

***DES-3216***  
***Management Module for***  
***HP OpenView/Windows NT***  
***User Guide***

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RECYCLABLE

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# *DES-3216 Management*

## *User Guide*

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### **About this Guide**

This guide discusses how to use the HP OpenView for Windows NT network management system to manage the DES-3216 10/100 Auto Negotiation Flex Switch. The following is included: a description of the switch, a brief overview of SNMP network management, a detailed description of the device front panel display, and comprehensive discussion on using the management module to control and monitor the switch. For more information on installing the 16-port N-Way Ethernet switch and configuring it for network management, please consult the hardware edition of the *DES-3216 User Guide*.

# Introduction

## ***DES-3216 10/100 Auto Negotiation Flex Switch***

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This guide discusses how to manage the DES-3216 16-port N-Way Managed Ethernet switch using the HP OpenView for Windows NT network management system. The DES-3216 combines Ethernet, Fast Ethernet and switching technologies into one package. This device features sixteen N-Way switching ports supporting either high-speed 100BASE-TX or conventional 10BASE-T Ethernet.

Additional information about configuring the Ethernet switch may be found in the hardware edition of the *DES-3216 User Guide*.

## ***Network Management***

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As networks grow larger, network management becomes more and more of a necessity. A large network requires a considerable amount of work to keep it running smoothly, including time and effort spent on user support, troubleshooting, network planning, and performance monitoring. The intent of a network management system (NMS) is to make it possible to monitor a widely spread-out network (possibly spanning many different sites) from a centralized location.

Network management works by placing a small degree of intelligence” in the network elements (routers, bridges, hubs, hosts,

etc.) to be managed. This intelligence takes the form of an *agent* that is capable of collecting statistics and status information, as well as performing control operations that affect the operation of the network. The agent responds to commands and requests for information from the centralized network management system, allowing the health and performance of the network to be monitored and adjusted.

A network protocol known as the Simple Network Management Protocol (SNMP) is generally used to communicate between network management stations and the devices they manage. SNMP was originally developed for controlling the devices that made up the infrastructure of the Internet, and has become the primary standard for network management. SNMP commonly runs on top of the TCP/IP Internet Protocol, though other transmission methods are possible.

Because a network management station can be used to manage a wide range of devices, network management software is generally divided into two different parts: a base *platform* consisting of software common to the management of all devices; and a set of *modules*, each of which can communicate with a narrow range of devices by way of their SNMP-based agents. If a new device type is added to the network, then a new module (compatible with the particular platform being used) needs to be added to facilitate its management.

This manual describes the module used on the HP OpenView for Windows NT platform for controlling DES-3216 10/100 Auto Negotiation Flex switches. The module supports a wide range of features, including

- ◆ Realistic, continually-updated graphic display of the switch front panel
- ◆ Display of network status in table, line curve, or bar graph form
- ◆ Allows convenient control of the switch    advanced features



## Installing the Management Module

This section describes the requirements and procedures for installing the DES-3216 management module on your network management system.

### ***Requirements***

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D-Link recommends that your system meet the following requirements to be able to use the DES-3216 switch management module:

- ◆ An IBM PC AT or compatible computer with a Pentium 133 or faster processor
- ◆ Microsoft Windows NT
- ◆ HP OpenView Network Node Manager, version B.05.01 or later
- ◆ 24 megabytes (32M preferred) of main memory (RAM)
- ◆ At least 10 megabytes of free hard disk space
- ◆ A Windows NT-compatible mouse or other pointing device
- ◆ An Ethernet network card with appropriate drivers

Before installing the module, HP OpenView must be installed on your system. Take note of the directory path, because the same path needs to be entered when installing management modules.

## ***Installing the Module Software***

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The DES-3216 equipment package includes a single DES-3216 Software Diskette, or CD-ROM. This disk holds the software module needed for managing DES-3216 equipment under HP OpenView in a Windows NT environment. The HP OpenView software must first be installed on the management station, then the module may be installed. Proceed with these steps:

1. HP OpenView for Windows NT software must be properly installed and operational on the station chosen for installation of the DES-3216 management module. Confirm operability of the Windows NT startup menu. Then, choose HP OpenView from each of the next two menus offered. If the software is installed properly, a network map entitled HP OpenView will appear. Before proceeding with the steps below, ensure that the NNM Services-Stop menu in the OpenView menu group is running and that OpenView background services have been stopped. It is also recommended to exit any other applications which may be running on the computer.
2. Insert the DES-3216 Software Diskette into a floppy drive of the administrator computer (drive A is assumed). If a CD-ROM is provided, insert the disk into your CD-ROM drive.
3. Choose **Run...** from the **Start** menu on the taskbar. When the dialog box appears, type the pathname of the Install program on the floppy drive (A:\SETUP or B:\SETUP).

4. Click **OK**. The installation program will start.
5. The installation program will automatically find the OpenView Installation path.

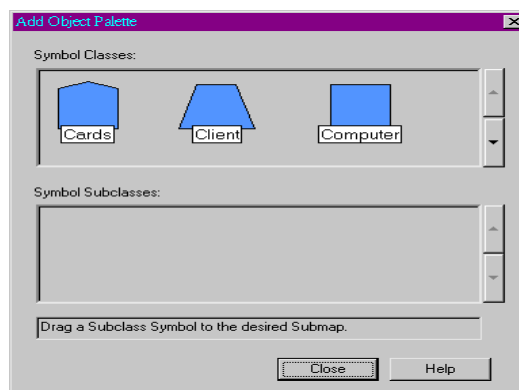
## DES-3216 Management

### ***Adding a DES-3216 Switch Icon to the Network Map***

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Add the new DES-3216 node into the HP OpenView network map by the following steps. The detail selections and data entries will vary according to the network environment; the procedure given here will nonetheless provide useful guidance:

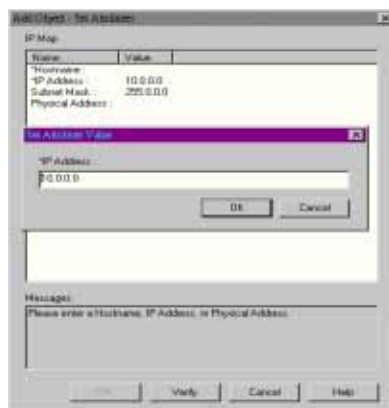
1. Launch the HP OpenView program and open its network map display (see first item in previous section for detailed instructions).
2. Under the Edit menu, choose **Add Object**. An Add Object Palette dialog opens.



3. In the Add Object Palette dialog, select the "connector" icon from the Symbol Class window and then find the "es3216" icon from the Symbol Subclasses window and move it to the

network map by use of the drag and drop function. An Add Object dialog opens.

4. Enter the required information in the Label text windows (for example, des3216) of the Add Object dialog.
5. Double-click **IP Map** and an Add Object-Set Attributes dialog will open. Next, double-click **IP address** and enter the IP address in the Set Attribute Value window. Click **OK** to complete the entry.



6. When the steps above have been completed, double-clicking the device icon will access the network map in future uses.

## ***Preparing the Switch for Management***

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Before using the management module for the DES-3216 intelligent Ethernet/Fast Ethernet switch, make sure that the switch is properly set up:

- ◆ Ensure that the switch is either connected to the same network as the network management station, or that it is connected using the SLIP protocol using the RS-232C console port.
- ◆ Ensure that the switch TCP/IP settings are set correctly. If the switch is on the same local network, the network portion of the switch IP address needs to be the same as that of the network management station. If they are on separate LANs, the TCP/IP gateway (router) field of both the switch and the router need to be set properly so that information can be routed correctly between the switch and the management station.
- ◆ If any of the configuration settings of the switch are to be modified, remember to specify a valid set community name. Specifying otherwise will prevent you from performing such an action on the switch.
- ◆ Ensure that the switch is turned on.

For more information about these and other items, consult the hardware edition of the *DES-3216 User Guide*.

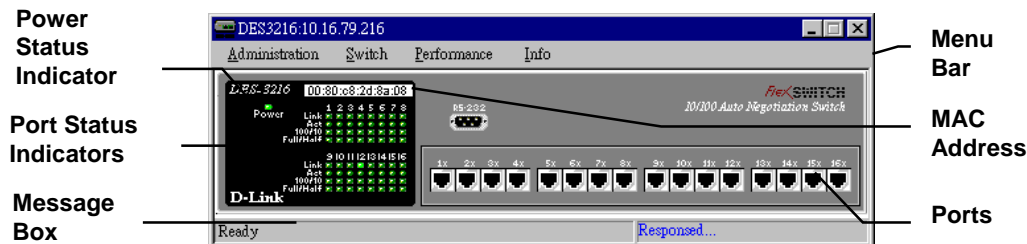
## ***Working with the Front Panel Display***

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Management of the DES-3216 switch is realized through a front panel display. This panel provides many features that facilitate management, including realistic LED displays for reporting the actual status of the ports and the network, user-selectable ports for easy selection of the device to work on, and menu buttons for invoking commands that perform specific administrative operations.

To view the front panel of the management module display, double-click the switch icon on the network map.

The main display window looks like this:



Elements on the display are described below:

- ◆ **MAC address** This displays the MAC address (otherwise known as the Ethernet address or Physical address) of the switch. Physical addresses for Ethernet devices are guaranteed unique. (The switch MAC address will only be displayed if it is being polled from the network map.)
- ◆ **Menu bar** The Administration, Switch, Performance, and Info buttons display their respective pull-down menus. The use of these menus is described later on in this manual.
- ◆ **Message box** This displays information and status messages.
- ◆ **Ports** Each of the RJ-45 (10BASE-T/100BASE-TX) ports on the front panel are depicted here. Individual ports can be selected to perform operations on them. Clicking within the border immediately surrounding the ports will select the switch as a whole.

- ◆ **Port status indicators** For each of the ports on the switch, there are four corresponding port status indicators. Each port indicator can be interpreted as follows:
  - ◇ **Link** Lights when the port is connected to a powered-on Ethernet/Fast Ethernet station.
  - ◇ **Act** Blinks when information is transmitted or received on the port.
  - ◇ **100/10** Lights when the port is operating at 100Mbps. Ports 1 through 16 are N-Way ports that can automatically detect whether 10BASE-T Ethernet or 100BASE-TX Fast Ethernet twisted-pair cable is connected.
  - ◇ **Full/Half** Lights when the port is operating in full-duplex mode.
- ◆ **Power status indicator** Shows that the switch is receiving power.

## **Selecting Ports**

Many of the switch management functions apply to the switch itself, or to particular switch ports. To select the switch itself, click in the gray area surrounding the ports on the front panel display. The border of this area will turn light green to indicate that the switch is selected.

To select an individual port or module, click on the port itself. The color of the inside area of the port will turn light blue to indicate that it has been selected:





## ***Administration***

---

Many of the configuration controls of the DES-3216 switch can be set via the management module as well as from the console interface. These options are described below.

### **Configuration**

Configuration information about the DES-3216 switch can be obtained from the management module by opening the **Administration** menu and accessing either the System Configuration dialog box, or the Ports Configuration table. See the following two sections for more details.

### **System Configuration**

The System Configuration dialog box features a wide array of both user-provided and module-provided fields. This dialog can be accessed without selecting the switch. Follow these steps:

1. Open **Administration**, choose **Configuration**, and click **System Configuration**. The following System Configuration dialog box appears:

**System Configuration: 10.16.79.216**

Device Name: DES-3216 IP Address: 10 . 16 . 79 . 216

Location: D-Link Corporation Subnet Mask: 255 . 0 . 0 . 0

Contact: CT Snow Gateway IP: 10 . 254 . 254 . 254

RS232 Config: Console Set Community: private

Baud Rate: 19200 Get Community: public

Dial Number: Auto-Learn: Enabled

☒ Send Authentication Fail Trap

Object	Description
System Description	10/100 16 Port Fast Ethernet Switching Hub
System OID	1.3.6.1.4.1.171.10.9.3
SysUptime	4days 05:39:17.68
Bridge Type	Transparent-Only
MAC Address	08:00:00:10:10:10

Refresh OK Close

Set OK at 05/22/98 18:56:13  
Start Set...Please wait!  
Set OK at 05/22/98 18:57:32

- If modifications or additions are desired, change the fields as necessary.
- Click **OK** to let the changes take effect, or click **Close** to cancel the current session changes.

The fields displayed in the top part of the table are user-provided or user-selected:

- ◆ **Device Name** Name of the switch.
- ◆ **IP Address** IP address of the switch.
- ◆ **Location** Description of the physical location of the switch.
- ◆ **Subnet Mask** Subnet field of the switch IP address.  
There are three classes of subnets. Their default values are as follows:

- ◇ Class A internet address: 255.0.0.0

- ◇ Class B internet address: 255.255.0.0
- ◇ Class C internet address: 255.255.255.0
- ◆ **Contact** Information describing how to find the person responsible for the switch.
- ◆ **Gateway IP** IP address of the gateway responsible for delivering trap messages from the switch to the network management station. The default IP address of the gateway is 0.0.0.0, meaning no gateway exists, or the switch and the network management station are on the same network.
- ◆ **RS232 Config** Determines whether the switch console port is used for terminal-based console communications, or for out-of-band management using the SLIP protocol.
- ◆ **Set Community** This setting allows the station the right to set, or modify, configuration values. Most network devices use "private" as one of their set community names.
- ◆ **Baud Rate** Bit rate of the console port when it is being used for out-of-band (SLIP) communications.
- ◆ **Get Community** The setting allows the station the right to get, or read, configuration values. Most network devices use "public" as one of their get community names.
- ◆ **Dial Number** Dialup telephone number (for reference purposes) for use with out-of-band management.
- ◆ **Auto-Learn** Determines whether or not automatic address learning is enabled in the switch. This should normally be turned on.
- ◆ **Send Authentication Fail Trap** Checkbox that determines whether or not an authentication fail trap should be sent if

access is attempted with an authorized community name or if write privileges are attempted by a user with read-only access.

The items displayed in the rest of the table include:

- ◆ **System Description** Description of the switch model.
- ◆ **System OID** SNMP Object Identifier for the switch model.
- ◆ **SysUptime** Amount of time the switch has been powered on.
- ◆ **Bridge Type** Indicates what type of bridging this bridge can perform (for example, transparent only, source route only, or srt).
- ◆ **MAC Address** Hardware address (physical address) of the switch. This address is set at the factory.
- ◆ **Software Version** Version number of the software currently stored in the Flash memory of the switch.
- ◆ **PROM FW Version** Version number of the firmware stored in the Flash memory of the switch.
- ◆ **Hardware Revision** Version number of the switch hardware.
- ◆ **Protocol Capability** Protocols supported by the switch.
- ◆ **Number IP Interface** Number of TCP/IP channels available for use for switch management. This will be 2 if the SLIP (Out-of-Band) interface is enabled, and 1 if only the in-band Fast Ethernet interface is available.
- ◆ **Total Number Of Ports** Total number of ports available on the device. The DES-3216 features 16 ports.

- ◆ **Total Ports In Use** Total number of ports currently in use. Corresponds to the number of link LEDs currently lit.
- ◆ **IP Interface Type** Shows the type of network interface.
- ◆ **DRAM Size** Size of dynamic random access memory in megabytes.
- ◆ **MIB Capability** List of MIB modules that are supported by the switch.
- ◆ **Last Bootp Server** The address of the BOOTP server last used to set the switch IP address.
- ◆ **Last IP Address Used** IP address used the last time the switch was booted.
- ◆ **Unauthorized SNMP Packet IP** When a request with an unknown (unauthorized) SNMP community name is received, this item shows the source address.
- ◆ **Unauthorized Packet Community** When a request with an unknown (unauthorized) SNMP community name is received, this item shows the illegal community name.

## Ports Configuration

The operation of individual ports can be controlled using the Ports Configuration table. This table shows the detailed status of each of the ports and modules on the switch, and allows several port settings to be changed.

To display this table,

1. Select the switch (group) by clicking in the gray area surrounding the RJ-45 ports.

2. Open **Administration**, choose **Configuration**, and click **Ports Configuration**. The Ports Configuration table appears:

G.	P.	Connector	Partition Status	Link St
1	1	portType-UTP	no-partition	link-f
1	2	portType-UTP	no-partition	link-f
1	3	portType-UTP	no-partition	link-f
1	4	portType-UTP	no-partition	link-f
1	5	portType-UTP	no-partition	link-f
1	6	portType-UTP	no-partition	link-f
1	7	portType-UTP	no-partition	link-f
1	8	portType-UTP	no-partition	link-f
1	9	portType-UTP	no-partition	link-f
1	10	portType-UTP	no-partition	link-pe
1	11	portType-UTP	no-partition	link-f
1	12	portType-UTP	no-partition	link-f
1	13	portType-UTP	no-partition	link-f
1	14	portType-UTP	no-partition	link-pe
1	15	portType-UTP	no-partition	link-f
1	16	portType-UTP	no-partition	link-f

Buttons: Refresh, Set, Close

Status: Start Get...Please wait!  
Get OK at 05/23/98 14:26:02

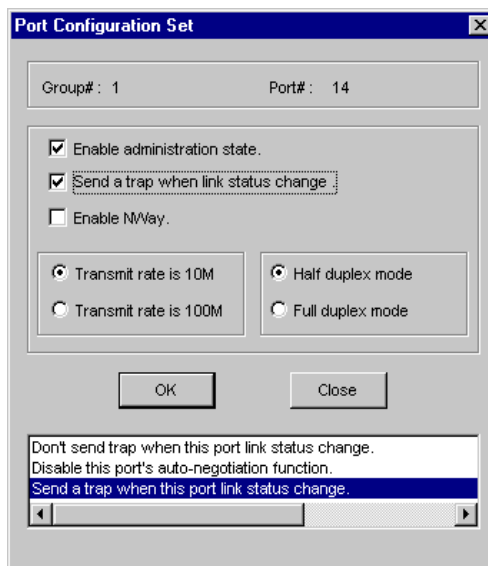
Clicking **Refresh** will force the display to match the switch current status.

If the window is too small for all of the port displays to fit on the screen at once, use the scroll bars to scroll the window up and down, and left and right.

The Ports Configuration table may also be accessed by right-clicking in the gray area surrounding the ports on the front panel display (a green border will appear) and selecting **Ports Configuration** from the drop-down menu.

To make changes to items on the Ports Configuration Table,

1. Highlight the selected port and click **Set**. The following Port Configuration Set dialog box appears:



2. Select or deselect the control desired.
3. Click **OK** to let the changes take effect, or click **Close** to cancel the current session changes.

The controls displayed on the Ports Configuration table are:

- ◆ **Group Index** Selected switch.
- ◆ **Port Index** Selected port.
- ◆ **Connector** Port type of selected port.
- ◆ **Partition Status** Indicates whether the port has been manually partitioned off from the rest of the network.

- ◆ **Link Status** Indicates whether there is a station connected to the port.
- ◆ **Admin State** Indicates whether port is connected to the network.
- ◆ **Duplex State** Determines whether the port is used in half-duplex or full-duplex mode.

In half-duplex mode, at any given moment the port can be used to transmit or receive data, but not both at the same time. This gives a total throughput of 10Mbps for Ethernet ports and 100Mbps for Fast Ethernet ports. In full-duplex mode, the port can transmit and receive at the same time, giving a total throughput of 20Mbps or 200Mbps, respectively.

Full-duplex mode can only be used when a port is connected *directly* to a network adapter capable of full-duplex operation. It can not be used if the port is connected to a hub or other repeater, or if the device on the other end does not support full-duplex communication.

- ◆ **Link Status Alarm State** Determines whether or not a trap should be sent if the link (connection to a network station) is up and goes down, or is down and goes up.
- ◆ **Filter Bcast State** Determines whether or not the port should receive broadcast packets.
- ◆ **Forward Unknown State** Determines whether or not unknown packets (packets with destination addresses that the switch has not yet learned) should be broadcast to the port.
- ◆ **Send Partition Trap** Determines whether or not a trap should be sent when the status of a link on the selected port changes. An automatic test occurs where the link test status changes from link fail to OK and vice versa (OK to link



failure). If enabled, the switch sends a trap message to its designated trap receiver when such an event occurs on a port. This parameter is set to disable by default.

- ◆ **Negotiation State** Enables or disables N-Way speed negotiation on the port.
- ◆ **Speed State** Determines whether the port should be used at 10Mbps or 100Mbps.

The controls displayed on the Port Configuration Set dialog are:

- ◆ **Enable administration state** Checkbox to enable or disable port control administration state.
- ◆ **Send a trap when link status changes** Checkbox to cause a trap to be sent when the port link status changes.
- ◆ **Enable NWay** Checkbox to enable N-Way auto-negotiation.
- ◆ **Transmit rate is 10M** Option button to set port transmission rate to 10M.
- ◆ **Transmit rate is 100M** Option button to set port transmission rate to 100M.
- ◆ **Half duplex mode** Option button to set port in half duplex mode.
- ◆ **Full duplex mode** Option button to set port in full duplex mode.

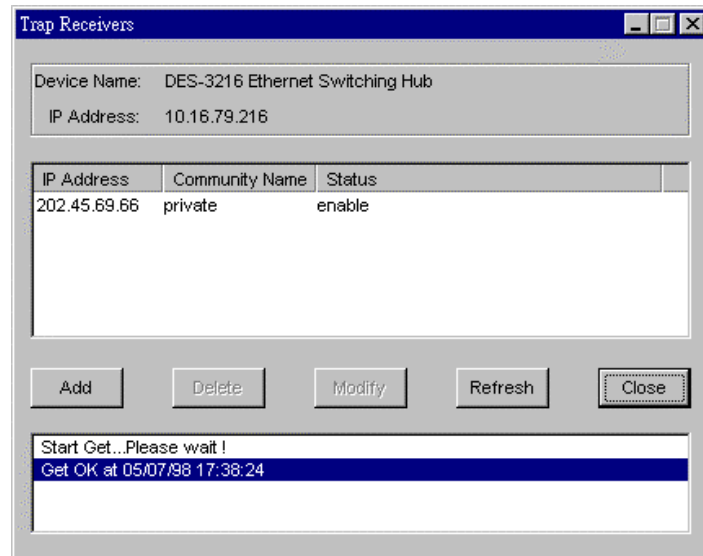
## **Trap Receivers**

The DES-3216 Ethernet switch can define a list of IP addresses for network management stations and receive SNMP traps sent by the

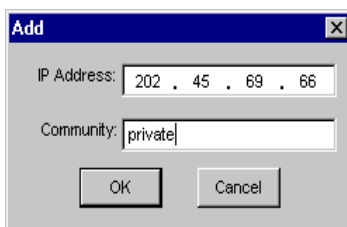
switching device to the network management stations when exceptional events happen. These include:

- ◆ When the switch is powered on.
- ◆ Whenever a user-defined threshold condition occurs.

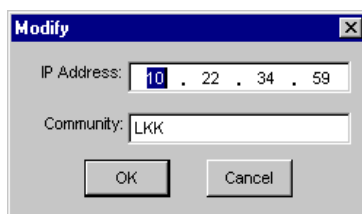
The switch requires designation of which network management stations should receive these traps. To view the trap recipients, select **Trap Receivers** from the **Administration** menu. The Trap Receivers dialog box appears:



To add a trap recipient, click **Add**, enter the required information in the Add dialog box shown below, and click **OK**.



To modify a trap recipient, highlight the entry, make the necessary changes in the Modify dialog box shown below, and click **OK**.



To delete a trap recipient, highlight the entry, and click **Delete**.

The fields displayed in the Trap Receivers' dialogs are:

- ◆ **IP Address** IP address of the trap recipient (network management station).
- ◆ **Community Name/Community** SNMP community name that will be included with trap requests sent to this recipient.
- ◆ **Status** Indicates whether the trap entry is enabled or disabled.

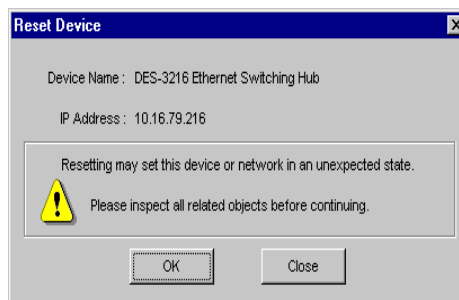
For more information about changing the switch trap configuration, see the hardware edition of the *DES-3216 User Guide*.

## **Reset Device**

The management module allows for remote resetting of the switch. Doing a reset is equivalent to turning the switch off and on again, which resets all statistic counters and restores settings to the values stored in EEPROM.

To perform a reset,

1. Select **Reset Device** from the **Administration** menu.
2. Click **OK** to confirm the reset.



## **Switch**

---

The DES-3216 implements the IEEE 802.1d Spanning Tree Protocol (STP) to provide the following functions:

- ◆ **Network loop detection and prevention** There should only be one path between any two communicating nodes. If there is more than one path, forwarded packets will be looped indefinitely. The spanning tree protocol detects any looped

path and selects the path with the lowest *path cost* as the active path, while blocking the other paths and using them as backups.

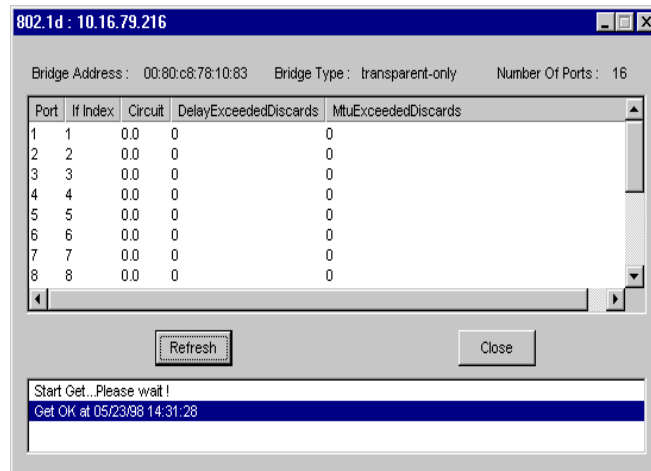
- ◆ **Automatic topology reconfiguration** If the path for which there is a backup path fails, the backup path will be automatically activated, and the spanning tree protocol will automatically reconfigure the network topology.

The spanning tree parameters are mainly for the determination of the root bridge and root ports on the network. If there is a loop on the network, data packets will pass through the root bridge. If the bridge has several ports, then the root port will be used to pass the data packets to the root bridge.

The spanning tree protocol is implemented in two levels: bridge and port. At the bridge level, the STP algorithm calculates a bridge identifier for each bridge and then determines the root bridge and the designated bridges. At the port level, the spanning tree protocol determines the root port and the designated ports for each bridge of the network.

### **Bridge 802.1d**

The 802.1d table contains an array of STP port and bridge information. To display this table without selecting the switch, open **Switch** and choose **Bridge 802.1d**. The 802.1d window appears:



Each of the items on the table are described below:

- ◆ **Bridge Address** MAC address used by this bridge when it must be referred to in a unique fashion. It is recommended that this be the numerically smallest MAC address of all ports that belong to this bridge.
- ◆ **Bridge Type** Indicates what type of bridging this bridge can perform (for example, transparent only, source route only, or srt).
- ◆ **Number of Ports** Number of ports on the bridge. The DES-3216 switch features 16 ports.
- ◆ **Port** Number of the selected port for which the bridge management information is contained.
- ◆ **If Index** Value of the instance of the object, defined in MIB-II, for the interface corresponding to this port.

- ◆ **Circuit** For a port which potentially has the same If Index value as another port on the same bridge, this object contains the name of an object instance unique to this port. For example, in the case where multiple ports correspond one-to-one with multiple X.25 virtual circuits, this value might identify an object instance (e.g., the first) associated with the X.25 virtual circuit corresponding to this port. For a port which has a unique If Index value, this object can have the value "0 0".
- ◆ **DelayExceededDiscards** Number of frames discarded by this port due to excessive transit delay through the bridge. It is incremented by both transparent and source route bridges.
- ◆ **MtuExceededDiscards** Number of frames discarded by this port due to excessive size. It is incremented by both transparent and source route bridges.

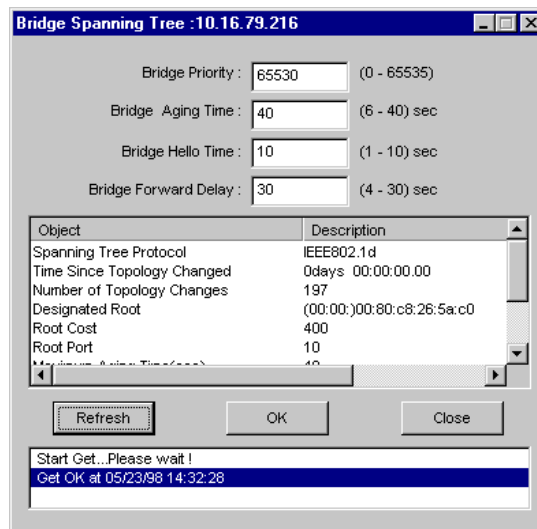
## **Spanning Tree**

The **Spanning Tree** menu contains two items, **Bridge Spanning Tree** and **Port Spanning Tree**.

### **Bridge Spanning Tree**

To access the Bridge Spanning Tree dialog box without selecting the switch,

1. Open **Switch**, choose **Spanning Tree**, and click **Bridge Spanning Tree**. The Bridge Spanning Tree window appears:



2. Click **Refresh** to ensure all modifications performed by other network administrators are reflected in the dialog box before starting to make new changes.
3. Change the fields or text boxes as necessary.
4. Click **OK** to let the changes take effect.

Each of the text boxes are described below:

- ◆ **Bridge Priority** Read-write object displays the priority number of the bridge. The value is used in conjunction with the bridge MAC address to set the bridge ID which in turn is used when determining the root bridge of a multibridged network. The root bridge is responsible for processing data packets when network loops occur. The smaller the number set, the higher the bridge priority is. The higher the bridge priority, the more chance the bridge has of becoming the root bridge. A bridge priority ranges from 0 to 65535, with 0 being the highest priority.



- ◆ **Bridge Aging Time** Read-write object indicates the maximum aging time of STP information learned from the network (on any port) before it is discarded. When the value set for this parameter expires, and the switch still has not received a BPDU from the root bridge, it will start sending its own BPDU to all other bridges for permission to become the root bridge. If it turns out that the switch has the lowest bridge identifier, it will then become the root bridge. A bridge maximum age ranges from 6 to 40 seconds.
- ◆ **Bridge Hello Time** Read-write object displays the interval between two consecutive transmissions of BPDU packets sent by the root bridge to inform all other bridges that it is indeed the root bridge. If a Bridge Hello Time is set for a bridge that is not the root bridge, the setting will be used if and when the bridge becomes the root bridge. Bridge Hello Time ranges from 1 to 10 seconds.
- ◆ **Bridge Forward Delay** Read-write object indicates the time any port on the switch spends in the "listening state" while moving from "blocking state" to "forwarding state". Bridge Forward Delay ranges from 4 to 30 seconds.

Use the following formulae when setting this parameter:

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

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

A description of each field in the Bridge Spanning Tree dialog box, located below the text boxes, follows:

- ◆ **Spanning Tree Protocol** Read-only object indicates the STP version implemented on the bridge.
- ◆ **Time Since Topology Changed** Read-only object displays the last time changes were made to the network topology.

These changes usually occur when backup paths are activated due to primary path failures.

- ◆ **Number of Topology Changes** Read-only object displays the number of times (since the current management session with the device was started) changes were made to the network topology. Changes usually occur on the network when backup paths are activated.
- ◆ **Designated Root** Read-only object displays the MAC (Ethernet) address of the bridge/switch on the network that has been chosen as the STP root.
- ◆ **Root Cost** Read-only object displays the cost for the path between the switch and the root bridge. If the switch is the root bridge, then the root cost is zero.
- ◆ **Root Port** Read-only object identifies the port (on the bridge) that offers the least path cost from the bridge to the root bridge. In the event of a network loop, data packets will pass through the root port.
- ◆ **Maximum Aging Time(sec)** Read-only object indicates the maximum age of STP information learned from the network (on any port) before it is discarded.
- ◆ **Hello Time(sec)** Read-only object displays the amount of time between transmission of configuration BPDUs by this bridge on any port when operating as the root or trying to become so.
- ◆ **Hold Time(sec)** Read-only object displays the time interval during which no more than two configuration BPDUs shall be transmitted by the bridge.
- ◆ **Forward Delay(sec)** Read-only object indicates how fast any port on the bridge can change its spanning state when

moving towards the forwarding state. The value determines how long the port stays in each of the listening and learning states, which precede the forwarding state.

## Ports Spanning Tree

To access the Ports Spanning Tree table,

1. Open **Switch**, choose **Spanning Tree**, and click **Ports Spanning Tree**. The Ports Spanning Tree table appears:

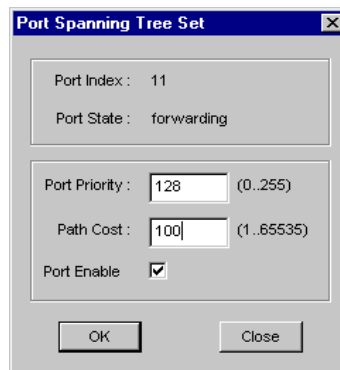
Port Index	Priority	State	Enable
1	120	forwarding	enabled
2	128	forwarding	enabled
3	128	forwarding	enabled
4	128	forwarding	enabled
5	128	forwarding	enabled
6	128	forwarding	enabled
7	128	forwarding	enabled
8	128	forwarding	enabled
9	250	forwarding	enabled
10	128	forwarding	enabled
11	128	forwarding	enabled
12	128	forwarding	enabled
13	128	forwarding	enabled

Device Name : DES-3216 Ethernet switch Hub

Buttons: Refresh, Set, Close

Status: Start Get...Please wait!  
Get OK at 05/23/98 14:33:51

2. Click **Refresh** to ensure all modifications performed by other network administrators are reflected in the dialog box before starting to make new changes.
3. To change settings, highlight the desired port, and click **Set**.  
The Port Spanning Tree Set dialog box appears:



4. After making all the desired modifications, click **OK** to let the changes take effect.

The following describes the controls found in the Port Spanning Tree table and dialog box:

- ◆ **Port Index** Read-only object displays the physical number of the port which the entry pertains. The value is used in conjunction with the port priority to set the port ID.
- ◆ **Priority/Port Priority** Read-write object displays the priority number of the port. The value is used in conjunction with the physical port number to set the port ID which in turn is used when determining the root port of a bridge. The smaller the number set, the higher the port priority is. The higher the port priority, the more chances the port has of becoming the root port. Port priority ranges from 0 to 255, with 0 being the highest port priority.
- ◆ **State/Port State** Read-only object indicates the current spanning state of the port. A port can have the following states: disabled, blocking, listening, learning, forwarding, and broken. A broken state means that the link on the port has been broken because the port is malfunctioning. Blocking means that the port has been blocked because it is

neither a root port nor a designated port. In STP, only root and designated ports are used.

- ◆ **Enable/Port Enable** Read-write object indicates whether the Port Spanning Tree State is enabled or disabled. The Enable Spanning Tree Protocol checkbox is located on the Port Spanning Tree Set dialog box .
- ◆ **Path Cost** Read-write object specifies the path cost for the network segment attached to the port. By convention, a 10Mbps LAN has a path cost of 100, while 100Mbps has a path cost of 10. The lower the path cost, the more chances the port has of becoming the root port of the bridge.
- ◆ **Designated Root** Read-only object displays the bridge ID of the current root bridge on the network.
- ◆ **Designated Cost** Read-only object displays the corresponding path cost of the designated port for the segment the port is connected to.
- ◆ **Designated Bridge** Read-only object displays the MAC address of the switch/bridge that is the designated bridge for the segment to which the port is attached.
- ◆ **Designated Port** Read-only object displays the port ID of the designated port for the segment the port is connected to.
- ◆ **Forward Transitions** Read-only object displays the number of times the port moved from learning state to forwarding state.

## **Performance**

---

The DES-3216 management module allows for both the collection of network statistics and their display in several easy-to-read forms. This chapter describes how to use the module to display network statistics in tabular, bar graph, and line curve formats.

The performance option allows monitoring of the whole system and its ports by displaying the values of their respective statistics counters. The option enables the user to display these values in either a port table, in order to view the current values in numerical form, or to display the values in a line curve or bar graph format, to enable comparisons to be made between present and previous values.

The line curve and bar graph displays are particularly useful in performance analysis since they provide a visual report on the progress of the system and port performances. By monitoring these values, potential problems can be detected before they occur on the network by simply observing the graph directions. The tabular display, on the other hand, will be very useful in cases where there is a need for the values to be displayed in forms such as absolute rate per second, rate per second, average rate per second (delta), and maximum rate per second (peak).

The network management station retrieves statistics values from the system at a constant interval determined by the polling time. Each statistics window will provide an input box for setting the polling time for that current session.

## Statistics

### Port Statistics

To display port statistics in tabular form,

1. Select the port to display statistics for.
2. From the **Performance** menu, choose **Statistics**, and click **Port Statistics**. The Port Statistics table will appear:

**Port Statistics:10.16.79.216**

Device Name: DES-3216 Ethernet switch Hub      Group: 1      Port #: 14  
 Uptime: 5days 03:49:16.19      Opened: Sat, May 23, 02:57:42 PM

Polling time: 3 (1...59) sec      Apply

	Absolute	Delta	Rate	Peak	Peak At
BytesReceived	1045801	313	156	8471	14:57:5...
BytesSent	7295274...	31685	15842	52305	14:58:2...
FramesReceived	10418	3	1	56	14:57:5...
FramesSent	179529	25	12	61	14:57:5...
TotalBytesReceived	1045801	313	156	8471	14:57:5...
TotalFramesReceived	10418	3	1	56	14:57:5...
BroadcastFramesReceived	30	0	0	0	0
MulticastFramesReceived	149	0	0	0	0
CRCError	0	0	0	0	0
OversizeFrames	0	0	0	0	0

Restart      Stop      Reset      Close

The Port Statistics table may also be accessed by right-clicking the selected port on the front panel display (a blue fill will appear) and selecting **Port Statistics** from the drop-down menu.

Descriptions of the items above follow:

- ◆ **Device Name** Name of the device.
- ◆ **Group** Number of switch.
- ◆ **Port #** Port number which the option applies to.

- ◆ **Uptime** Time since the network management portion of the system was last re-initialized.
- ◆ **Opened** Date, day, and time when the current management session with the selected device was started.
- ◆ **Polling time** Allows for increase or decrease of time between updates to the table. The default interval is 3 seconds, meaning the manager console polls the device every 3 seconds to retrieve statistics values. The values are then processed and displayed on the table.
- ◆ **Absolute** This column displays the accumulated count since resetting the statistics counters. These counters are reset whenever you restart the system, or click the **Stop**, **Reset**, and **Restart** buttons in succession.
- ◆ **Delta** This column displays the average count per second.
- ◆ **Rate** This column displays the total count per second.
- ◆ **Peak** This column displays the maximum count per second.
- ◆ **Peak At** This column displays the date and time when the peak value was reached for the selected object.
- ◆ **BytesReceived/GoodBytesReceived** Counts the total number of bytes (octets) included in valid (readable) frames.
- ◆ **BytesSent/GoodBytesSent** Counts the number of bytes successfully sent from the port.
- ◆ **FramesReceived/GoodFramesReceived** Counts all valid frames received on the port.
- ◆ **FramesSent/GoodFramesSent** Counts the total number of frames transmitted from the port.



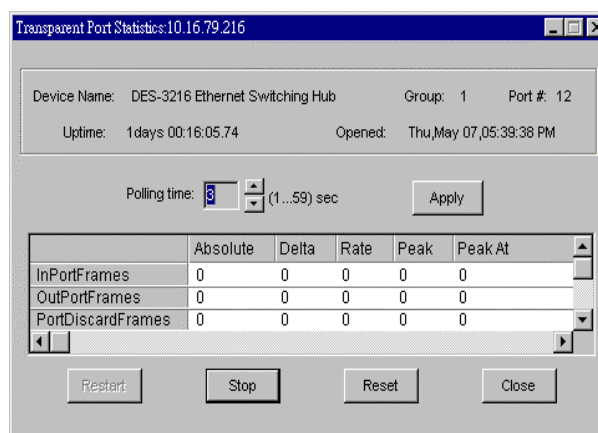
- ◆ **TotalBytesReceived** Counts the total number of bytes received on the port, whether in valid or invalid frames .
- ◆ **TotalFramesReceived** Counts the number of frames received on the port, whether they were valid or not.
- ◆ **BroadcastFramesReceived** Counts the number of frames sent to broadcast addresses received on the port.
- ◆ **MulticastFramesReceived** Counts the number of frames sent to multicast addresses received on the port.
- ◆ **CRCError** Counts (otherwise valid) frames that fail the CRC integrity check.
- ◆ **OversizeFrames** Counts frames longer than the 1522-byte (octet) limit set by the Ethernet standard. This is likely caused by a software problem.
- ◆ **Fragments** Counts packets less than 64 bytes with either bad framing or an invalid CRC. These are normally the result of collisions.
- ◆ **Jabber** Counts frames longer than the maximum 1522 bytes (octets) with either bad framing or an invalid CRC.
- ◆ **Collision** Counts collisions on the Ethernet segment.
- ◆ **LateCollision** Counts collisions that occur at or after the 64th byte (octet) in the frame. This may indicate that delays on the Ethernet are too long, and you have either exceeded the repeater count or cable length specified in the Ethernet standard.
- ◆ **MACRxError** Counts data errors detectable as 10BASE-T symbol errors,” bit patterns with illegal encodings. This may indicate noise on the line.

- ◆ **Frames64Bytes** Displays the number of frames with 64 bytes of information.
- ◆ **Frames65~127Bytes** Display the number of frames with 65 to 127 bytes of information.
- ◆ **Frames128~255Bytes** Display the number of frames with 128 to 255 bytes of information.
- ◆ **Frames256~511Bytes** Display the number of frames with 256 to 511 bytes of information.
- ◆ **Frames512~1023Bytes** Display the number of frames with 512 to 1023 bytes of information.
- ◆ **Frames1024~1522Bytes** Display the number of frames with 1024 to 1522 bytes of information.

### Transparent Port Statistics

To monitor transparent bridge statistics of traffic for a selected port,

1. Select the port to display statistics for.
2. From the **Performance** menu, choose **Statistics**, and click **Transparent Port Statistics**. The Transparent Port Statistics table will appear:



The Transparent Port Statistics table may also be accessed by right-clicking the selected port on the front panel display (a blue fill will appear) and selecting **TP Port Statistics** from the drop-down menu.

Descriptions of the items above not previously mentioned in earlier sections:

- ◆ **InPortFrames/PortInFrames** The number of frames that have been received by this port from its segment. Note that a frame received on the interface corresponding to this port is only counted by this object if and only if it is for a protocol being processed by the local bridging function, including bridge management frames.
- ◆ **OutPortFrames/PortOutFrames** The number of frames that have been transmitted by this port to its segment. Note that a frame transmitted on the interface corresponding to this port is only counted by this object if and only if it is for a protocol being processed by the local bridging function, including bridge management frames.

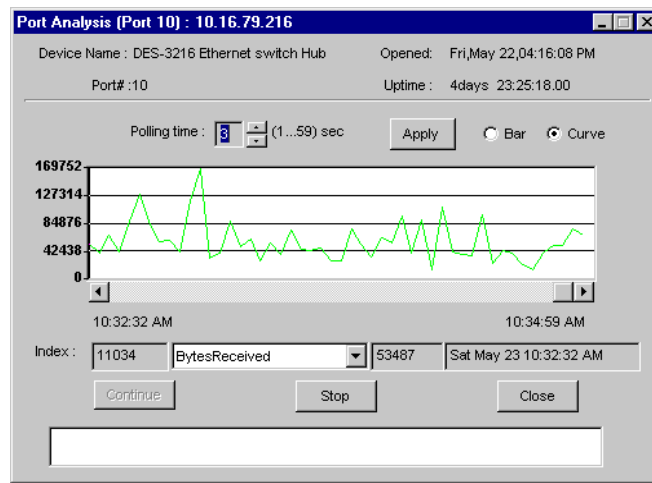
- ◆ **PortDiscardFrames/PortInDiscards** Count of valid frames received which were discarded (i.e. filtered) by the forwarding process.

## Analysis

### Port Analysis

To monitor analysis of traffic for a selected port in either bar graph or line curve form,

1. Select the port to display statistics for.
2. Open the **Performance** menu, choose **Analysis**, and click **Port Analysis**.
3. The Port Analysis screen appears:



The Port Analysis screen may also be accessed by right-clicking the selected port on the front panel display (a blue fill will appear) and selecting **Port Analysis** from the drop-down menu.

The module allows polling information to be obtained by use of a mouse. Select a point on the graph by clicking and dragging the vertical line at the left edge of the display to any point on the graph. The index number and the returned value will be displayed in the boxes at the bottom of the Port Analysis dialog.

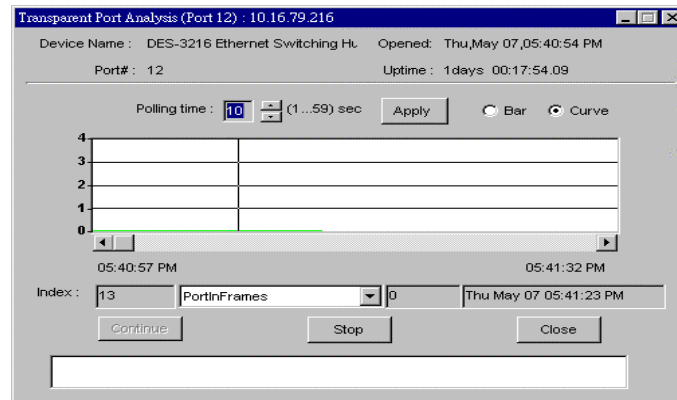
The following describes the items from above not mentioned in earlier sections:

- ◆ **Bar** User-selected option button for bar graph creation.
- ◆ **Curve** User-selected option button for line curve graph creation.
- ◆ **Index** Display segment identifier/counter.

## Transparent Port Analysis

To monitor transparent bridge analysis of traffic for a selected port,

1. Select the port to display statistics for.
2. From the **Performance** menu, choose **Analysis**, and click **Transparent Port Analysis**. The Transparent Port Analysis table will appear:



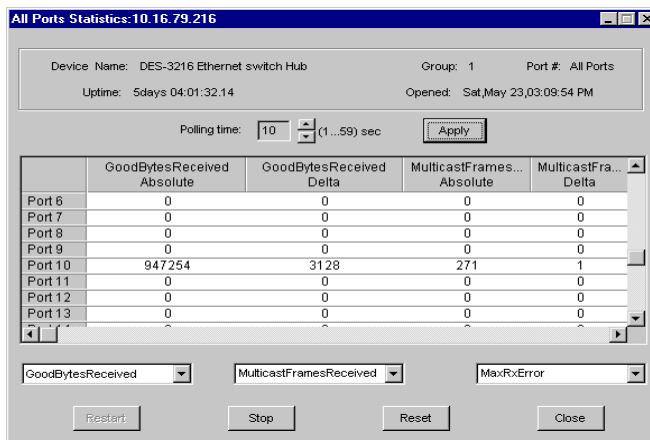
The Transparent Port Analysis screen may also be accessed by right-clicking the selected port on the front panel display (a blue fill will appear) and selecting **TP Port Analysis** from the drop-down menu.

For detailed descriptions of the items on this window, see earlier sections of the Performance chapter.

### **All Ports Statistics**

To monitor and display statistics of traffic for all ports of the switch in tabular form,

1. Select the switch.
2. Open **Performance** and choose **All Ports Statistics**.
3. The All Ports Statistics table appears:



The All Ports Statistics table may also be accessed by right-clicking in the gray area surrounding the ports on the front panel display (a green border will appear) and selecting **All Ports Statistics** from the drop-down menu.

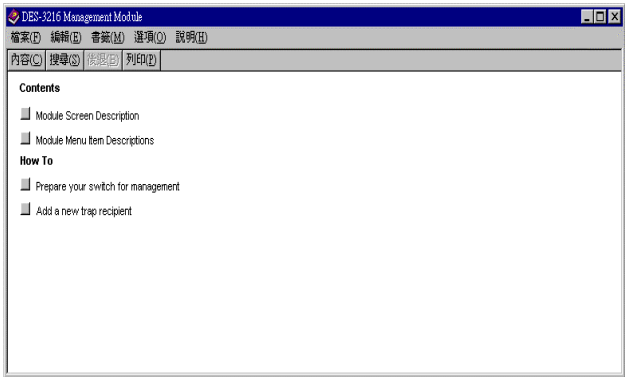
For detailed descriptions of the items on this window, see earlier sections of the Performance chapter.

## Info

---

Online help, as well as information about the management module of the switch, can be accessed from the **Info** menu.

To invoke online help, select **Help** from the **Info** menu.



To display information about version, authorship, and copyright information about this management module, select **About** from the **Info** menu.



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