

DES-3216

Management Module for

HP OpenView/Windows

User Guide

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RECYCLABLE

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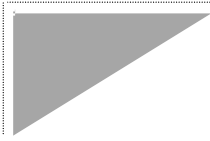
DES-3216 Management

User Guide



About this Guide

This guide explains how to use the HP OpenView for Windows network management system to manage the DES-3216 intelligent Ethernet/Fast Ethernet switch. It includes 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 Ethernet/Fast Ethernet switch and configuring it for network management, please consult the hardware edition of the *DES-3216 User Guide*.



Introduction

DES-3216 Intelligent Ethernet Switching

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

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

Network Management

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 platform for controlling DES-3216 intelligent Ethernet 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

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 100 or faster processor
- ◆ Microsoft Windows 3.1x or Microsoft Windows 95
- ◆ HP OpenView Network Node Manager, version C.02.06 or later
- ◆ 16 megabytes (32M preferred) of main memory (RAM)
- ◆ At least 10 megabytes of free hard disk space
- ◆ A Windows-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

Take the following steps to install the module on your network management system:

1. Exit HP OpenView if it is being run.
2. Insert the module diskette into your system floppy drive (**A:** or **B:**).
3. If using Windows 3.1, choose **Run...** from the Program Manager **File** menu. Under Windows 95, 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**.
5. The Installation program will auto search for the HP OpenView directory and install all of the necessary files onto your system.

The HP OpenView network management system will now be ready to manage DES-3216 Ethernet switches.

Preparing the Switch for Management

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 is turned on.
- ◆ 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.

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



DES-3216 Management

Adding the DES-3216 Switch to the Network Map

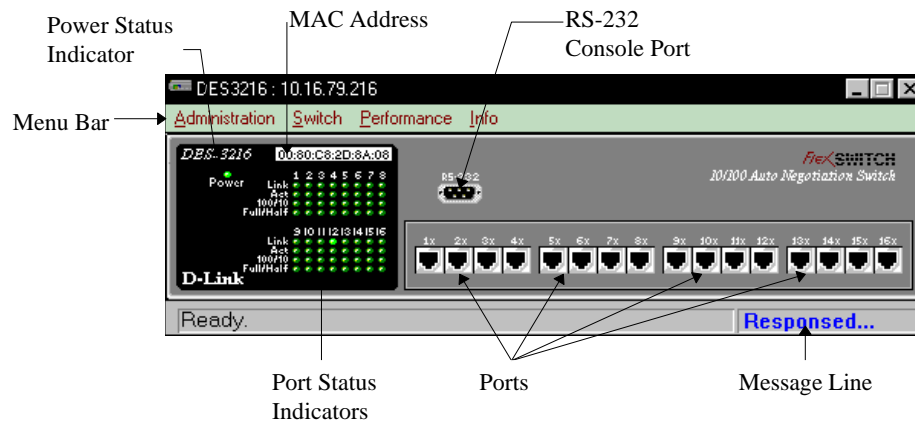
Before you can manage individual DES-3216 Ethernet/Fast Ethernet switches, they must be added to the HP OpenView network map. Follow these steps:

1. Launch the HP OpenView program and open its network map display by accessing **Programs** from the Windows startup menu and choosing HP OpenView from each of the two menus offered. If the software is installed properly, a network map entitled HP OpenView will appear.
2. Under the **Edit** menu, choose **Add**. An Add dialog opens.
3. Select **Component** from the top list box, then select DES-3216 from the bottom list box . This highlights the appropriate icon.
4. Drag and drop the highlighted icon to the network map.
5. A Describe DES-3216 dialog will automatically appear once the module icon has been moved to the network map. Enter the required information in the input boxes offered and click **OK**.
6. The network map has been created. Double-click the module map icon. The switch front panel should be displayed if the network link has been properly established.

Working with the Front Panel Display

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:

- ◆ **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.
- ◆ **Power Status Indicator**

- ◇ **Power** Shows that the switch is receiving power.
- ◆ **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.)
- ◆ **RS-232 Port** RS-232C console port can be used either for console-based management, or for out-of-band management using the SLIP (Serial Line IP) protocol.
- ◆ **Message line** This displays 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 green when the port is connected to a powered-on Ethernet/Fast Ethernet station.
 - ◇ **Act** Lights blinks off briefly when information is transmitted or received on the port, after the port is connected to a powered-on Ethernet/Fast Ethernet station.
 - ◇ **100/10** Lights when the port is operating at 100Mbps. All ports are NWay ports that can automatically detect whether 10BASE-T Ethernet or 100BASE-TX Fast Ethernet twisted-pair cable is connected.
 - ◇ **Full/Half** Lights green when the port is operating in full duplex mode.

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 and modules. The border of this area will turn 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 dialog box. 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 box 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 : 10.17.11.39

SysName : DES-5016 Ethernet S IP Address : 10 . 17 . 11 . 39

Location : Discovery, Irvine, C Subnet Mask : 255 . 0 . 0 . 0

Contact : DES-5016 Ethernet S Gateway : 10 . 254 . 254 . 254

Rs232 Config : Out-Of-Band Baud Rate : 19200

☒ Learn any new addresses from the Ethernet ports.

☒ Send Authentication Fail Trap.

Object	Description
System Description	10/100 Fast Ethernet Switching Hub
System OID	1.3.6.1.4.1.171.10.9.3
Uptime	0days 03:53:29.93
Last IP Address	10.17.11.39
MAC Address	00:80:c8:2d:8a:08

Refresh OK Close

Start Get...Please wait!
Get OK at 06/15/98 15:21:22

2. If modifications or additions are desired, change the fields as necessary.
3. 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:

- ◆ **SysName** Name for 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 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.
- ◆ **Baud Rate** Bit rate of the console port when it is being used for out-of-band (SLIP) communications.
- ◆ **Learn any new addresses from the Ethernet ports** Checkbox that determines whether or not to instruct the module to record the source MAC address for each packet a port receives in an address table.
- ◆ **Send Authentication Fail Trap** Checkbox that determines whether or not an authentication fail trap should be sent if access is attempted with an unauthorized community name or if write privileges are attempted by a user with read-only access.

The items displayed in the list box include:

- ◆ **System Description** Description of the switch model.
- ◆ **System OID** SNMP Object Identifier for the switch model.
- ◆ **Uptime** Amount of time the switch has been powered on.
- ◆ **Last IP Address** IP address used the last time the switch was booted.
- ◆ **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.
- ◆ **MIB Capability** List of MIB modules that are supported by the switch.
- ◆ **DRAM Size** Size of dynamic random access memory in megabytes.
- ◆ **Unauthorized SNMP Packet IP Address** When a request with an unknown (unauthorized) SNMP community name is received, this item shows the source address.
- ◆ **Unauthorized SNMP Packet Community** When a request with an unknown (unauthorized) SNMP community name is received, this item shows the illegal community name.
- ◆ **Total Ports In Use** Total number of ports currently in use. Corresponds to the number of link LEDs currently lit.

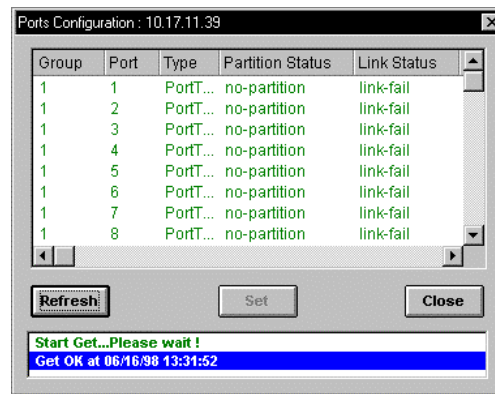
- ◆ **Number IP Interfaces** Number of TCP/IP channels available for use for switch management. This will be 2 if the SLIP (Out-of-Band) interface is enabled, and 1 if only the in-band Fast Ethernet interface is available.
- ◆ **Total number of ports** The total number of ports managed by the switch.
- ◆ **Bridge Type** Type of bridge about every port associated with it.
- ◆ **IP interface Type** Type of network interface.

Ports Configuration

The operation of individual ports can be controlled using the Ports Configuration dialog. This dialog 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 dialog,

1. Select the switch (group) by clicking in the area surrounding the RJ-45 ports. A green box appears if correctly selected.
2. Open **Administration**, choose **Configuration**, and click **Ports Configuration** (Shortcut : right click in the green box and select from the menu). The following **Ports Configuration** table appears:



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 controls displayed in the Ports Configuration section are described below:

- ◆ **Group** Selected switch.
- ◆ **Port** Selected port.
- ◆ **Type** 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.
- ◆ **Duplex Mode** 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.

- ◆ **Negotiation** Enables or disables NWay speed negotiation on the port.
- ◆ **Speed** Determines whether the port should be used at 10Mbps or 100Mbps.
- ◆ **Admin Control** Allows user to connect or disconnect port to the network.
- ◆ **Link Changes Trap** 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 Broadcast Control** Determines whether or not the port should receive broadcast packets.
- ◆ **Forward Unknown Control** Determines whether or not unknown packets (packets with destination addresses that the switch has not yet learned) should be broadcast to the port.
- ◆ **Port 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.

To make changes to items to a port in **Ports Configuration** :

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



1. Set the parameter desired.
2. Click **OK** to let the changes take effect, or click **Close** to cancel the current session changes.

The controls displayed in the **Set Port Parameters** dialog box are described below:

- ◆ **Group** Selected switch.
- ◆ **Port** Selected port.
- ◆ **Administration** Enable or disable the port control administration state.
- ◆ **NWay** Allow auto-negotiation between 10Mbps / 100Mbps, HDX / FDX or not.
- ◆ **Duplex** Determines whether the port is used in half-duplex or full-duplex mode. This option cannot be changed (grayed out).
- ◆ **Speed** Determines whether the port should be used at 10Mbps or 100Mbps. This option cannot be changed (grayed out).

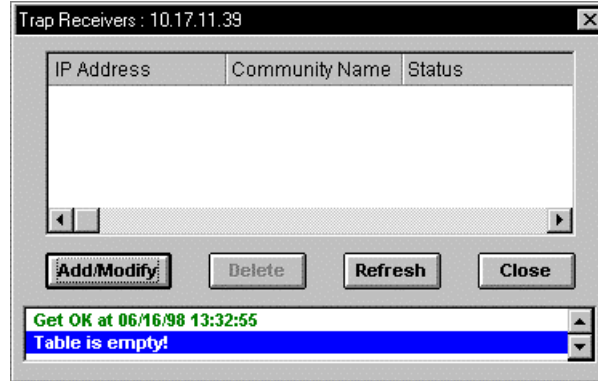
- ◆ **Send trap when link status changes** Determines whether or not a trap should be sent when the status of a link on the selected port changes. An automatic test occurs where the link test status changes from link fail to OK and vice versa (OK to link failure). If enabled, the switch sends a trap message to its designated trap receiver when such an event occurs on a port.

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.



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



To modify a trap recipient, highlight the entry, make the necessary changes, and click **OK**. To delete a trap recipient, highlight the entry and click **Delete**.

The fields displayed are:

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

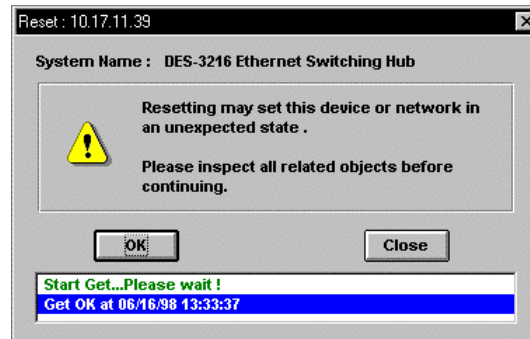
For more information about changing the switch trap configuration, see the hardware edition of the *DES-3216 User Guide*.

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

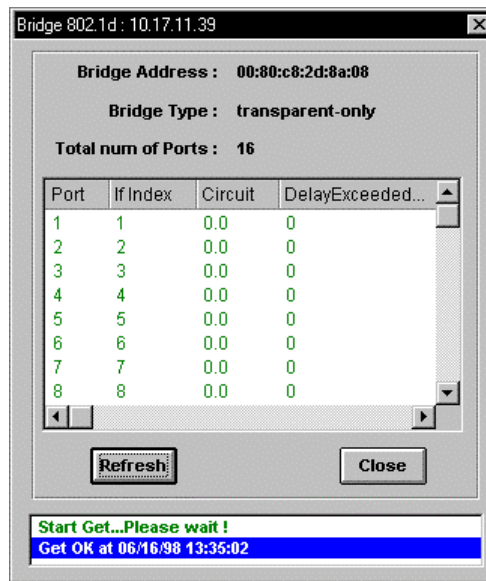
the spanning tree protocol will automatically reconfigure the network topology.

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 levels. 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 **Bridge 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 **Bridge 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** Type of bridge containing generic information about every port associated with it.
- ◆ **Total num of Ports** Number of ports on the bridge. The DES-3216 switch features 16 ports.
- ◆ **Port** Shows the port number .
- ◆ **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.

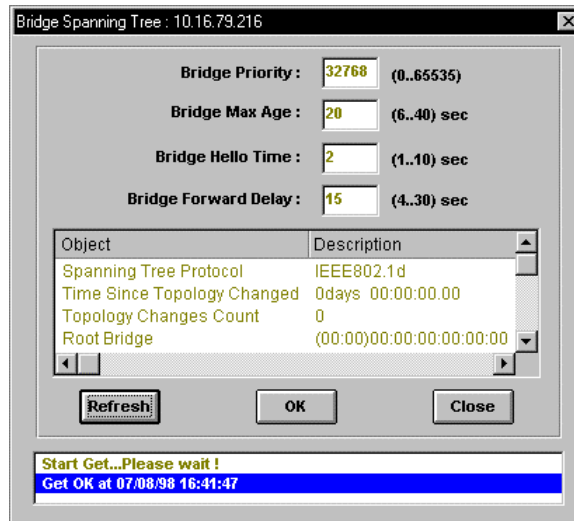
Spanning Tree

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



2. Click the **Refresh** button 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** The 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 Max Age** The 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, with 20 seconds as the default value.
- ◆ **Bridge Hello Time** The 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, with 2 seconds as default.
- ◆ **Bridge Forward Delay** The 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:

Bridge Max Age • 2 • (Bridge Hello Time + 1 second)

Bridge Max Age • 2 • (Bridge Forward Delay - 1 second)

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

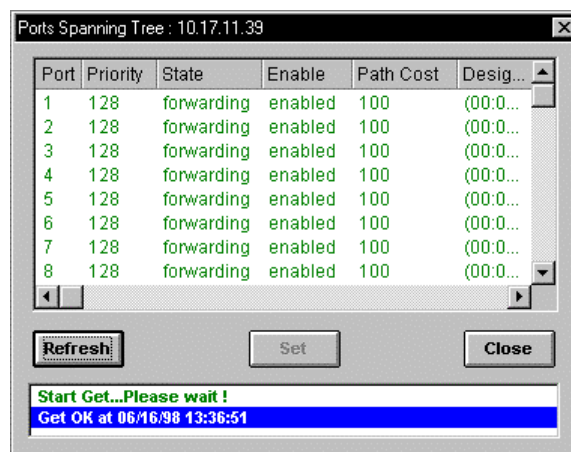
- ◆ **Spanning Tree Protocol** The read-only object indicates the STP version implemented on the bridge. An "802.1d(3)" value means that the STP version is IEEE 802.1d.
- ◆ **Time Since Topology Changed** The read-only object displays the last time changes were made to the network topology. These changes usually occur when backup paths are activated due to primary path failures.
- ◆ **Topology Change Count** The 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.
- ◆ **Root Bridge** The 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** The 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** The 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.
- ◆ **Hold Time (sec)** The read-only object displays the time interval during which no more than two configuration BPDUs shall be transmitted by the bridge.

- ◆ **Root Hello Time (sec)** The 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.
- ◆ **Root MaxAge (sec)** The read-only object indicates the maximum age of STP information learned from the network (on any port) before it is discarded.
- ◆ **Root Forward Delay (sec)** The 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

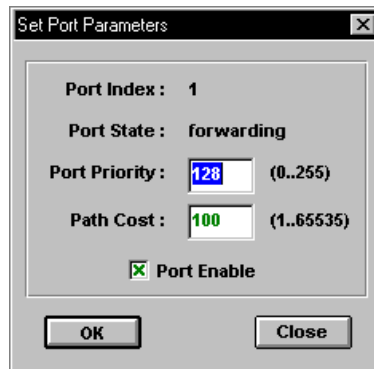
To access the **Ports Spanning Tree** dialog box,

1. Open **Switch**, choose **Spanning Tree**, and click **Ports Spanning Tree**.



2. Click the **Refresh** button 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 **Set Port Parameters** 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 **Ports Spanning Tree** and **Set Port Parameters** dialog boxes:

- ◆ **Port** The 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** The 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** The 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** The read-only object indicates whether the Ports spanning tree State is enabled or disabled. The Port Enable checkbox is located in the Set Port Parameters dialog box .
- ◆ **Path Cost** The 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** The read-only object displays the bridge ID of the current root bridge on the network.
- ◆ **Designated Cost** The read-only object displays the corresponding path cost of the designated port for the segment the port is connected to.
- ◆ **Designated Bridge** The 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** The read-only object displays the port ID of the designated port for the segment the port is connected to.
- ◆ **Forward Transitions** The read-only object displays the number of times the port moved from learning state to forwarding state.
- ◆ **Port Index** This is the physical number of the port selected.
- ◆ **Port State** This is the current spanning state of the port. A port can have the following states: disabled, blocking, listening, learning, forwarding, and broken.
- ◆ **Port Priority** This is the priority number of the port. The smaller the number set, the higher the port priority is. Port priority ranges from 0 to 255, with 0 being the highest port priority.

- ◆ **Path Cost** This is 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.
- ◆ **Port Enable** Check this box to enable the Ports Spanning Tree 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.
2. From the **Performance** menu, choose **Statistics**, then **Port Statistics** (Shortcut : Right click on the desired port and select **Port Statistics** from the menu). The Port Statistics table will appear:

	Absolute	Delta	Rate	Peak	Peak...
BytesReceived	8780859...	1212...	40819	57078	13:3...
BytesSent	1562416	1440	484	484	13:3...
FramesReceived	1715139	164	55	76	13:3...
FramesSent	13006	6	2	2	13:3...
TotalBytesReceived	8780859...	1212...	40819	57078	13:3...
TotalFramesReceived	1715139	164	55	76	13:3...
BroadcastFramesReceived	1091906	0	0	261	13:3...
MulticastFramesReceived	38647	8	2	14	13:3...
CRCError	166	0	0	0	

Descriptions of the items above follow:

- ◆ **System Name** Name of the device.
- ◆ **Opened** Time and date when the current management session with the selected device was started.
- ◆ **Uptime** Time since the network management portion of the system was last re-initialized.
- ◆ **Port** Port number which the option applies to.
- ◆ **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 **Restart** button of the port table.
- ◆ **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.
- ◆ **PeakAt** This column displays the date and time when the peak value was reached for the selected object.
- ◆ **BytesReceived** Counts the total number of bytes (octets) included in valid (readable) frames.
- ◆ **BytesSent** Counts the number of bytes successfully sent from the port.
- ◆ **FramesReceived** Counts all valid frames received on the port.
- ◆ **FramesSent** 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 your Ethernet are too long, and you have either exceeded the repeater count or cable length specified in the Ethernet standard.
- ◆ **64 Bytes** Displays the number of frames with 64 bytes of information.
- ◆ **65-127Bytes** Display the number of frames with 65 to 127 bytes of information.
- ◆ **128-255Bytes** Display the number of frames with 128 to 255 bytes of information.
- ◆ **256-511Bytes** Display the number of frames with 256 to 511 bytes of information.

- ◆ **512-1023Bytes** Display the number of frames with 512 to 1023 bytes of information.
- ◆ **1024-1522Bytes** Display the number of frames with 1024 to 1522 bytes of information.
- ◆ **MACRxError** Counts data errors detectable as 10BASE-T symbol errors," bit patterns with illegal encodings. This may indicate noise on the line.

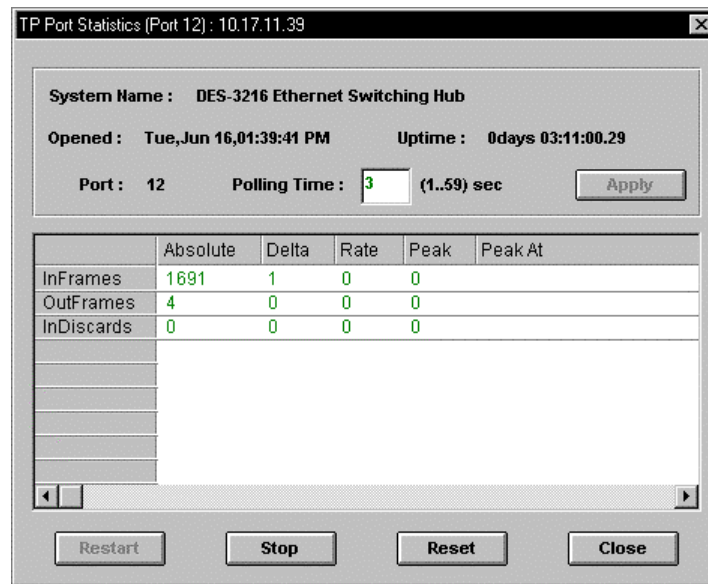
TP Port Statistics

To display transparent bridge port statistics in tabular form,

1. Select the port .

Open **Performance**, choose **Statistics**, and click **TP Port Statistics** (Shortcut : right-click the selected port on the front panel display (a blue fill will appear) and select **TP Port Statistics** from the drop-down menu).

1. The Port Statistics for Transparent Bridge table appears:



Descriptions of items on the Port Statistics for Transparent Bridge table follow (for additional descriptions see the earlier Port Statistics section):

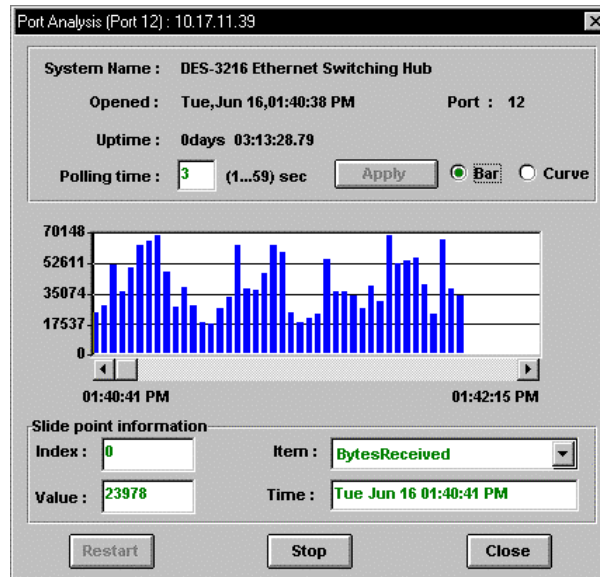
- ◆ **InFrames** The number of frames that have been received by this port from its segment. Note that a frame received on the interface corresponding to this port is only counted by this object if and only if it is for a protocol being processed by the local bridging function, including bridge management frames.
- ◆ **OutFrames** 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.
- ◆ **InDiscards** Count of valid frames received which were discarded (i.e. filtered) by the Forwarding Process.

Analysis

Port Analysis

To display port statistics in bar graph or line curve form :

1. Select the port to display statistics for.
2. Open the **Performance** menu and choose **Analysis** , then click on **Port Analysis**(Shortcut : right-click the selected port on the front panel display (a blue fill will appear) and select **Port Analysis** from the drop-down menu).
3. The Port Analysis screen appears:



4. Click Bar or Curve to create the graphical display desired.

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 above:

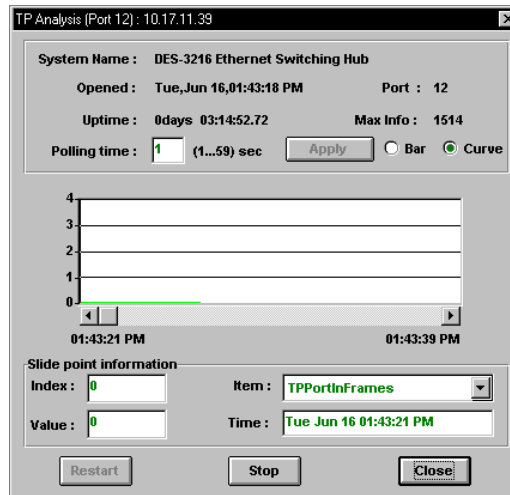
- ◆ **System Name** Name of the device.
- ◆ **Opened** Time and date when the current management session with the selected device was started.
- ◆ **Port** Port number which the option applies to.
- ◆ **Uptime** Time since the network management portion of the system was last re-initialized.
- ◆ **Polling 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.
- ◆ **Bar** User-selected button for bar graph creation.
- ◆ **Curve** User-selected button for line curve graph creation.
- ◆ **Slide Point Information** The **Index**, **Value**, **Item**, and **Time** describe the graphical representation of the analysis.
- ◆ **Index** Displays the segment identifier/counter (horizontal axis on the curve).
- ◆ **Value** Value of the object selected shown on the vertical axis at the index point .
- ◆ **Item** This list box contains the objects from the **Port Statistics** dialog box described above. Select an object for analysis .

- ◆ **Time** Time and date the current analysis session started.

TP Port Analysis

To display port statistics for the transparent bridge in bar graph or line curve form,

1. Select the port to display statistics for.
2. Open **Performance**, choose **Analysis**, and click **TP Port Analysis**
(Shortcut : right-click the selected port on the front panel display (a blue fill will appear) and select **TP Port Analysis** from the drop-down menu).
3. The Port Statistics for Transparent Bridge screen appears:



The controls located in the window are described in the **Port Analysis** and **TP Port Statistics** sections except for :

- ◆ **Max Info** The maximum size of the INFO (non-MAC) field that this port will receive or transmit.

All Ports Statistics

To display port statistics for the switch in tabular form,

1. Select the switch.
2. Open **Performance** and choose **All Ports Statistics** (Shortcut : right-click the switch (the green box) and select **All Ports Statistics** from the drop-down menu).
3. The All Ports Statistics table appears:

All Ports Statistics : 10.17.11.39

System Name : DES-3216 Ethernet Switching Hub

Opened : Tue, Jun 16, 01:46:29 PM Uptime : 0days 03:16:52.35

Group : 1 Polling Time : 3 (1-59)sec

	BytesReceive... Absolute	BytesReceive... Delta	BytesSe... Absolute	BytesSe... Delta	FramesReceive... Absolute	Fram... Delta
Port 1	0	0	0	0	0	0
Port 2	0	0	0	0	0	0
Port 3	0	0	0	0	0	0
Port 4	0	0	0	0	0	0
Port 5	0	0	0	0	0	0
Port 6	0	0	0	0	0	0
Port 7	0	0	0	0	0	0
Port 8	0	0	0	0	0	0
Port 9	0	0	0	0	0	0
Port 10	0	0	0	0	0	0

4. To display individual statistics, choose one item from each of the drop-down lists at the foot of the **All Ports Statistics** table. Three port statistics can be displayed at one time. Use the scroll bar to view the statistics for all 16 ports.

The controls located in the window are the same as described in the **Port Statistics** section.

Info

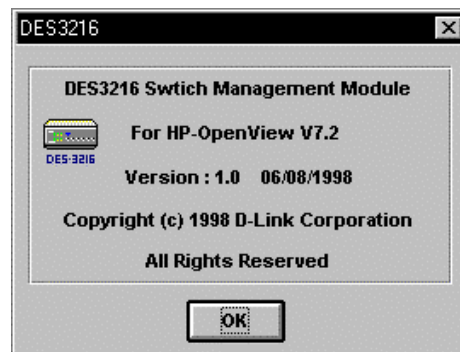
Online help, as well as information about the management module of the switch, can be accessed from the **Info** menu.

Help

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

About

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



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