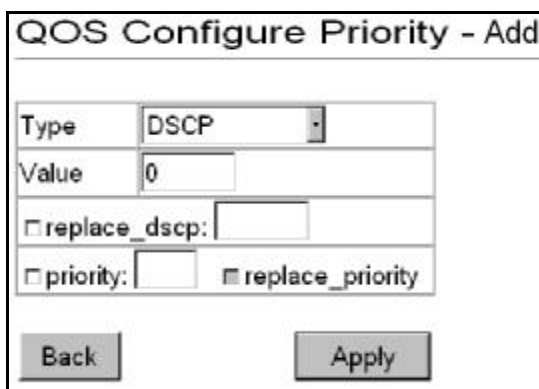
Click on the QOS Configure Priority link:



Type	Value	Priority Setting
------	-------	------------------

Figure 6 - 42. QOS Configure Priority

Clicking on the New button opens the following window:



Type	DSCP
Value	0
☐ replace_dscp:	
☒ priority:	☐ replace_priority

Back Apply

Figure 6 - 43. QOS Configure Priority - Add

The QOS Configure Priority - Add input screen is divided into two parts – the criteria the switch will use to identify which packets will be subject to the actions selected in the second part. The first part of the screen consists of the Type drop-down menu and the Value field.

The first part of the screen allows you to specify packets that have DSCP or 802.1p priority values. If a packet has the DSCP or 802.1p priority value entered in the Value field, then the actions specified by the `replace_dscp:`, `priority:`, or `replace_priority:` click-boxes will be executed.

In addition, you can specify that packets that contain a specific IP or MAC address as their destination, will receive the actions specified by the `replace_dscp:`, `priority:`, or `replace_priority:` click-boxes. The IP or MAC address is entered into the appropriate field that appears when these options are selected.

You can also specify that packets that have a specified TCP or UDP port number in their headers will receive the actions specified by the `replace_dscp:`, `priority:`, or `replace_priority:` click-boxes. The TCP or UDP port number is entered into the Value field.

The `replace_dscp:` click-box instructs the switch to replace the DSCP value (in a packet that meets the selected criteria) with the value entered in the adjacent field.

The `priority:` click-box instructs 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.

The `replace_priority:` click-box instructs 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.

The following fields can be set:

Parameter	Description
Type	The drop-down menu allows you to select which criteria will be used by the switch to make priority queuing decisions. The available choices are: DSCP - the switch will use the Differentiated Services Code Point information contained in an incoming packet to determine if the actions specified in the click-boxes will be executed. The value of the DSCP is a number between 0 and 63 – with 0 being the lowest priority. 802.1p - the switch will use the 802.1p priority tag information contained in an incoming packet to determine if the actions specified in the click-boxes will be executed. The value of the 802.1p tag is between 0 and 7 – with 0 being the lowest priority. TCP - the switch will use the TCP port number contained in an incoming packet to assign the packet to determine if the actions specified in the click-boxes will be executed. The TCP port number that will receive the specified priority handling is specified in the Value field. UDP - the switch will use the UDP port number contained in an

incoming packet to assign the packet to determine if the actions specified in the click-boxes will be executed. The UDP port number that will receive the specified priority handling is specified in the Value field.

IP Address - the switch will use the IP address contained in an incoming packet to assign the packet to determine if the actions specified in the click-boxes will be executed. The IP address that will receive the specified priority handling is entered in the IP Address field that appears below the Type field when this option is selected.

MAC Address - the switch will use the MAC address contained in an incoming packet to assign the packet to determine if the actions specified in the click-boxes will be executed. The MAC address that will receive the specified priority handling is entered in the MAC Address field that appears below the Type field when this option is selected.

Value This field allows the entry of a number that is relevant to the selection made in the Type field above.

replace_dscp: The replace_dscp: click-box instructs the switch to replace the DSCP value (in a packet that meets the selected criteria) with the value

entered in the adjacent field.

priority: The **priority:** click-box instructs 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.

replace_priority The **replace_priority:** click-box instructs 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.

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: Disabled

Target Port: Unit: 1 Port: 1

Unit	1																																																																																																																																							
Mirrored Port	<table> <tr> <th></th> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>24</th><th>25</th><th>26</th> </tr> <tr> <td>None</td> <td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td><td>☒</td> </tr> <tr> <td>Rx</td> <td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td> </tr> <tr> <td>Tx</td> <td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td> </tr> <tr> <td>Both</td> <td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td> </tr> </table>		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	None	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	Rx	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Tx	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Both	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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Rx	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐																																																																																																														
Tx	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐																																																																																																														
Both	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐																																																																																																														

Apply

Figure 6 - 44. 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:

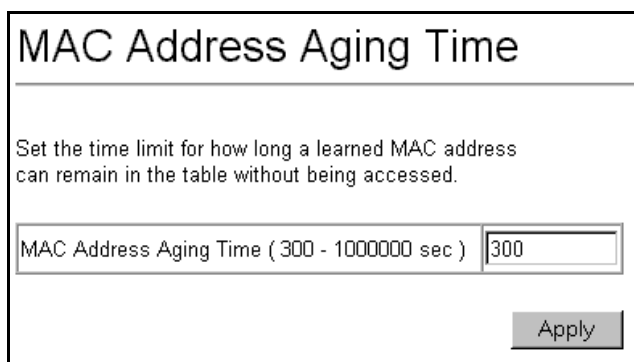
Parameter	Description
Source Port	Allows the entry of the port number of the port to be mirrored. This port is the source of the packets to be duplicated and forwarded to the Target port.
Direction <Ingress>	This field can be toggled between <i>Either</i> , <i>Ingress</i> and <i>Egress</i> . <i>Ingress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

Forwarding

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:

The image shows a web-based configuration window titled "MAC Address Aging Time". Below the title is a descriptive text: "Set the time limit for how long a learned MAC address can remain in the table without being accessed." Below this text is a text input field with the label "MAC Address Aging Time (300 - 1000000 sec)" and a value of "300" entered. To the right of the input field is an "Apply" button.

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)	300
Apply	

Figure 6 - 45. 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

	MAC Address	VLAN Name	Unit	Port	Type
☐	aa-bb-cc-dd-ee-ff	default	1	1	Static

Figure 6 - 46. 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	
VLAN Name	
Type	Static
Unit	1
Port	1

Figure 6 - 47. 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
Unit	1
Port	1

BackApply

Figure 6 - 48. Unicast MAC Address Settings - Edit

The following fields can be set:

Parameter	Description
MAC Address	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.
VLAN Name	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.
Unit	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.

Port 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:

Multicast MAC Address Settings

Configure how specific multicast MAC addresses are forwarded.

Total Entries: 1

New

Edit

Delete

MAC Address	VLAN Name	Port Map					
		1	to 8	9	to 16	17 to 24	25 26
☐ 01-00-5e-ff-dd-cc	default	Unit 1	-----	-----	-----	-	-

Figure 6 - 49. Multicast MAC Address Settings

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

Multicast MAC Address Settings - Add

MAC Address																											
VLAN Name																											
Unit	1 ▾																										
State	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	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Egress	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Forbidden	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Figure 6 - 50. 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:

Multicast MAC Address Settings - Edit

MAC Address	01-00-5e-ff-dd-cc																										
VLAN Name	default																										
Unit	1 ▾																										
State	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	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Egress	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Forbidden	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Figure 6 - 51. Multicast MAC Address Settings - Edit

The following fields can be set:

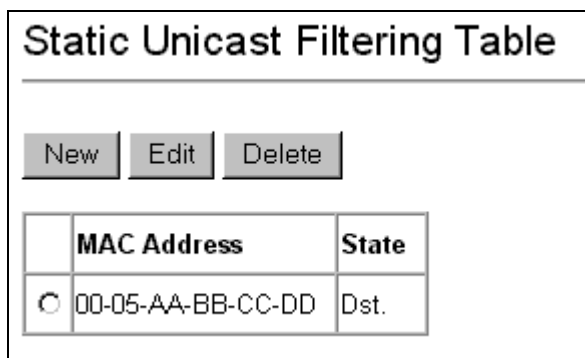
Parameter	Description
MAC Address:[]	Allows the entry of the MAC address of an end station that will be entered into the switch's static forwarding table.
VLAN Name	Allows the entry of the VLAN name of the VLAN the MAC address below is a member of – when adding a new

	entry to the table. Displays the VLAN name of the VLAN the MAC address is a member of – when editing an existing entry.
Port: []	Allows the entry of the port number on which the MAC address entered above resides.
None	Specifies the port as being none.
Egress	Specifies the port as being a source of multicast packets originating from the MAC address specified above.
Forbidden	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.

Static Unicast Filtering Table

Unicast MAC address entered into the switch's Static Unicast Filtering Table will have packets addressed to these MAC addresses filtered from the switch.

To enter a Unicast MAC address into the switch's filtering table, click on the Forwarding folder and then the MAC Forwarding folder and then click on the Static Unicast MAC Filtering Table link:



The interface titled "Static Unicast Filtering Table" features three buttons at the top: "New", "Edit", and "Delete". Below these is a table with two columns: "MAC Address" and "State". The first row of the table contains a radio button, the MAC address "00-05-AA-BB-CC-DD", and the state "Dst.".

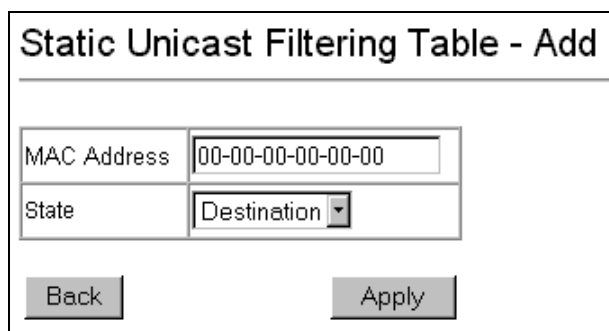
	MAC Address	State
☐	00-05-AA-BB-CC-DD	Dst.

Figure 6 - 52. Static Unicast Filtering Table

All of the unicast MAC addresses currently entered into the switch's filtering table are displayed.

To add a unicast MAC address to the filtering table:

Click on the New button:



The interface titled "Static Unicast Filtering Table - Add" contains two input fields. The "MAC Address" field is populated with "00-00-00-00-00-00". The "State" field is a dropdown menu currently showing "Destination". At the bottom are two buttons: "Back" and "Apply".

MAC Address	00-00-00-00-00-00
State	Destination

Back Apply

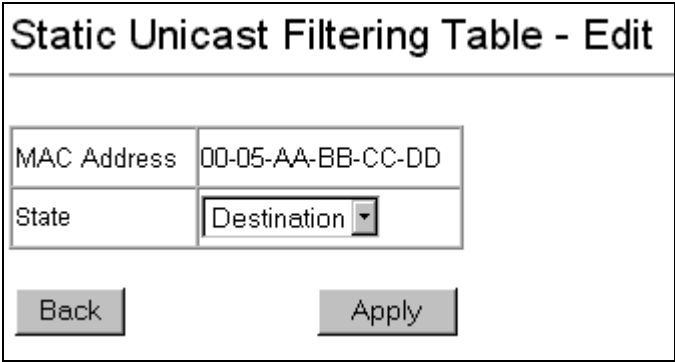
Figure 6 - 53. Static Unicast Filtering Table - Add

Enter the unicast MAC address in the MAC Address field, and specify if this address will be a Destination, a Source, or Either a source or destination of packets. Specifying a MAC address entry in the filtering table as a Destination will filter

packets with this MAC address as their destination. Source will filter packets with this MAC address as their source, and Either will filter packets with this MAC address as either their source or destination.

To edit an existing Static Unicast Filtering Table entry:

Select the filtering table entry you want to edit by clicking the appropriate click-box, and then click the Edit button:



Static Unicast Filtering Table - Edit	
MAC Address	00-05-AA-BB-CC-DD
State	Destination ▼
Back Apply	

Figure 6 - 54. Static Unicast Filtering Table - Edit

The Static Unicast Filtering Table - Edit screen allows you to edit any selected entry in the switch's filtering table.

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:

Broadcast/Multicast Storm Control

Configure thresholds for triggering storm control for broadcast and multicast packets.

Unit 1

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

Apply

Figure 6 - 55. 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 STP and 802.1w Rapid STP. The spanning tree commands in the Command Line Interface (CLI) are listed (along with the appropriate parameters) in the following table.

STP Switch Settings

The Spanning Tree Protocol (STP) 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	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	RSTP ▾
TX Hold Count (1 - 10)	3
Forwarding BPDU	Enabled ▾
Apply	

Figure 6 - 56. STP Switch Settings

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

Parameter	Description
Status <Enabled>	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 .. 65535) <32768>	A Priority for the switch can be set from 0 to 65535. 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	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	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	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							
Edit							
Port	State	Cost	Priority	Edge	P2P	Status	Role
e1	Enabled	*200000	128	No	Yes	Disabled	Disabled
e2	Enabled	*200000	128	No	Yes	Forwarding	NonStp
e3	Enabled	*200000	128	No	Yes	Disabled	Disabled
e4	Enabled	*200000	128	No	Yes	Disabled	Disabled
e5	Enabled	*200000	128	No	Yes	Disabled	Disabled
e6	Enabled	*200000	128	No	Yes	Disabled	Disabled
e7	Enabled	*200000	128	No	Yes	Disabled	Disabled
e8	Enabled	*200000	128	No	Yes	Disabled	Disabled
e9	Enabled	*200000	128	No	Yes	Disabled	Disabled
e10	Enabled	*200000	128	No	Yes	Disabled	Disabled
e11	Enabled	*200000	128	No	Yes	Disabled	Disabled
e12	Enabled	*200000	128	No	Yes	Disabled	Disabled
e13	Enabled	*200000	128	No	Yes	Disabled	Disabled
e14	Enabled	*200000	128	No	Yes	Disabled	Disabled
e15	Enabled	*200000	128	No	Yes	Disabled	Disabled
e16	Enabled	*200000	128	No	Yes	Disabled	Disabled
e17	Enabled	*200000	128	No	Yes	Disabled	Disabled
e18	Enabled	*200000	128	No	Yes	Disabled	Disabled
e19	Enabled	*200000	128	No	Yes	Disabled	Disabled
e20	Enabled	*200000	128	No	Yes	Disabled	Disabled
e21	Enabled	*200000	128	No	Yes	Disabled	Disabled
e22	Enabled	*200000	128	No	Yes	Disabled	Disabled
e23	Enabled	*200000	128	No	Yes	Forwarding	NonStp
e24	Enabled	*200000	128	No	Yes	Forwarding	NonStp
e25	Enabled	*200000	128	No	Yes	Disabled	Disabled
e26	Enabled	*200000	128	No	Yes	Disabled	Disabled

Figure 6 - 57. STP Port Settings

To change STP 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.

STP Port Settings - Edit

Port	2
State	Enabled
Cost	200000 ☒ Auto
Priority	128
Migration	No
Edge	No
P2P	Yes
Configure Ports from 2 to	1

BackApply

Figure 6 - 58. Edit 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.

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
Cost	A Port Cost can be set from 1 to 65535. The lower the number, the greater the probability the port will be chosen to forward packets.
Priority	A Port Priority can be from 0 to 255. The lower the number, the greater the probability the port will be chosen as the Root Port.
Migration	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.
Edge	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.

P2P

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.

**Configure Ports
from __ to __**

A consecutive groups 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 - 59. MAC Notification Global Settings

Configure the following MAC notification global settings:

Parameter	Description
State	Enable or Disable MAC notification switch wide form the pull-down menu.
Interval	This is the time in seconds between notifications.
History Size	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.

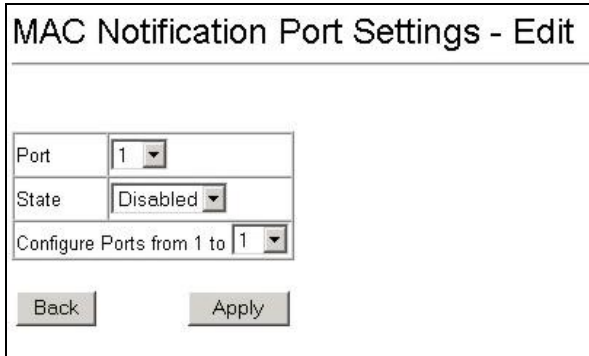
MAC Notification Port Settings

Edit

	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 - 60. 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: 1

State: Disabled

Configure Ports from 1 to 1

Back Apply

Figure 6 - 61. 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 groups 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.

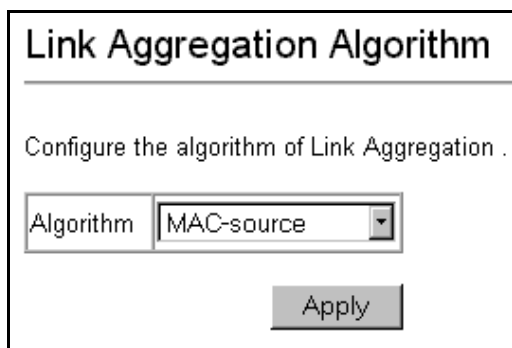
The switch allows the creation of up to 6 link aggregation groups, each group consisting of up to 8 links (ports). The aggregated links must be contiguous (they must have sequential port numbers) except the two (optional) Gigabit ports – which can only belong to a single link aggregation group. A link 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.

The image shows a web-based configuration window titled "Link Aggregation Algorithm". Below the title is a horizontal line, followed by the text "Configure the algorithm of Link Aggregation .". There is a label "Algorithm" next to a dropdown menu that currently displays "MAC-source". Below the dropdown is an "Apply" button.

Link Aggregation Algorithm

Configure the algorithm of Link Aggregation .

Algorithm

Figure 6 - 62. 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.

	Group ID	Master Port	Port Members	Status	Anchor
			1 to 8 9 to 16 17 to 24 25 26		
☐	1	Unit 1 Port 10	Unit 1 ----- -*----- ---***** - -	Enabled	Unit 1 Port 10

Figure 6 - 63. Link Aggregation

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

Link Aggregation

Group ID:

Master Port: Unit: Port:

Status:

Unit:

Port Member:

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

Figure 6 - 64. 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	1																									
Master Port	Unit:	1	Port:	10																						
Status	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
Member	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☐	☐
Back Apply																										

Figure 6 - 65. Link Aggregation - Edit

The following fields can be set:

Parameter	Description
Group ID	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 and existing entry.
Master Port <1>	The Master port of link aggregation group.
Unit	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.
Port Member	Allows the specification of the ports that will make up the link

aggregation group.

State <*Disabled*>

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. This is done using the 802.1 State menu (see the end of 802.1 Configuration section). 802.1X settings can be configured before it is enabled switch wide.

802.1X Port Settings

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

802.1X Port Settings - Edit

Port	3
Capability	None ▾
Port Status	Authorized
Pae State	Force_Authorized
Backend State	Success
AdminCrDir	Both ▾
OperCrDir	Both
Port Control	Auto ▾
QuietPeriod (sec)	60
TxPeriod (sec)	30
SuppTimeout (sec)	30
ServerTimeout (sec)	30
MaxReq	2
ReAuthPeriod (sec)	3600
ReAuthenticate	Disabled ▾

Back Apply

Figure 6 - 67. 802.1X Port Settings – Edit

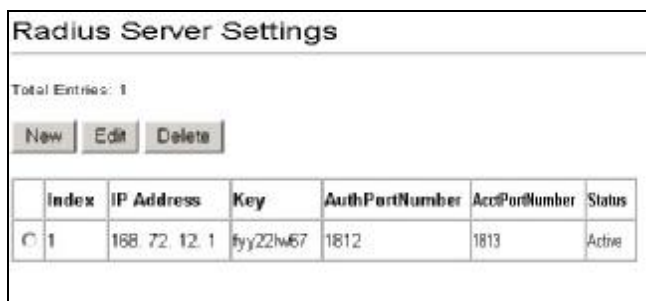
Configure the following 802.1x port settings:

Parameter	Description
Port	Port being configured for 802.1x settings.
Capability	Two role choices can be selected: 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.
Port status	Lists the current status of port, Authorized or Unauthorized.
PAE State	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.
Backend State	Shows the current state of the Backend Authenticator.
AdminCtlState	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.
OperCtlState	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.
Port Control	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.
Quiet Period	Select the time interval between authentication failure and the start of a new authentication attempt.
Tx Period	Select the time to wait for a response from a supplicant (user) to send EAP Request/Identity packets.
Support Timeout	Select the time to wait for a response from a supplicant (user) for all EAP packets, except for the Request/Identity packets.
Server Timeout	Select the length of time to wait for a response from a Radius server.
MaxReq	Select the maximum number of times to retry sending packets to the supplicant.
ReAuthPeriod	Select the time interval between successive re-authentications.
ReAuthenticate	Enable or disable reauthentication.

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

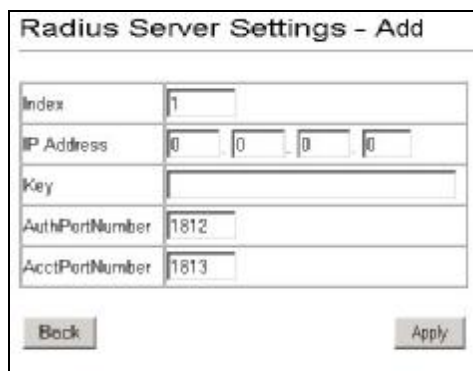


The screenshot shows the 'Radius Server Settings' page. At the top, it says 'Total Entries: 1'. Below this are three buttons: 'New', 'Edit', and 'Delete'. A table follows with the following data:

	Index	IP Address	Key	AuthPortNumber	AcctPortNumber	Status
	1	168.72.12.1	fy22hw67	1812	1813	Active

Figure 6 - 68. 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' page. It contains the following fields:

- Index: 1
- IP Address: 168.72.12.1
- Key: fy22hw67
- AuthPortNumber: 1812
- AcctPortNumber: 1813

At the bottom are two buttons: 'Back' and 'Apply'.

Figure 6 - 69. Radius Server – Add New

Configure the following Radius server settings:

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

Radius Server Settings - Edit

Index	1
IP Address	168 . 72 . 12 . 1
Key	hy22M67
AuthPortNumber	1812
AcctPortNumber	1813

Figure 6 - 70. Edit Radius Server Settings

802.1X State

To enable 802.1x on the switch select *Enabled* and click the Apply button.

A screenshot of a web-based configuration interface for a switch. The title "802.1X State" is at the top. Below it is a label "802.1X State" followed by a dropdown menu currently set to "Disabled". At the bottom right is an "Apply" button.

802.1X State	
802.1X State	Disabled ▼
Apply	

Figure 6 - 71. 802.1X State – Enable/Disable

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
	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 - 72. 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 - 65535)	1
Querier State	Disabled ▾
Host Timeout (1 - 16711450)	260
Host Leave Timer (1 - 16711450)	2
Route Timeout (1 - 16711450)	260
State	Disabled ▾

BackApply

Figure 6 - 73. IGMP Snooping Configuration

The following fields can be set:

Parameter	Description
VLAN Name	Allows the entry of the name of the VLAN for which IGMP Snooping is to be configured.
Query Interval	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.

Max Response	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.
Robustness Variable	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.
Last Member Query Interval	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.
Querier State	This field can be switched using the pull-down menu between <i>Disabled</i> and <i>Enabled</i> .
Host Timeout	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.
Host Leave Timer	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.
Route Timeout	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.
State <Disabled>	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.

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.

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:

The screenshot shows a web browser window with the title 'Download Firmware from TFTP Server'. Below the title is a heading 'Upgrade the switch's firmware.' followed by a form. The form contains three input fields: 'Select Upgrade Unit' with a dropdown menu showing '1' and a checkbox; 'Server IP Address' with four individual input boxes for each octet, all containing '0'; and 'Path \ Filename' with a single text input box. At the bottom of the form are two buttons: 'Download' and 'Save Settings'.

Figure 6 - 74. 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.

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

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

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.

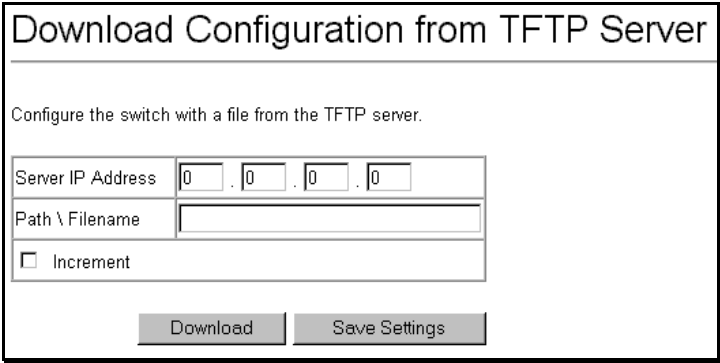
The TFTP server must be running TFTP server software to perform the file transfer. TFTP server software is a part of many network management software packages – such as NetSight, or can be obtained as a separate program.

Click Download to record the IP address of the TFTP server. Use the Save Settings to enter the address into NV-RAM.

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:



The screenshot shows a web browser window with the title "Download Configuration from TFTP Server". Inside the window, there is a heading "Download Configuration from TFTP Server" and a sub-heading "Configure the switch with a file from the TFTP server." Below this, there is a form with three main sections: "Server IP Address" with four input boxes each containing "0", "Path \ Filename" with a single text input box, and an "Increment" checkbox which is unchecked. At the bottom of the form are two buttons: "Download" and "Save Settings".

Figure 6 - 75. Use Configuration File on Server

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

Click Apply to record the IP address of the TFTP server. Use Save Changes from the Maintenance menu to enter the address into NV-RAM

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:

The screenshot shows a web form titled "Upload Settings to TFTP Server". Below the title is a instruction: "Save the switch's configuration to the TFTP server." There are two input fields: "Server IP Address" with four sub-fields each containing "0", and "Path \ Filename" with a single text box. At the bottom are two buttons: "Upload" and "Save Settings".

Figure 6 - 76. 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 Apply. Highlight Start 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:

The screenshot shows a web form titled "Upload History Log to TFTP Server". Below the title is a instruction: "Save the switch's history log to the TFTP server." There are two input fields: "Server IP Address" with four sub-fields each containing "0", and "Path \ Filename" with a single text box. At the bottom are two buttons: "Upload" and "Save Settings".

Figure 6 - 77. 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 Apply to make the changes current. Click Start to initiate the file transfer.

Utilities

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	0 . 0 . 0 . 0
Number of Repetitions	☒ Infinite times ☐ times (1 - 255)
Default Timeout	1 sec. (1 - 99)

Start

Figure 6 - 78. 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.

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.

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

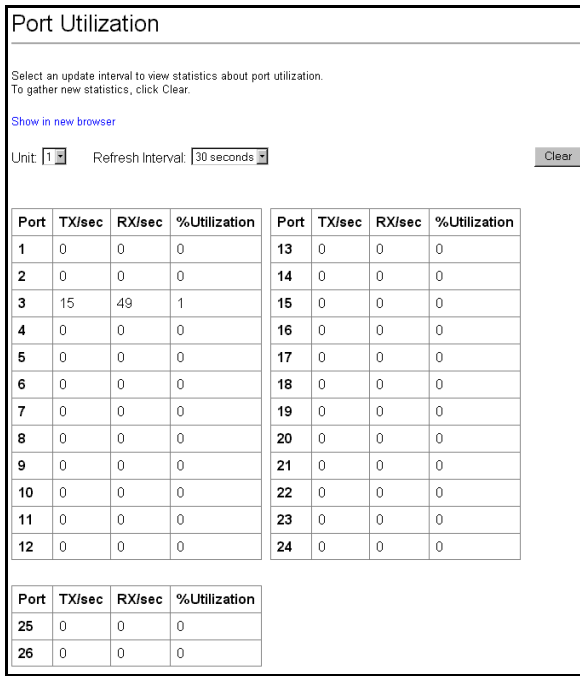


Figure 6 - 79. Port Utilization window

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 following field can be set:

Parameter	Description	
Update Interval <Suspend>	Interval	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

CRC Error	0
Undersize	0
Oversize	0
Fragment	0
Jabber	0
Drop Packets	0

TX Frames

Excessive Deferral	0
CRC Error	0
Late Collision	0
Excessive Collision	0
Single Collision	0
Collision	0

Figure 6 - 80. 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 following fields from above are described in more detail:

Parameter	Description
Unit	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.
Port	Allows the selection of a particular port on the switch.
Update Interval < <i>Suspend</i> >	The interval (in seconds) that the table is updated. The default is <i>Suspend</i> .
RX Frames	Received packets.
CRC Error	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).
Undersize	The total number of frames received that were less than 64 octets long (excluding framing bits, but including FCS octets) and were otherwise well formed.
Oversize	The total number of frames received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed.
Fragment	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.
Jabber	The total number of frames received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either an FCS or an alignment error.
Drop Packets	The total number of events in which packets were dropped due to a lack of resources.
TX Frames	Transmitted packets.
Excessive Deferral	The number of frames for which the first transmission attempt on a particular interface was delayed because the medium was busy.
CRC Error	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).
Late Collision	Late Collisions. The number of times that a collision is detected later than 512 bit-times into the transmission of a packet.
Excessive Collision	Excessive Collisions. The number of frames for which transmission failed due to excessive collisions.
Single Collision	Single Collision Frames. The number of successfully transmitted frames for which transmission is inhibited by more than one collision.

Collision

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:

Port Packet Analysis

Select a port and an update interval to view statistics about packet types and frames.
To gather new statistics, click Clear.

[Show in new browser](#)

Unit: Port: Interval:

Frame Size	Frame Counts	Frames/sec
64	943192	48
65-127	307197	9
128-255	108136	0
256-511	117813	7
512-1023	282124	2
1024-1518	453053	14

Packet Type	Total	Total/sec
RX Bytes	1007006387	4522
RX Frames	2185487	50
TX Bytes	8886597	22262
TX Frames	26041	30

Frame Type	Frame Counts	Frames/sec
Unicast RX	827850	25
Multicast RX	753319	4
Broadcast RX	604318	21

Figure 6 - 81. Port Packet Analysis window

The following fields from above are described in more detail:

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

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

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 Table By VLAN

VLAN Name

Browse Table By MAC Address

MAC Address

Browse Table By Port

Unit: Port:

VID	VLAN Name	MAC Address	Unit	Port	Type
1	default	00-00-22-22-22-52	1	3	Learned
1	default	00-00-e2-4f-57-03	1	3	Learned
1	default	00-00-e2-54-22-81	1	3	Learned
1	default	00-00-e2-6b-bc-f6	1	3	Learned
1	default	00-01-02-03-04-00	1	3	Learned
1	default	00-01-30-fa-5f-00	1	3	Learned
1	default	00-01-96-9c-06-00	1	3	Learned
1	default	00-04-76-61-14-66	1	3	Learned
1	default	00-05-5d-0a-c6-d6	1	3	Learned
1	default	00-05-5d-25-9b-26	1	3	Learned
1	default	00-05-5d-26-04-be	1	3	Learned
1	default	00-05-5d-ed-6f-83	1	3	Learned
1	default	00-05-5d-ed-84-ea	1	3	Learned
1	default	00-05-5d-ef-90-fd	1	3	Learned
1	default	00-05-5d-f6-9e-66	1	3	Learned
1	default	00-05-5d-f8-78-81	1	3	Learned
1	default	00-05-5d-f8-79-1c	1	3	Learned
1	default	00-05-5d-f8-96-27	1	3	Learned
1	default	00-05-5d-f8-96-f1	1	3	Learned
1	default	00-05-5d-f9-26-db	1	3	Learned

Total Addresses in Table: 289

Figure 6 - 82. 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 ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒
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 ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒
Number of IEEE 802.1Q VLANs: 1	

Figure 6 - 83. 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:

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 - 84. 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:

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 - 85. IGMP Snooping Status

The following fields can be set or are displayed.

Parameter	Description
Multicast Group	The IP address of the multicast group.
MAC Address	The MAC address of the multicast group.
Reports	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 - 86. Switch History



TECHNICAL SPECIFICATIONS

General		
Standards:	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	
Protocols:	CSMA/CD	
Data Transfer Rates:	Half-duplex	Full-duplex
Ethernet	10 Mbps	20Mbps
Fast Ethernet	100Mbps	200Mbps
Gigabit Ethernet	n/a	2000Mbps

General	
---------	--

Topology:	Star
-----------	------

General	
Network Cables: 10BASE-T:	2-pair UTP Cat. 3,4,5 (100 m) EIA/TIA- 568 100-ohm STP (100 m)
100BASE-TX:	2-pair UTP Cat. 5 (100 m) EIA/TIA-568 100-ohm STP (100 m)
Fiber Optic:	IEC 793-2:1992 Type A1a - 50/125um multimode Type A1b - 62.5/125um multimode Both types use SC optical connector
Number of Ports:	24 x 10/100 Mbps NWay ports 2 Gigabit Ethernet (optional)

Physical and Environmental	
AC inputs:	100 - 240 VAC, 50/60 Hz (internal universal power supply)
Power Consumption:	29 watts maximum
DC fans:	2 built-in 40 x 40 x10 mm fan
Operating Temperature:	0 to 50 degrees Celsius
Storage Temperature:	-25 to 55 degrees Celsius
Humidity:	Operating: 5% to 95% RH non-condensing; Storage: 0% to 95% RH non-condensing
Dimensions:	441 mm x 207 mm x 44 mm (1U), 19 inch rack-mount width

Physical and Environmental	
	mount width
Weight:	2.5 kg
EMI:	FCC Class A, CE Class A, VCCI Class A, BSMI Class A, C-Tick Class A FCC Part 15/IECES-003 (Canada), VCCI Class A ITE, EN55022/EN50082-1 or EN%24, C-Tick (AS/NZS3548, BSMI (CNS 13438)
Safety:	UL, CSA, CE Mark, TUV/GS CSA International

Performance	
Transmission Method:	Store-and-forward
RAM Buffer:	8 MB per device
Filtering Address Table:	8K MAC address per device
Packet Filtering/ Forwarding Rate:	Full-wire speed for all connections. 148,800 pps per port (for 100Mbps) 1,488,000 pps per port (for 1000Mbps)
MAC Address Learning:	Automatic update.
Forwarding Table Age Time:	Max age:10-9999 seconds. Default = 300.



SWITCH FIRMWARE ADDENDUM

The following is an overview of the changes between firmware release B-15 and firmware release B-21 for the DES-3226S switch:

Factory Reset

Several options have been added to the Factory Reset function in the B-21 Firmware.

The B-15 Firmware offered the ability to retain the switch's IP address, subnet mask, and default gateway settings – while resetting all other settings to their factory defaults.

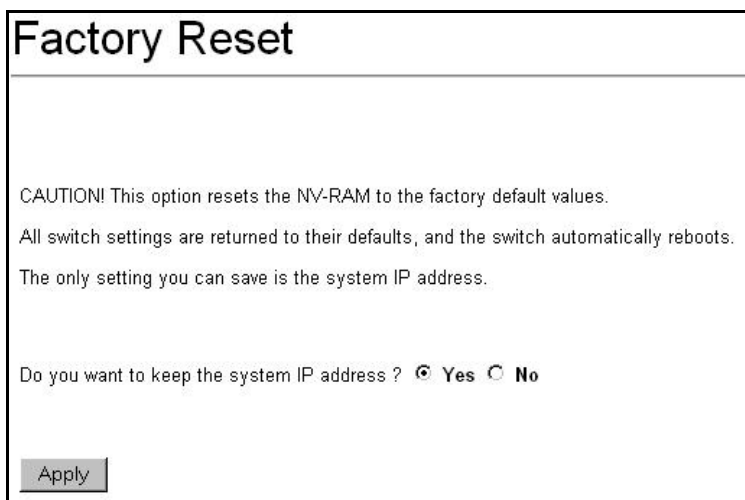
The B-21 Firmware adds the option of retaining the switch's User Accounts and History Log while resetting all other configuration parameters to their factory defaults.

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.

Firmware B-15:



Factory Reset

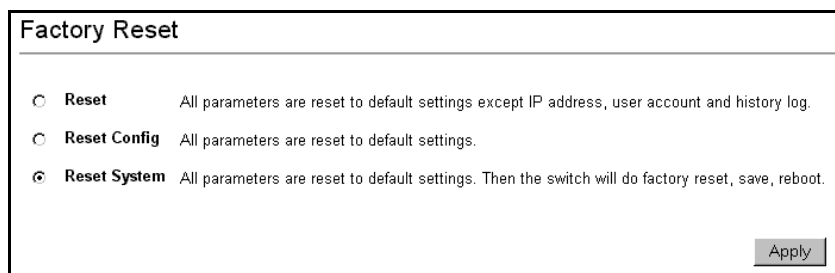
CAUTION! This option resets the NV-RAM to the factory default values.
All switch settings are returned to their defaults, and the switch automatically reboots.
The only setting you can save is the system IP address.

Do you want to keep the system IP address ? ☒ Yes ☐ No

Apply

Figure C-1. Factory Reset - Firmware B-15

Firmware B-21:



Factory Reset

☐ **Reset** All parameters are reset to default settings except IP address, user account and history log.

☐ **Reset Config** All parameters are reset to default settings.

☒ **Reset System** All parameters are reset to default settings. Then the switch will do factory reset, save, reboot.

Apply

Figure C-2. Factory Reset - Firmware B-21

Reset – retains the switch’s IP settings, user accounts, and history log while resetting all other configuration parameters to their factory defaults.

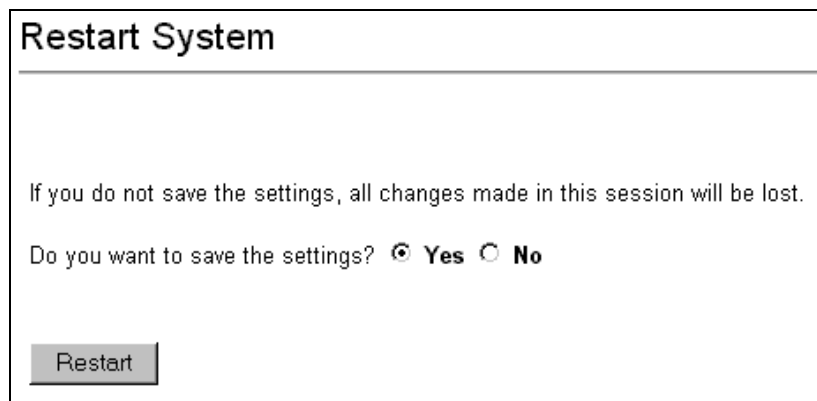
Reset Config – all configuration parameters are reset to their factory defaults, but are not entered into the switch's non-volatile RAM. If **Save Changes** is not executed, the switch will return to the last saved configuration when rebooted.

Reset System – all configuration parameters are reset to their factory defaults, and are then saved to the switch's non-volatile RAM.

Restart System

A **Restart System** function has been added with Firmware B-21. This function was not supported in Firmware B-15.

Firmware B-21:



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 C-3. Restart System Screen - Firmware B-21

Note: clicking **Yes** is the equivalent of executing **Save Changes** and then restarting the switch.

Switch Information

The Switch Information screen has been modified in Firmware B-21 to remove some extraneous information.

Firmware B-15

Switch Information	
Displays information about the switch's hardware and firmware.	
Device Type	DES-3226S Fast-Ethernet Switch
Module Type	EXT_MODULE_1P_GBIC_1P_STACK
MAC Address	00-11-33-44-55-66
Get IP From	Manual
IP Address	10.42.73.10
VLAN Name	default
Subnet Mask	255.0.0.0
Default Gateway	10.1.1.254
Boot PROM Version	Build 0.00.001
Firmware Version	Build 1.00-B10
Hardware Version	1B1
Device S/N	
Name	
Location	
Contact	
Spanning Tree	Disabled
GVRP	Disabled
IGMP Snooping	Disabled
RIP	Disabled
DVMRP	Disabled
PIM-DM	Disabled
TELNET	Enabled (TCP 23)
WEB	Enabled (TCP 80)
RMON	Enabled

Figure C-4. Switch Information – Basic Settings - Firmware B-15

Firmware B-21

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	DA-10-21-00-00-01
Get IP From	Manual
IP Address	10.34.55.14
VLAN Name	default
Subnet Mask	255.0.0.0
Default Gateway	0.0.0.0
Boot PROM Version	Build 0.00.001
Firmware Version	Build 1.00-B21
Hardware Version	1B1
Device S/N	
Name	
Location	
Contact	
Spanning Tree	Disabled
GVRP	Disabled
IGMP Snooping	Disabled
TELNET	Enabled (TCP 23)
WEB	Enabled (TCP 80)
RMON	Disabled

Figure C-5. Switch Information – Basic Settings - Firmware B-21

Priority

The Priority section of Firmware B-15 has been superseded in Firmware B-21 by the QOS (Quality of Service) section – described below.

Firmware B-15

MAC Address Priority

Configure a specified MAC addresses to be given a higher or lower priority depending on whether it is the source, the destination, or either.

Total Entries: 1

	MAC Address	VLAN Name	User Priority	Source / Destination
☐	aa-bb-cc-dd-ee-ff	default	0	Source

Figure C-6. Setup MAC Address Priority - Firmware B-15

MAC Address Priority - Add

MAC Address	
VLAN Name	
User Priority	0
Source / Destination	Source

Figure C-7. MAC Address Priority - Add - Firmware B-15

MAC Address Priority - Edit

MAC Address	aa-bb-cc-dd-ee-ff
VLAN Name	default
User Priority	0 ▾
Source / Destination	Source ▾

BackApply

Figure C-8. MAC Address Priority - Edit - Firmware B-15

Firmware B-21

This function has been superseded by the QOS (Quality of Service) section – described below.

QOS (Quality of Service)

The QOS (Quality of Service) functions of Firmware B-21 supersede the Priority functions of Firmware B-15.

Configuring QOS Output Scheduling

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).

QOS Output Scheduling		
Class	MAX. Packets	MAX. Latency (*16 microseconds)
Class-0	0	0
Class-1	0	0
Class-2	0	0
Class-3	0	0

Figure C-9. QOS Output Scheduling - Firmware B-21

Configuring Default Priority

The priority queues are numbered from 0 – the lowest priority – to 7 – the highest priority.

802.1p Default Priority																																																									
Select priority based on port or disable priority based on per port basis.																																																									
Unit 1																																																									
<table border="1"> <thead> <tr> <th>Port</th> <th>Default Priority</th> </tr> </thead> <tbody> <tr><td>1</td><td> 0 </td></tr> <tr><td>2</td><td> 0 </td></tr> <tr><td>3</td><td> 0 </td></tr> <tr><td>4</td><td> 0 </td></tr> <tr><td>5</td><td> 0 </td></tr> <tr><td>6</td><td> 0 </td></tr> <tr><td>7</td><td> 0 </td></tr> <tr><td>8</td><td> 0 </td></tr> <tr><td>9</td><td> 0 </td></tr> <tr><td>10</td><td> 0 </td></tr> <tr><td>11</td><td> 0 </td></tr> <tr><td>12</td><td> 0 </td></tr> <tr><td>13</td><td> 0 </td></tr> </tbody> </table>	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	<table border="1"> <thead> <tr> <th>Port</th> <th>Default Priority</th> </tr> </thead> <tbody> <tr><td>14</td><td> 0 </td></tr> <tr><td>15</td><td> 0 </td></tr> <tr><td>16</td><td> 0 </td></tr> <tr><td>17</td><td> 0 </td></tr> <tr><td>18</td><td> 0 </td></tr> <tr><td>19</td><td> 0 </td></tr> <tr><td>20</td><td> 0 </td></tr> <tr><td>21</td><td> 0 </td></tr> <tr><td>22</td><td> 0 </td></tr> <tr><td>23</td><td> 0 </td></tr> <tr><td>24</td><td> 0 </td></tr> <tr><td>25</td><td> 0 </td></tr> <tr><td>26</td><td> 0 </td></tr> </tbody> </table>	Port	Default Priority	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
Port	Default Priority																																																								
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Figure C-10. Priority Based on Port - Firmware B-21

Configuring 802.1p User Priority

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.

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 C-11. QOS Class of Traffic - Firmware B-21

QOS Configuring Priority

The DES-3226S allows you to configure how forwarded packet's priority value will be changed or maintained by the switch prior to transmitting the packet. You can specify how a packet's priority value will be written by the switch by DSCP, 802.1p, TCP or UDP port number, IP address, or MAC address.

QOS Configure Priority		
New Edit Delete		
Type	Value	Priority Setting

Figure C-12. QOS Configure Priority - Firmware B-21

The QOS Configure Priority - Add input screen is divided into two parts – the criteria the switch will use to identify which packets will be subject to the actions selected in the second part. The first part of the screen consists of the Type drop-down menu and the Value field.

The first part of the screen allows you to specify packets that have DSCP or 802.1p priority values. If a packet has the DSCP or 802.1p priority value entered in the Value field, then the actions specified by the `replace_dscp:`, `priority:`, or `replace_priority:` click-boxes will be executed.

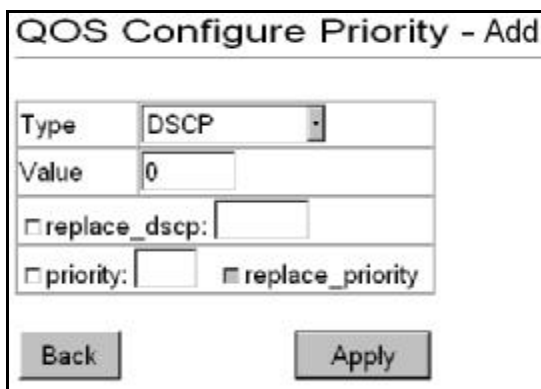
In addition, you can specify that packets that contain a specific IP or MAC address as their destination, will receive the actions specified by the `replace_dscp:`, `priority:`, or `replace_priority:` click-boxes. The IP or MAC address is entered into the appropriate field that appears when these options are selected.

You can also specify that packets that have a specified TCP or UDP port number in their headers will receive the actions specified by the `replace_dscp:`, `priority:`, or `replace_priority:` click-boxes. The TCP or UDP port number is entered into the Value field.

The `replace_dscp:` click-box instructs the switch to replace the DSCP value (in a packet that meets the selected criteria) with the value entered in the adjacent field.

The `priority:` click-box instructs 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.

The `replace_priority`: click-box instructs 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.



The screenshot shows a web-based configuration window titled "QOS Configure Priority - Add". It contains the following fields and controls:

- Type:** A dropdown menu with "DSCP" selected.
- Value:** A text input field containing the number "0".
- replace_dscp:** An unchecked checkbox followed by an empty text input field.
- priority:** An unchecked checkbox followed by an empty text input field.
- replace_priority:** A checked checkbox.
- Buttons:** "Back" and "Apply" buttons at the bottom.

Figure C-13. QOS Configure Priority - Add - Firmware B-21

Filtering

IP filtering is not supported by Firmware B-21.

Firmware B-15

IP Address Filtering

Configure a specified IP address to be dropped depending on whether it is the source, the destination, or either.

Total Entries: 1

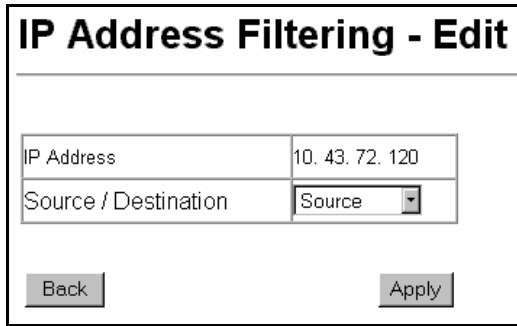
	IP Address	Source / Destination
☐	10.43.72.120	Source

Figure C-14. Filter Address Setup - Firmware B-15

IP Address Filtering - Add

IP Address	0 0 0 0
Source / Destination	Source

Figure C-16. IP Address Filtering - Add - Firmware B-15



IP Address	10. 43. 72. 120
Source / Destination	Source

Back

Apply

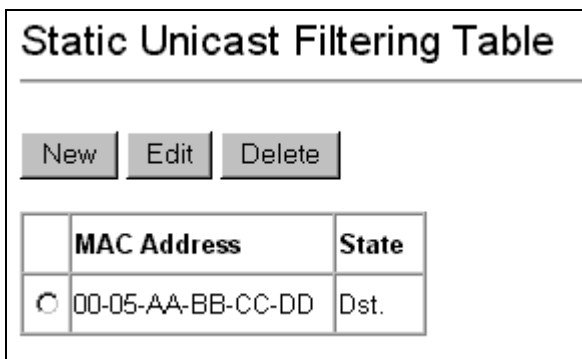
Figure C-17. IP Address Filtering - Edit - Firmware B-15

Firmware B-21

A MAC address filtering function is available in Firmware B-21. It is located under the Forwarding folder, then the MAC Forwarding folder, and finally the Static Unicast Filtering Table link.

Static Unicast Filtering Table

Unicast MAC address entered into the switch's Static Unicast Filtering Table will have packets addressed to these MAC addresses filtered from the switch.



	MAC Address	State
☐	00-05-AA-BB-CC-DD	Dst.

Figure C-18. Static Unicast Filtering Table - Firmware B-21

All of the unicast MAC addresses currently entered into the switch's filtering table are displayed.

Static Unicast Filtering Table - Add	
MAC Address	00-00-00-00-00-00
State	Destination
Back Apply	

Figure C-19. Static Unicast Filtering Table - Add - Firmware B-21

Specifying a MAC address entry in the filtering table as a Destination will filter packets with this MAC address as their destination. Source will filter packets with this MAC address as their source, and Either will filter packets with this MAC address as either their source or destination.

Select the filtering table entry you want to edit by clicking the appropriate click-box, and then click the Edit button:

Static Unicast Filtering Table - Edit	
MAC Address	00-05-AA-BB-CC-DD
State	Destination
Back Apply	

Figure C-20. Static Unicast Filtering Table - Edit - Firmware B-21

Broadcast/Multicast Storm Control under Forwarding

Firmware B-15

This function is not supported by Firmware B-15

Firmware B-21

Broadcast/Multicast Storm Control

A Broadcast/Multicast Storm Control function is available in Firmware B-21. It is located under the Forwarding folder, and then on the MAC Forwarding folder, and finally under the Broadcast/Multicast Storm Control link:

Broadcast/Multicast Storm Control

Configure thresholds for triggering storm control for broadcast and multicast packets.

Unit 1

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

Apply

Figure C-21. Broadcast/Multicast Storm Control - Firmware B-21

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.

Link Aggregation

Link Aggregation

The B-19 firmware release adds the Link Aggregation Algorithm selection screen. This screen and its attendant functions are not in firmware release B-15.

The screens from firmware release B-21 are shown below:

Firmware B-15:

This function is not supported in Firmware B-15.

Firmware B-21:

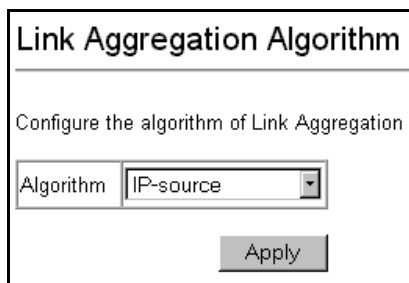


Figure C-22. Link Aggregation Algorithm - Selection - Firmware B-21

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.



BRIEF REVIEW OF BITWISE LOGICAL OPERATIONS

AND

The logical AND operation compares 2 bits and if they are both “1”, then the result is “1”, otherwise, the result is “0”.

	<i>0</i>	<i>1</i>
<i>0</i>	0	0
<i>1</i>	0	1

OR

The logical OR operation compares 2 bits and if either or both bits are “1”, then the result is “1”, otherwise, the result is “0”.

	<i>0</i>	<i>1</i>
<i>0</i>	0	1
<i>1</i>	1	1

XOR

The logical XOR (exclusive OR) operation compares 2 bits and if exactly one of them is a “1”, then the result is “1”, otherwise the result is “0”.

	0	1
0	0	1
1	1	0

NOT

The logical NOT operation simply changes the value of a single bit. If it is a “1”, the result is “0”, if it is a “0”, the result is “1”. This operation is carried out on a single bit.

0	1
1	0

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Print, type or use block letters.

Your name: Mr./Ms _____ Dept. _____

Organization: _____

Your title at organization: _____

Telephone: _____ Fax: _____

Organization's full address: _____

Country: _____

Date of purchase (Month/Day/Year): _____

Product Model	Product Serial No.	* Product installed in type of computer (e.g., Compaq 486)	* Product installed in computer serial No.

(* Applies to adapters only)

Product was purchased from:

Reseller's name: _____

Telephone: _____ Fax: _____

Reseller's full address: _____

Answers to the following questions help us to support your product:

1. Where and how will the product primarily be used?

☐ Home ☐ Office ☐ Travel ☐ Company Business ☐ Home Business ☐ Personal Use

2. How many employees work at installation site?

☐ 1 employee ☐ 2-9 ☐ 10-49 ☐ 50-99 ☐ 100-499 ☐ 500-999 ☐ 1000 or more

3. What network protocol(s) does your organization use ?

☐ XNS/IPX ☐ TCP/IP ☐ DECnet ☐ Others _____

4. What network operating system(s) does your organization use ?

☐ D-Link LANsmart ☐ Novell NetWare ☐ NetWare Lite ☐ SCO Unix/Xenix ☐ PC NFS ☐ 3Com 3+Open

☐ Banyan Vines ☐ DECnet Pathwork ☐ Windows NT ☐ Windows NTAS ☐ Windows '95

☐ Others _____

5. What network management program does your organization use ?

☐ D-View ☐ HP OpenView/Windows ☐ HP OpenView/Unix ☐ SunNet Manager ☐ Novell NMS

☐ NetView 6000 ☐ Others _____

6. What network medium/media does your organization use ?

☐ Fiber-optics ☐ Thick coax Ethernet ☐ Thin coax Ethernet ☐ 10BASE-T UTP/STP

☐ 100BASE-TX ☐ 100BASE-T4 ☐ 100VGAnyLAN ☐ Others _____

7. What applications are used on your network?

☐ Desktop publishing ☐ Spreadsheet ☐ Word processing ☐ CAD/CAM

☐ Database management ☐ Accounting ☐ Others _____

8. What category best describes your company?

☐ Aerospace ☐ Engineering ☐ Education ☐ Finance ☐ Hospital ☐ Legal ☐ Insurance/Real Estate ☐ Manufacturing

☐ Retail/Chainstore/Wholesale ☐ Government ☐ Transportation/Utilities/Communication ☐ VAR

☐ System house/company ☐ Other _____

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☐ Yes ☐ No ☐ Don't know yet

10. Your comments on this product?



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