DIGITAL MultiSwitch 300

Installation and User's Guide

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This guide describes how to install and configure a DIGITAL MultiSwitch 300.

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Preface

Overview

About This Guide

This guide describes the DIGITAL MultiSwitch 300 and procedures for installing and configuring it.

Intended Audience

This guide is intended for use by personnel who install and configure the DIGITAL MultiSwitch 300 system.

Organization

This guide is organized as follows:

Chapter/ Appendix	Description
1	Provides an overview of and describes the features of the MultiSwitch 300.
2	Describes typical configurations of networks using the MultiSwitch 300.
3	Details the installation and setup of the MultiSwitch 300.
4	Identifies the process for troubleshooting problems with the MultiSwitch 300.
5	Provides an overview of and describes the features of the SNMP Agent.
6	Describes how to access the Administrative Interface.
7	Details the use of the Administrative Interface and identifies the commands available at the console.
8	Describes how to use an SNMP Manager with the MultiSwitch 300.
9	Identifies the process for troubleshooting problems with the SNMP Manager.
A	Provides product specifications for the MultiSwitch 300.
B	Lists and describes all the command line console commands available through the Administrative Interface.
C	Identifies the system default values.
D	Provides a list of associated documents and ordering information.
E	Service Information and Support

Conventions

This guide uses the following conventions:

Convention	Description
`Special Type`	This special type in examples indicates system output.
boldface	Indicate user input at the console.
<*Italics*>	Italic type in examples indicates variable user input.
<Return>	Indicates that you should press the Return key.

Safety

Any warning or caution that appears in this guide is defined as follows:

WARNING	Contains information to prevent personal injury.
CAUTION	Contains information to prevent damage to equipment.
VORSICHT	Enthält Informationen, die beachtet werden müssen um den Benutzer vor Schaden zu bewahren.
ACHTUNG	Enthält Informationen, die beachtet werden müssen um die Gerate vor Schaden zu bewahren
DANGER	Signale les informations destinées à prévenir les accidents corporels.
ATTENTION	Signale les informations destinées à prévenir la détérioration du matériel.
AVISO	Contiene información para evitar daños personales.
PRECAUCIÓN	Contiene información para evitar daños al equipo.

Chapter 1

Introduction

Product Description

The DIGITAL MultiSwitch 300 is a 12-port Fast Ethernet switch featuring eight autonegotiating 10/100BaseTX ports and up to four additional 10/100BaseTX/FX uplink ports. The MultiSwitch 300 provides a cost-effective solution for increasing the available bandwidth and distance of Fast Ethernet installations by dividing the network into segments and insulating each from the others' local traffic. Since each port autonegotiates either a 10 Mb/s or a 100 Mb/s connection, the MultiSwitch 300 allows you to upgrade your existing 10 Mb/s network devices to 100 Mb/s as needed.

Each switch supports up to 4096 addresses. Up to four additional ports are available by using 10/100BaseTX/FX plug-in modules (two ports per module are added).

Delays in data transfer are eliminated through the MultiSwitch 300 parallel store-and-forward architecture with direct port-to-port transfer. Its proprietary hardware enables the switch to handle wire speed reception, including broadcast and multicast frames, through a filtering and forwarding rate of 700,000 packets per second. Unique selective flow control improves performance by preventing lost packets due to buffer overload. This feature is critical for sliding window network operating systems (NOSs) such as TCP/IP and Novell NetWare 4.2, and is available on 10/100 Mb/s half-duplex ports and 100 Mb/s full-duplex ports.

Up to 200 Mb/s point-to-point connections over standard Fast Ethernet cabling can be achieved with full-duplex adapter cards made for supporting high-end workstations and applications. Furthermore, full-duplex operation eliminates the Fast Ethernet distance limitation of 200 to 400 m (depending on the media type), enabling transmission distances up to 18 km over fiber optic cable.

Broadcast and security domains may be defined, creating virtual networks that allow secure workgroups and better manage network traffic. Any filter can be defined based on multicast/broadcast, source port, destination port, and destination address. Additional VLAN features include the ability to set virtual broadcast domains and virtual security LANs. Further reliability is provided through complete runt and CRC filtering.

The MultiSwitch 300 can operate as a standalone unit or with any other Ethernet offering from Digital Equipment Corporation. The unit does not require an NMS agent; however, it can be monitored and controlled through any SNMP-based NMS, if desired.

Features

- 8 RJ45 STP autonegotiating 10/100 ports
- Two expansion slots supporting up to 2 TX, 2 FX
- Standard 19-inch rack-mount chassis (rack-mount kit included)
- Auto-ranging power supply (automatically adjusts to any voltage between 90 Vac and 264 Vac at 50/60 Hz)
- Half/full duplex selectable on each port via management
- Flow control selectable on each port
- 4096 address cache entries
- Extensive custom filtering table
- Serial console port with password protection
- Downloadable flash firmware (serial or TFTP)
- SNMP support
- Spanning Tree
- RMON support built in for statistics, history, alarms, and events (Group 1, 2, 3, and 9)
- Port-based VLAN
- Port mirroring
- Telnet

Switch and Network Management Systems

The MultiSwitch 300 can be monitored and controlled through the DIGITAL MultiSwitch 300 Manager application, or through a generic SNMP NMS. See the *DIGITAL MultiSwitch 300 Manager User's Guide* for information about how the DIGITAL NMS works.

The MultiSwitch 300 does not require an NMS; however, network management functions greatly assist monitoring and controlling your network. For example, through SNMP you can monitor port statistics, configure individual ports, and view bridging information.

Chapter 2

Typical Configurations

Configuring Your Network

Links to a file server and links between switches often create bandwidth bottlenecks. When a dedicated 10 Mb/s link is not fast enough, or when a network-wide upgrade path is planned, Fast Ethernet is a viable solution.

Links to a File Server

Intense client/server traffic on the LAN may limit the overall performance of a network. Fast Ethernet allows the file server to communicate at 100 Mb/s to a 10/100 switch such as the MultiSwitch 300, which then distributes the traffic to several 100 Mb/s or 10 Mb/s ports.

Links Between Switches

Links that run at more than 10 Mb/s are essential between switches. If the link between two switches is at 10 Mb/s, then only one full-speed Ethernet stream can be handled at any given time. With the 100 Mb/s connection of Fast Ethernet, 10 full-speed Ethernet streams may be handled simultaneously using half-duplex mode. With full-duplex mode, 20 full-speed symmetrical streams may be handled simultaneously.

An Ethernet to Fast Ethernet switch presents the network administrator with a possible upgrade path. At first, the switch can be used simply to segment the existing network, immediately boosting performance. Next, with the addition of a single 100 Mb/s network interface card (NIC), a file server can be migrated to Fast Ethernet, increasing its availability. As needed, additional file servers or individual users can be moved to Fast Ethernet while leaving all other parts of the network running as usual. If some of the shared Ethernet segments are still congested, but don't warrant a full 100 Mb/s connection, additional switches may be added to further divide the shared segments, creating a small collapsed 100 Mb/s backbone and small switched 10 Mb/s segments. The MultiSwitch 300s autonegotiating 10/100 ports provide unmatched flexibility because they allow the network administrator to upgrade the network devices to 100 Mb/s as needed; existing 10 Mb/s hardware is fully compatible with the MultiSwitch 300.

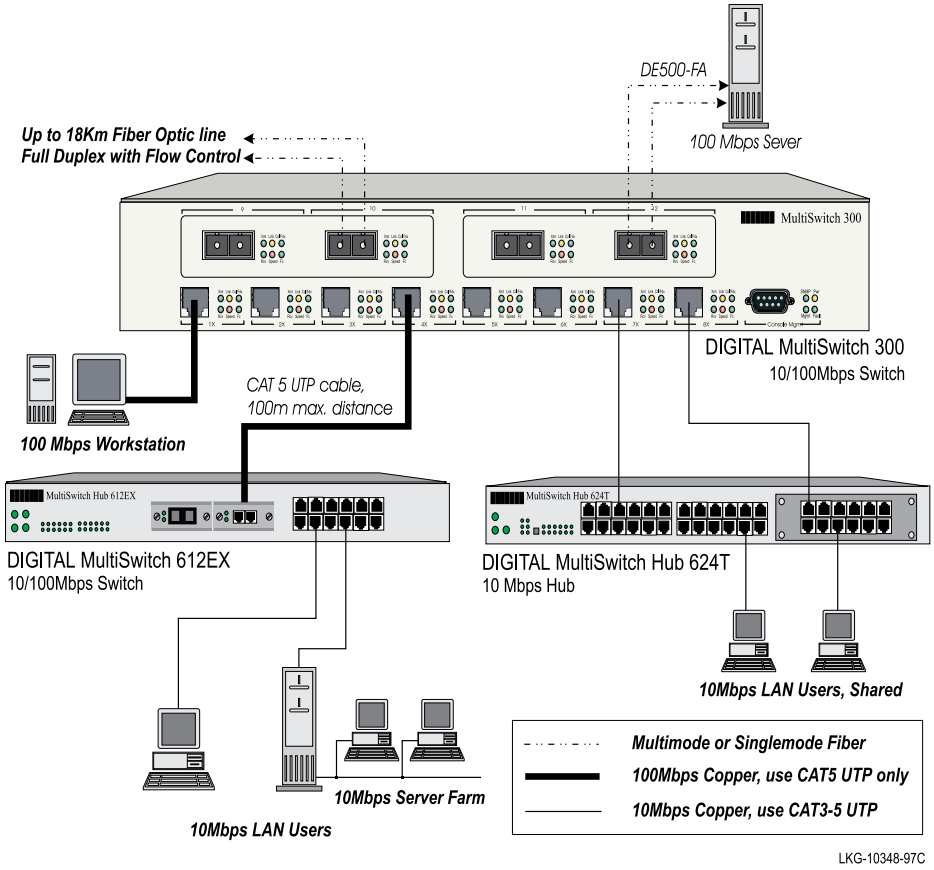
Finally, if a network's bandwidth needs outstrip even 100 Mb/s shared workgroups, the MultiSwitch 300 can be used with the DIGITAL MultiSwitch 600 family of products to create a fully switched Fast Ethernet network.

Configuration Examples

Single Server Environment

In a network with a single server, or even in a collapsed backbone with a single server, a good way to achieve bandwidth improvement is to use a dedicated 100 Mb/s Fast Ethernet link to the server. Both the 10 Mb/s workgroups and the 100 Mb/s server can be connected directly to the MultiSwitch 300 (Figure 2-1).

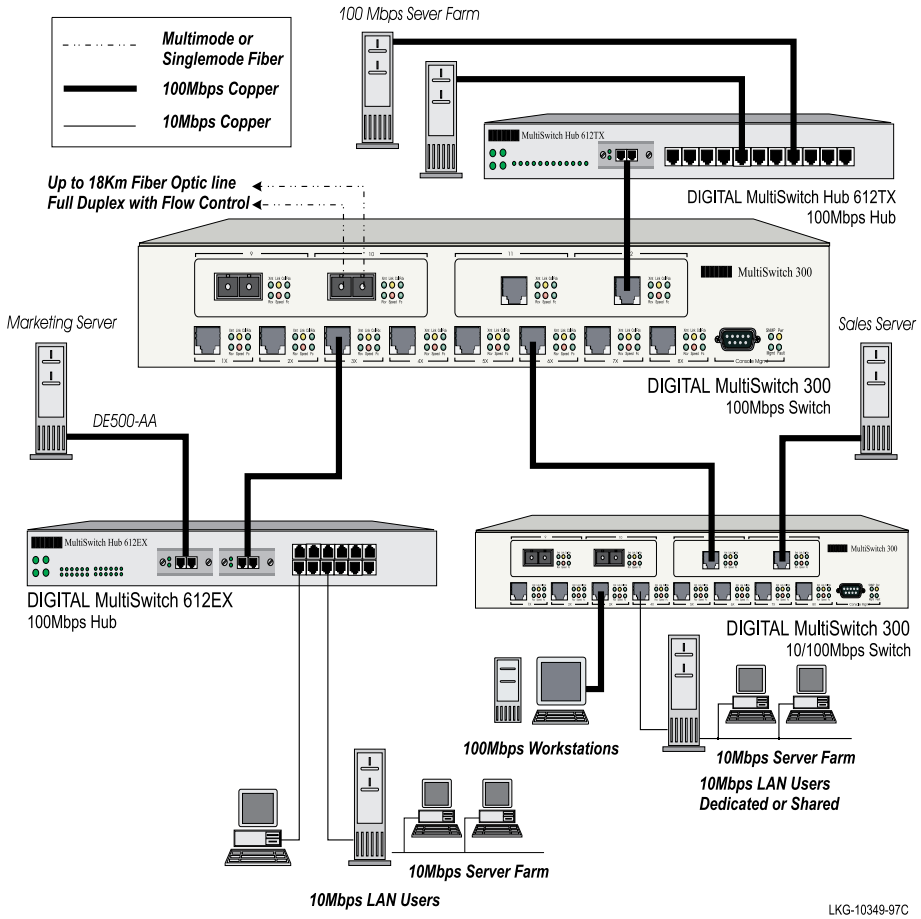
Figure 2-1: Typical Configuration in a Single Server Environment



Multiple Server Environment

With multiple servers, a variety of approaches may be taken depending on your network's traffic patterns. If each of your network users has a particular primary server that they use, then that server should be connected to one of the fast ports of the MultiSwitch 612EX. The second fast port should be connected to the backbone; the MultiSwitch 300 serves as the departmental backbone switch and the servers should be connected to it either through a 100 Mb/s hub, such as the MultiSwitch Hub 612TX, or connected directly (Figure 2-2).

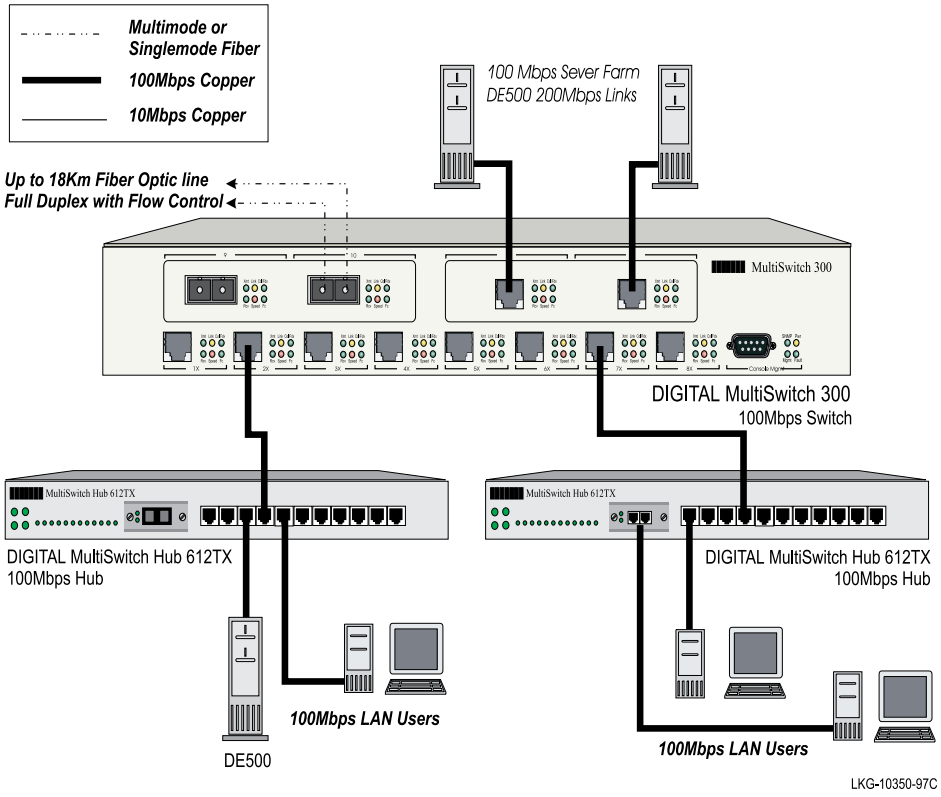
Figure 2-2: Typical Configuration in a Multiple Server Environment



100 Mb/s Environment

In a 100 Mb/s environment, workgroup clients should be connected to a 100 Mb/s hub such as the MultiSwitch Hub 612TX (Figure 2-3). All hubs should be connected to the MultiSwitch 300. By connecting the hubs to a switched environment, the 100 Mb/s BaseTX distance limitation applies only to the workgroups.

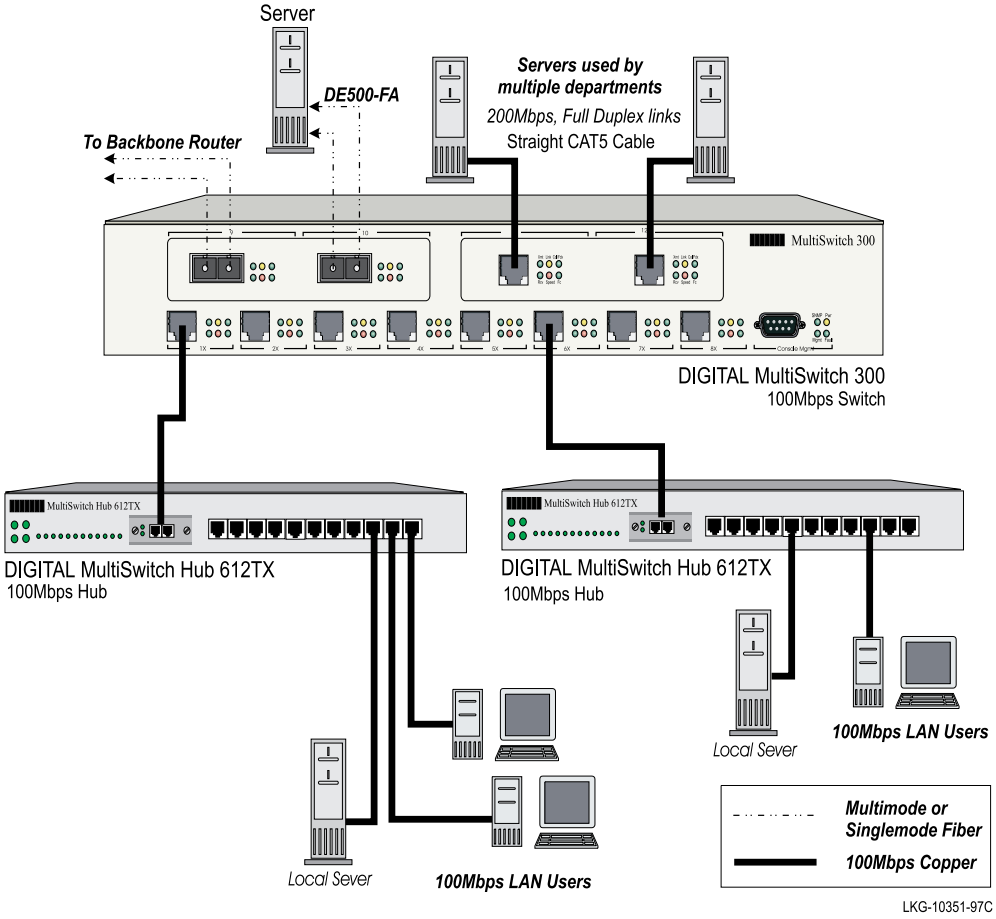
Figure 2-3: Typical Configuration in a 100 Mb/s Environment



Multiple Server/WAN Environment

If the users typically utilize more than one server extensively, then it may be beneficial to configure their network so that machines that serve multiple groups are given their own port on the switch. For instance, suppose that there are several departments, each with its own file server, and there is a single firewall router connected to the backbone. Each department should then have its own port on the switch, while the router, which is used by members of all departments, should have its own port on the switch.

Figure 2-4: Typical Configuration in a Multiple Server/WAN Environment



Excessive Flow Control

During times of peak network usage, you may occasionally see the flow control indicator (Fc) flash. This is normal. However, either of the following conditions could indicate a problem with your network configuration: if the indicator stays lit for more than a few seconds at a time, or there is an excessive number of flow controls reported by the NMS. A port's flow control indicator flashes whenever a packet is received that needs to be forwarded to a port that already has too many packets queued for it. This indicates a temporary over-bandwidth situation on one port; that is, the total traffic attempting to be forwarded to the port was in excess of 100 Mb/s, and the switch's buffers were full. This typically occurs when there are several fast machines on different ports trying to access a machine across the switch. If this occurrence was due to an unusual event, then no further action is necessary. If this is part of the normal usage pattern for the network, then the station(s) causing the flow control to activate should be identified and moved to the same segment as the machine it is communicating with.

When a situation arises where Ethernet bandwidth is insufficient for the traffic, there are only two possible actions: drop packets or use flow control. Buffering packets works for a time period, but an extended over-bandwidth situation will eventually overflow buffers and cause dropped packets. Flow control is an alternative solution, since it relies on Ethernet's inherent collision detection mechanism to relieve temporary over-bandwidth situations (half-duplex mode only).

Full-Duplex Flow Control

Normally, flow control is not available on full-duplex ports. This is because the switch generates flow controls by sending a JAM signal whenever it is unable to forward a frame. When the host NIC receives the JAM, it will retransmit the packet from hardware buffers. This is faster than relying on higher level software transport layers, which must first detect the dropped packet via a time-out mechanism, then regenerate and re-queue it. Since there are no collisions in full-duplex mode, the traditional method of generating a flow control will not work. However, the MultiSwitch 300 implements a proprietary flow control protocol on full-duplex ports by sending a special frame that another MultiSwitch 300 interprets as a signal to briefly halt transmission to the overloaded port; this will alleviate the over-bandwidth situation. To gain the advantages of flow control when using full-duplex, **both** switches must be MultiSwitch 300's.

NOTE

Full-duplex MultiSwitch 300 flow control works only between MultiSwitch 300s. Full-duplex flow control should NOT be enabled on a MultiSwitch 300 port if the device on the other end is not a MultiSwitch 300 (that is, MultiSwitch 6xx, VNswitch, other vendors' switches).

Repeater Count Limits

A switch does not count as a repeater. Each of the segments connected to a switch port can support a full Ethernet LAN; there can be up to two Class II hubs or one Class I hub between the switch and any station(s).

If you have specific questions about your network configuration, or have a particularly difficult network, please call your DIGITAL Service Representative. (See Chapter 4, MultiSwitch 300 Troubleshooting.)

NOTE

The MultiSwitch 300 can handle a sustained load of 530 Mb/s or 700 Kp/s. Exceeding these capabilities for an extended period of time will result in excessive flow control. If this happens, the network should be reconfigured to decrease the load.

Chapter 3

Installation and Setup

Installing the MultiSwitch 300

The following instructions will enable you to successfully install the MultiSwitch 300 in your network.

Step 1: **Determine the Best Location for the Switch**

Install the unit in a 19-inch rack using the enclosed rackmount ears, or place the unit on a secure, flat surface after attaching the enclosed rubber feet. Ensure that the switch is within reach of the necessary connections (power outlet, Ethernet connections, and, if the unit will be monitored through the serial port, a PC, UNIX workstation, or modem).

Step 2: **Plug in the Switch**

Simply connect the power cord to the switch and an outlet. Turn the power switch to the ON position. The power supply automatically adjusts to any outlet providing between 90 Vac and 264 Vac at 50/60 Hz.

Step 3: **Connect the Ethernet Devices**

For optimum performance, the Ethernet segments connected to the MultiSwitch 300 must be configured so that machines on a given port communicate primarily among themselves; most traffic does not need to cross the switch.

NOTE

The default configuration of all ports is half-duplex mode. To change this default, you must use the Administrative Interface or an SNMP manager.

To connect an Ethernet device to a MultiSwitch 300 port:

- The autonegotiating ports on the MultiSwitch 300 are designed to be connected directly to a hub, using a crossed patch cable. To connect a workstation to the switch, you must use either a hub between them, or a straight cable.

To use full-duplex mode:

- Full-duplex mode may be selected via management. Consult Chapter 6, Accessing the SNMP Agent, or the *DIGITAL MultiSwitch 300 Manager User's Guide* for port configuration.

Step 4: What to Do Next

If you are using the MultiSwitch 300 as a standalone device (not under NMS control), you have completed the installation and setup of the Switch.

Using the MultiSwitch 300

Operation of the switch requires minimal user intervention. The unit automatically learns the addresses of new stations as they appear, and will relearn addresses (up to a limit of 4096) of new stations dynamically, if the network is reconfigured.

Understanding the LEDs

Each of the 10/100 ports has six status LEDs, as shown in Figure 3-1.

Xmt Lights when this port transmits packets.

Rcv Lights when this port receives packets, even if they are not forwarded.

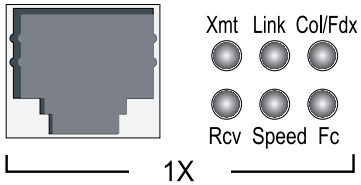
Link Lights whenever a link signal is received. This indicates that a connection has been established.

Speed Lights when the link is at 100 Mb/s, off when it is at 10 Mb/s.

Col/Fdx Is a multipurpose indicator. It lights continuously when full-duplex mode is enabled; otherwise, it is off, indicating half-duplex operation. It blinks whenever a collision is detected.

Fc If flow control is enabled on this port, this LED blinks whenever flow control is activated.

Figure 3-1: Status LEDs on a 10/100 Port



FX Cabling

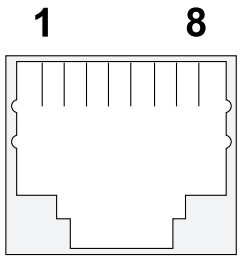
Fiber optic cabling is rapidly becoming a cost-effective alternative to Category 5 UTP. Fiber's falling cost, along with greater longevity, immunity to electrical interference, greater transmission distance, and higher bandwidth capability make it a strong alternative for new installations. The combination of fiber optics, Fast Ethernet, and full-duplex operation yields a compelling solution for LAN congestion. The MultiSwitch 300 supports up to 18 km over a single mode fiber optic cable, without a repeater. However, this is not possible in half-duplex, since the maximum diameter of a Fast Ethernet network is ~500 m. Full-duplex mode overcomes this limitation by

allowing simultaneous transmission and reception, eliminating collisions. With this combination, a 200 Mb/s link can be established between two switches separated by any supported distance. This should be more than sufficient for most LAN applications.

TX Cabling

The MultiSwitch 300 is an MDI-X device. Connections to other MDI-X devices, such as another MultiSwitch 300 or a hub, should be made with a crossed Category 5 patch cable (DIGITAL BN25G). The maximum cable length from a 100 Mb/s port is 100 m. For a connection to an MDI device, such as a workstation, a straight Category 5 patch cable should be used. The pinouts of the connectors are diagrammed in Figure 3-2 below. A crossed cable pinout is shown in Figure 3-3.

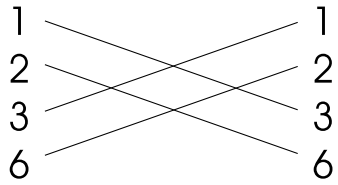
Figure 3-2: RJ45 Connector Pinouts



FEMALE RJ45 (MDI-X), INCLUDES MOST HUBS

1	RX+	5	Unused
2	RX-	6	TX-
3	TX+	7	Unused
4	Unused	8	Unused

Figure 3-3: Crossed Cable Pinout



FEMALE RJ45 (MDI), INCLUDES MOST NICS

1	TX+	5	Unused
2	TX-	6	RX-
3	RX+	7	Unused
4	Unused	8	Unused

Chapter 4

Troubleshooting the MultiSwitch 300

Procedure for Troubleshooting

If there are any operating problems with the MultiSwitch 300, follow the troubleshooting steps below (in order). If you find that the switch is still not functioning correctly, please contact your DIGITAL Service Representative.

1) Ensure that the unit is plugged into a grounded, functioning ac outlet providing between 90 Vac and 264 Vac at 50/60 Hz. Check the power fuse and replace it if blown.

CAUTION

For continued protection against fire, replace the power fuse with one that is the same type and rating.

---

2) Review all link LEDs to ensure that those ports you believe should be functioning are properly attached to a cable.

3) Verify that your cables are wired correctly; for example, use a UTP crossover cable to connect another MDI-X device (such as a hub or switch) directly to a port. Use a straight cable to directly connect a workstation. Refer to Figure 3-2 for the proper connector pinouts.

4) Ensure that you are using Category 5 cabling if you are running at 100 Mb/s.

5) Review all link LEDs to ensure that those ports you believe should be functioning are properly configured, and not disabled or partitioned. If the suspect ports are disabled or do not seem configured properly, reconfigure the port through the Administrative Interface or your SNMP managment software.

6) Review all full-duplex LEDs to ensure that those ports you believe should be functioning are in the correct mode of operation.

7) If the flow control LED shows excessive activity, refer to Chapter 2 for a discussion of how to best configure your network for operation with a switch.

8) Ensure that the equipment attached to the switch is properly configured.

If you encounter any situations or problems you cannot solve, obtain, if possible, the following information, then contact your DIGITAL Service Representative:

- The serial number of your switch and its hardware address.
- The hardware version number from the label on the unit.
- The firmware version number from the console screen or MultiSwitch 300 Manager application.
- The configuration of the equipment that is being interfaced with the switch.
- The sequence of events leading up to your problem.
- Actions you have already taken.

Chapter 5

The SNMP Agent

Overview

The MultiSwitch 300 contains a built-in SNMP agent running on the SNMP processor board. This allows each MultiSwitch 300 to be managed from a centralized management station with any SNMP-compliant NMS.

The SNMP agent software complies with the following standards:

- RFC 1155 - The Structure of Management Information (SMI) for TCP/IP Based Internets, May 1990
- RFC 1556 - Management Information Base (MIB) for Network Managers of TCP/IP Based Internets, May 1990
- RFC 1557 - The Simple Network Management Protocol (SNMP), May 1990
- RFC 1213 - The Management Information Base II (MIB II), March 1991
- RFC 1643 - Definitions of Managed Objects for the Ethernet-like Interface Types
- RFC 1573 - Evolution of the Interfaces Group of MIB-II, January 1994
- RFC 1493 - Definitions of Managed Objects for Bridges, July 1993
- RFC 793 - Transmission Control Protocol
- RFC 854 - Telnet Protocol Specification
- RFC 1055 - Non-standard for transmission of IP datagrams over serial lines: SLIP, January 1988

The SNMP agent utilizes UDP/IP (RFC 768, RFC 950, RFC 1071 and RFC 791) as OSI layers 3 and 4 protocols, ICMP(RFC 792) and ARP(RFC 826) to complete the UDP/IP protocol suite.

The UDP/IP stack implementation is conformant to:

- RFC 1122 - Requirements for Internet hosts - communication layers
- RFC 1123 - Requirements for Internet hosts - application and support

The MultiSwitch 300 may be managed by any SNMP manager that conforms to the above standards. It may be fully managed by the DIGITAL MultiSwitch 300 Manager application.

Chapter 6

Accessing the SNMP Agent

Connecting to the Administrative Interface

This section provides instructions for connecting a terminal to the console port on the right-hand side of the front panel of the switch. The terminal must be used for the initial setup of the SNMP Agent software and may be used to test the connection to the network management station.

Cabling

The console port is a serial port with a male DB-9 connector and a DTE-type pinout. To connect this to another DTE-type serial port (as found on most computers and terminals) a null modem cable is required.

MultiSwitch 300 (DTE) to Computer (DTE)		
DB9 pin	DB9 pin	DB25 pin
2 (RX)	3 (TX)	2 (TX)
3 (TX)	2 (RX)	3 (RX)
5 (GND)	5	7

Communication Parameters

The Administrative Interface port is configured at the factory with the following communication parameters:

- 9600 baud
- No parity
- Eight data bits
- One stop bit

Configuring the SNMP Agent

Logging In to the Administrative Interface

The Administrative Interface is protected against usage by inappropriate personnel. To access the Administrative Interface, the Network Administrator has to provide a name and a password.

```
Please Login
username: userseven
password: (not echoed)
```

As configured at the factory, the password consists of a null string. To enter the first time, just press <Return>. Once you have logged in to the Administrative Interface, you may change the password to avoid undesired access.

Setting the IP Address

To manage the MultiSwitch 300 using an SNMP network management application or to use the ping command to test the switch, you must assign an IP address, a netmask, and a broadcast address. The IP address should be assigned by the Network Administrator in accordance with the existing IP network.

Set the IP configuration with the set-ip-cfg command:

```
set-ip-cfg 192.1.1.64 255.255.255.0 192.1.1.255
```

NOTE

If the switch has no IP address, then the provided IP configuration will change the running parameters as well as the NVRAM based database. If the switch was already configured for the actual session, the parameters will change only the NVRAM database. To use these new parameters, reset the switch using the warm-reset command.

You may also use the set-ip command:

```
set-ip 192.1.1.64
```

In this case, the Agent will automatically determine the netmask and broadcast address. See Chapter 7 for more information about SNMP configuration commands.

Testing the Installation

After you have completed the installation and configured the IP address, use the Administrative Interface ping command to test for connectivity.

The ping command sends an echo request to the host specified in the command line. For example, to test connectivity from the switch to a workstation with an IP address of 192.168.1.2, use the following command:

```
SYS_console> ping 192.168.1.2 2
SYS_console>
Use CTRL-C or ping-stop to stop the ping process
192.168.001.002 Alive. echo reply: id 8495, seq 1, echo-data-len 0
192.168.001.002 Alive. echo reply: id 8495, seq 2, echo-data-len 0
PING process stopped - statistics :
ICMP echo requests   :         2
ICMP echo responses  :         2
PING process - press <CR> for prompt
SYS_console>
```

For more information on the ping command, see Chapter 7.

Accessing the Administrative Interface Remotely

After configuring the IP address of the switch, the Administrative Interface can be accessed remotely through Telnet. All commands work exactly as if the serial interface were being used. Please note that only one console session may be active at any given time. This means that after the first Telnet session is established, all other Telnet connections will be refused until the current session is closed. From the serial interface, you can end the remote console session by pressing <Return> three times.

Chapter 7

Using the Administrative Interface

Features of the Administrative Interface

The Administrative Interface provides the following:

- Configuration of system parameters, including the serial line and/or the console's parameters
- Configuration of the switch's SNMP Agent parameters
- Configuration of the ports' physical and bridging parameters
- Network performance monitoring
- A fail-safe backup for in-band management

Entering Commands

Enter commands by typing the command name followed by zero or more parameters and <Return>. For example, typing **banner** <Return> at the command prompt displays the Administrative Interface logo.

Italicized command items are variables and represent values. For example, <*IPaddress*> represents an IP address in dotted decimal notation as 123.1.2.3.

Command items in { }'s and separated by |'s represent alternatives for the command argument. For example:

```
get-comm {read|write|*}
```

means you can type one of:

```
get-comm read
get-comm write
get-comm *
```

If you enter a command incorrectly, a message is displayed indicating the type of error that occurred. For example, typing a nonexistent command gives the following message:

```
SYS_console> pin
command <pin> not found
```

If the command exists but the number of parameters is incorrect, the following message is displayed:

```
SYS_console> ping
too few arguments
```

To get an explanation of the command's parameters, add a question mark (?) after the command name:

```
SYS_console> ping ?
ping     IP traffic generator
   [arg #0]  destination IP address
   [arg #1]  number of packets to send or 0 for endless ping
SYS_console> ping _
```

Note that the command is reprinted after the prompt, and you have only to add the necessary parameters. If a question mark is added after the first parameter, then the same explanation is provided and the previous command, including the provided parameters, is re-displayed:

```
SYS_console> ping 129.1.1.7 ?
ping     IP traffic generator
   [arg #0]  destination IP address
   [arg #1]  number of packets to send or 0 for endless ping
SYS_console> ping 129.1.1.7 _
```

The Administrative Interface provides a history of the last commands. To obtain the last command in the command history, press <!> or Ctrl-P at the prompt.

To correct a command line, you may use the following special keys (see the help-kbd command):

- <!> or Ctrl-P For the previous command
- Ctrl-W To delete the previous word
- Ctrl-U To erase the entire line

When, as a result of a command, more than one screen-full of text is to be printed, you may continue to scroll or stop the process:

```
SYS_console> ip

            IP related commands
------------------------------------------------------------
 get-ip         show current IP address
 set-ip         set IP address
 get-ip-cfg     show current IP configuration
 set-ip-cfg     set IP address , netmask and broadcast
 clear-ip-cfg   clears the NVRAM based IP configuration
 set-slip       set slip IP address
 get-slip       get slip IP address
 get-slip-cfg   show current IP configuration
 set-slip-cfg   set IP address , netmask and broadcast
 get-gatew      show default gateway
 set-gatew      define default gateway
 get-arp-tbl    display the ARP table
 del-arp-entry  deletes an entry/all entries(*) of the ARP table
 add-arp-entry  add an entry to the ARP table
 get-bootp      retrieves the state of the BOOTP process
 set-bootp      enables or disables the BOOTP process
 ping           IP traffic generator
 ping-stop      stop the ping process
Hit any key for more...                    (type 'q' to quit)
 SYS_console> _
```

Finally, you may press <Tab> to see the list of commands that start with the text you already typed, for example:

```
SYS_console> get-c
              Commands matching <get-c>
------------------------------------------------------------
 get-comm       show current read or/and write community
 get-con-matrix retrieves the VLAN connectivity matrix
 get-colls-cnt  gets the collision dist. counters per port
SYS_console>
```

Administrative Interface Command Structure

The Administrative Interface has several categories of commands:

- Console commands: help, banner, serial line setup, console parameters setup
- System commands: system status, reset commands, download commands, system debug commands, initialize the NVRAM with defaults
- IP commands: parameter setup, parameter and information display
- SNMP agent commands: parameter setup, management and traps options

- Switching database commands: aging time management and switching database entry management
- Spanning Tree commands
- Virtual LAN commands
- Port configuration commands
- Switching statistics command

Console Commands

The console commands contain a set of commands that allows you to configure the Administrative Interface parameters and user interface.

?

Typing ? at the Administrative Interface prompt displays a list of all the available command topics and a short explanation about each. Typing one of the names on this list will yield a list of the commands under that topic.

```
SYS_console> ?
             Commands groups are:
             --------------------
 console        Console related commands
 system         System related commands
 ip             IP related commands
 snmp           SNMP related commands
 switch-db      Switching Database related commands
 vlan           Virtual LANS related commands
 port-cfg       Port Configuration related commands
 statistics     Switching Statistics related commands
 sp-tree        Spanning Tree related commands
 ------------------------------------------------------------
 use ! for prev. cmd, ^U to clr line, ^W to clr previous word
 ------------------------------------------------------------

SYS_console> _
```

help-kbd

This command lists the console function keys.

```
SYS_console> help-kbd
 ? or TAB -  for a list of the categories
 ! or ^P  -  for previous command
 TAB      -  for command completion
 ^U       -  to clear the line
 ^W       -  to clear the previous word
SYS_console> _
```

banner

The banner command displays the MultiSwitch 300 Administrative Interface logo.

clear

The clear command clears the screen and displays the prompt.

login

The login command exits the Administrative Interface, but does not disconnect a Telnet session. This allows you to test a password (or other activity) without reconnecting.

logout

The logout command finishes the actual Administrative Interface session. Any further access requires that you log in again.

set-prompt

Usage:

`set-prompt <new_prompt>`

The set-prompt command allows you to set a new command line prompt for the Administrative Interface. With the set-prompt command, you can set a more meaningful prompt, such as a location of the switch, or the name of a workgroup. The default prompt is SYS_console> _

```
SYS_console> set-prompt R&D_grp>
 CLI prompt change in the NVRAM OK
R&D_grp>
```

set-passwd

The console requires you to enter a password to log in, preventing unauthorized access. The set-passwd command allows you to change the console password. The system first prompts you for the original password. Then you are asked to input a new password, and then type it again for verification. At no time are any of the passwords echoed back.

If you enter the old password incorrectly or fail to verify the new password correctly, the password will not be changed:

```
SYS_console> set-passwd
Enter old password:
Enter new password:
Enter new password again:
New password not verified - password not changed!
SYS_console> _
```

If the password change succeeds, the system responds accordingly:

```
SYS_console> set-passwd
Enter old password:
Enter new password:
Enter new password again:
 CLI running password changed
 CLI password change in NVRAM OK
Password changed!
SYS_console> _
```

System Commands

The system commands allow you to display and set the system-related parameters.

sys-stat

The sys-stat command displays general status information about the Ethernet switch and its SNMP Agent hardware and software:

```
SYS_console> sys-stat

   MultiSwitch 300
   SNMP Agent Software  - Version V0.1x Feb  8 1997 01:27:29
   SNMP Object ID is : < 1.3.6.1.4.1.36.2.15.3.19 >
   System MAC Address :  00-00-F8-00-0A-5C
   Switching Data Base Size:     4096
   Total uptime(hundredths of seconds ):    68840
   Total uptime(days, hh:mm:ss format): 0 days, 0:11:28.40

i/f 1 -- description [Port 1 - 10/100 BaseTX Ethernet Port] -- status [up]
i/f 2 -- description [Port 2 - 10/100 BaseTX Ethernet Port] -- status [up]
i/f 3 -- description [Port 3 - 10/100 BaseTX Ethernet Port] -- status [up]
i/f 4 -- description [Port 4 - 10/100 BaseTX Ethernet Port] -- status [up]
i/f 5 -- description [Port 5 - 10/100 BaseTX Ethernet Port] -- status [up]
i/f 6 -- description [Port 6 - 10/100 BaseTX Ethernet Port] -- status [up]
i/f 7 -- description [Port 7 - 10/100 BaseTX Ethernet Port] -- status [up]
i/f 8 -- description [Port 8 - 10/100 BaseTX Ethernet Port] -- status [up]
i/f 9 -- description [Port  9 - missing ] -- status [DOWN]
i/f 10 -- description [Port 10 - missing ] -- status [DOWN]
i/f 11 -- description [Port 11 - missing ] -- status [DOWN]
i/f 12 -- description [Port 12 - missing ] -- status [DOWN]
SYS_console> _
```

The screen displays the following information:

- Device name and type
- SNMP Agent software version and release date
- Device SNMP object ID
- Device MAC address
- System uptime in 1/100 seconds as well as in days, hours, minutes, and seconds
- Interface description and status

warm-reset

The warm-reset command resets the SNMP Agent software without resetting the switch. Nevertheless, the switch configuration is changed according to the values stored in the NVRAM. This command permits you to refresh the switch configuration after a change of the NVRAM parameters. The statistics counters are also reset by the warm-reset command.

cold-reset

This command causes the switch to cold-reset. Cold reset is equivalent to power cycling the switch.

get-last-err

This command retrieves the most recent system failure for diagnostic purposes.

```
SYS_console> get-last-err
 System information since the last hardware reset
 ------------------------------------------------
 Software resets number : 0
The system never encountered a fatal error
SYS_console>
```

init-nvram

This command resets the nonvolatile RAM on the SNMP Agent to default values.

set-line-slip

Usage:

```
set-line-slip {9600|19200|38400}
```

This command changes the console serial port to SLIP mode for out of band SNMP management. The argument to the command is the new baud rate for the interface. The SLIP interface can be configured using the set-slip-cfg console command. You can return the serial port to console mode by pressing <Return> three times in a row.

get-sw-file

This command retrieves the SNMP Agent software file name.

set-sw-file

Usage:

```
set-sw-file <filename>
```

Sets the name of the file downloaded by TFTP. This name must match the name of the agent software file on the TFTP server. When TFTP is used, the per-packet retransmission timeout value on the server must be increased to 10 seconds because the SNMP Agent must first erase its flash EEPROM, which takes about 30 seconds.

get-rsw-file

This command retrieves the SNMP Agent software's remote filename.

set-rsw-file

Usage:

`set-rsw-file <remote_filename>`

This command sets the SNMP Agent software's remote filename for download. The download is initiated with the sw-dnld command.

get-tftp-srvr

This command retrieves the TFTP download server's IP address.

set-tftp-srvr

Usage:

`set-tftp-srvr <ip_address>`

This command sets the TFTP download server's IP address.

sw-dnld

This command starts the SNMP software download from the predefined server.

get-par-file

This command retrieves the SNMP Agent parameters filename.

set-par-file

Usage:

`set-par-file <filename>`

Sets the name of the SNMP Agent parameters file downloaded by BootP. This filename must match the name of the parameters file on the BootP server. The format of the parameters file is:

<switch_hardware_address> : <read_comm> : <write_comm>

For example:

```
00-00-F8-00-01-23 : public : private
```

set-fg-parm

Usage:

```
set-fg-param <dest> <source> <fill_byte> <length>
```

This command sets the frame generator parameters. The *dest* and *source* parameters are dash-separated hardware addresses in hexadecimal. The *fill_byte* parameter is a single byte used to fill the entire packet except for the first 12 bytes. The *length* parameter is the total length of the packet excluding CRC.

start-fg

Usage:

```
start-fg <dport> <count> <rate>
```

This command starts frame generation. The *dport* parameter is a hexadecimal bitmap of which ports to generate traffic on. For example, a *dport* of 3E will send frames to ports 2, 3, 4, 5, 6. The *count* parameter specifies the number of frames to send on each interface. A count of 0 specifies an infinite number of packets. The *rate* parameter specifies the number of packets per second to generate.

stop-fg

This command stops the Ethernet frame generator.

get-stst-level

This command shows the self-test level of the switch.

set-stst-level

Usage:

```
set-stst-level <level>
```

This command sets the self-test level of the switch. There are four levels of self-test: none, short, long, and diagnostics. The self-test level is stored in NVRAM.

The default self-test level is short. In this mode, this power-up sequence is followed:

The OS/bootloader boots out of the ROM bank. The checksum of the SNMP software flash bank is verified for consistency. The bootloader prints a # character to the serial console. It then waits 5 seconds for a download command from a PC running the

firmware download software on the serial port. If, after 5 seconds, no download request is detected, the bootloader will run the self-test out of ROM space. The self-test then runs in 10-Mbit loopback mode and performs these three tests:

1) **Loopback test.** This tests the basic send/receive functionality of each port with varying frame sizes.

2) **Broadcast test.** This tests the basic forwarding capabilities of the bus by sending broadcast frames from each port with varying frame sizes.

3) **Bus B test.** This tests the secondary bus.

If the self-test succeeds, the SNMP software is copied from the Flash into main memory and is executed. If any part of the test fails, the systems halts.

In short mode, the switch wakes up after 30 to 40 seconds (depending on the number of ports installed).

If the test level is none, no self-test is performed and the SNMP software is loaded immediately after the download timeout expires.

If the test level is long, a RAM check is run on reset, and the self-test performs many other tests. In this mode, the switch wakes up after about 2 minutes.

NOTE

The switch should be disconnected from the network while the long test is executing.

If the test level is diagnostics, the self-test runs in interactive mode. INTERACTIVE SELF-TEST SHOULD BE USED ONLY BY A QUALIFIED SWITCH ENGINEER. Typing "quit" at the debugger prompt exits the tester and resumes the boot sequence.

The interactive mode can also be entered by typing three escapes (<Esc> <Esc> <Esc>) in quick succession after the # character appears.

If, during boot, the boot ROM determines that the flash checksum is bad, it does NOT time out during the download sequence. Instead, it waits there until a valid download request is received on the console. As before, press the escape key quickly three times to bring up the interactive self-test.

During the self-tests, you can skip individual tests by pressing any key during the test.

IP Configuration Commands

This section lists general IP configuration commands available to the command line interface. Sections that follow cover additonal IP commands including commands pertaining to the ping ability of the SNMP Agent and pertinent features of the Address Resolution Protocol.

get-ip

Shows the device's current IP address, if any.

```
SYS_console> get-ip
 The device has no IP Address defined
SYS_console> _

SYS_console> get-ip
 The device IP address is: 129.001.001.064
SYS_console> _
```

get-ip-cfg

Shows the complete current IP configuration: address, network mask, and broadcast address.

```
SYS_console> get-ip-cfg
 The device has no IP Address defined
SYS_console>

SYS_console> get-ip-cfg
 The device IP address, netmask and broadcast are:
            IP address   : 129.001.001.064
            IP netmask   : 255.255.255.000
            IP broadcast : 129.001.001.255
```

set-ip

Usage:

```
set-ip <IP address>
```

Sets the IP address of the SNMP Agent. If no IP address was previously set (as is the default factory configuration), the new value will be used immediately and saved into NVRAM. Otherwise, the new value will only be stored in the NVRAM, and you must execute a warm-reset to effect the change.

set-ip-cfg

Usage:

`set-ip-cfg <IPaddress> <netmask> <broadcast>`

Sets IP address, network IP address, and broadcast IP address. If no IP configuration was previously set (as is the default factory configuration), the new values are used immediately and saved into NVRAM. If a previous IP configuration was being used, the new configuration is saved in NVRAM for the next session. To use the newly defined values immediately, reset the system using the warm-reset command.

NOTE

If the IP configuration is not specified, the agent will not respond to any in-band requests, including ping messages.

```
SYS_console> set-ip-cfg 129.1.1.64 255.255.255.0 129.1.1.255
 Device IP Address set for this session
 Device IP Address change in the NVRAM OK
 The device IP configuration in the next session will be:
            IP address   : 129.001.001.064
            IP netmask   : 255.255.255.000
            IP broadcast : 129.001.001.255

SYS_console> set-ip-cfg 129.1.1.67 255.255.255.0 129.1.1.255
 Device IP Address unchanged for this session
 Device IP Address change in the NVRAM OK
 The device IP configuration in the next session will be:
            IP address   : 129.001.001.067
            IP netmask   : 255.255.255.000
            IP broadcast : 129.001.001.255
SYS_console> _
```

clear-ip-cfg

This command clears the NVRAM based IP configuration.

get-bootp

This command retrieves the current state of the BootP process.

set-bootp

Usage:

`set-bootp {enable|disable}`

This command enables or disables BootP.

get-slip

This command retrieves the current SLIP address.

get-slip-cfg

This command retrieves the current SLIP configuration.

set-slip

Usage:

`set-slip <IPaddress>`

This command sets the SLIP address, see set-ip above for more information.

set-slip-cfg

Usage:

`set-slip-cfg <IPaddress> <netmask> <broadcast>`

This command sets the SLIP configuration. The arguments are similar to the set-ip-cfg arguments.

get-gatew

Shows the default gateway. This command shows which default route will be used to access a different IP network.

set-gatew

Usage:

`set-gatew <IPaddress>`

Sets the default gateway IP address. This command lets you specify the address of the router used to access a different IP network . The default value for the default gateway IP address is 0.0.0.0.

```
SYS_console> set-gatew 129.1.1.1
 Device Default Gateway change in the NVRAM OK
 Device Default Gateway changed to : 129.1.1.1

SYS_console> get-gatew
 Device default gateway address is : 129.001.001.001
SYS_console> _
```

get-def-ttl

This command returns the running default IP Time To Live value. This value (between 1 and 255) is the number of seconds this frame will be kept alive by routers along its path.

set-def-ttl

Usage:

`set-def-ttl <number>`

This command modifies the default Time To Live value. The *number* parameter (between 1 and 255) will be used as the new value.

Ping Commands

The ping command sends an ICMP echo request packet to a station. The ping process is independent of the process that serves the Administrative Interface console. Thus, the ping result (if any) printouts will be interleaved with the Administrative Interface input/output.

Issuing further commands while the ping process is active is not recommended.

Starting a new ping session while another one is active is not supported and an error message will be displayed.

ping

Usage:

`ping <IPaddress> {<number>|0}`

Pings the specified IP address a defined number of times, or for endless ping (0). The ping process starts sending one datagram per second until the desired number of datagrams are sent. It prints one line of output for every response that it receives. The ping command does not return any output if there is no response. Normal response time is 1 to 10 seconds.

The ping command is intended for testing the connectivity between the switch and an IP station. It is not intended as a traffic generator. Thus, using the endless ping option is not recommended.

If you started a long ping, stop it with Ctrl-C or issue a ping-stop command to stop it.

```
SYS_console> ping 192.168.1.2 4
SYS_console>
 Use CTRL-C or ping-stop to stop the ping process

192.168.001.002 Alive. echo reply: id 2652, seq 1, echo-data-len 0
192.168.001.002 Alive. echo reply: id 2652, seq 2, echo-data-len 0
192.168.001.002 Alive. echo reply: id 2652, seq 3, echo-data-len 0
 PING process stopped - statistics :
  ICMP echo requests   :         3
  ICMP echo responses  :         3
 PING process - press <CR> for prompt
```

This is an example of an unsuccessful ping:

```
SYS_console>
SYS_console> ping 129.1.1.88 4
SYS_console> _
```

If the host does not respond, the console prompt is printed and no output is added. Failure to get an echo response from a host may be due to:

- A bad physical connection.
- A non-existent or inactive host.
- Network Unreachable no corresponding entry in the routing table.
- Destination Unreachable the default gateway failed to route the datagram.
- Outdated ARP table information which requires flushing the ARP table with the del-arp-entry command.

If there is an active ping process due to a previous long ping command and you try to start a new ping, the command fails and an error message is displayed.

For example, start an endless ping to an unreachable host. No response will be received. Now try to ping an existing host. The second ping will fail because the first one is still active. The solution is to use the ping-stop command to stop the first active ping process.

```
SYS_console> ping 129.1.1.1 1
SYS_console>
              Use CTRL-C or ping-stop to stop the ping process
129.001.001.001 Alive. echo reply: id 297, seq 1, echo-data-len 8
 PING process stopped - press <CR> for prompt
SYS_console> ping 129.1.1.88 0
SYS_console> ping 129.1.1.1 1
 A ping process is active - can’t start another one
SYS_console> ping-stop
SYS_console> ping 129.1.1.1 1
SYS_console>
              Use CTRL-C or ping-stop to stop the ping process
129.001.001.001 Alive. echo reply: id 297, seq 1, echo-data-len 8
 PING process stopped - press <CR> for prompt
SYS_console> _
```

ping-stop

Stops the active ping process. Similar to Ctrl-C.

Address Resolution Protocol Commands

get-arp-tbl

Shows the ARP table. The ARP table contains information relating IP addresses to MAC addresses and interface numbers.

```
SYS_console> get-arp-tbl

IfIndex      IpAddress              MAC Address
=================================================
    1      129.001.001.001         00-00-F8-2D-73-9C
SYS_console> add-arp-entry 129.1.1.200 00-00-F8-2b-59-ea 1
 ARP Table Entry successfully added
SYS_console> get-arp-tbl

IfIndex      IpAddress              MAC Address
=================================================
    1      129.001.001.001         00-00-F8-2D-73-9C
    1      129.001.001.200         00-00-F8-2B-59-EA
SYS_console> del-arp-entry 129.1.1.200
 ARP Table Entry with IP Address <129.1.1.200> removed
SYS_console> get-arp-tbl

IfIndex      IpAddress              MAC Address
=================================================
    1      129.001.001.001         00-00-F8-2D-73-9C
SYS_console> _
```

add-arp-entry

Usage:

```
add-arp-entry <IPaddress> <mac_address> <Interface>
```

Adds an entry to the ARP table.

del-arp-entry

Usage:

```
del-arp-entry {<IPaddress>|*}
```

Deletes entries from the ARP table. If an IP address is specified, the matching ARP entry will be deleted. If * is specified, the entire ARP table will be flushed. This command should be used if the network topology has physically changed, for example, if a management station has been moved from one segment to another, changing its interface number.

SNMP Commands

This section lists commands pertinent to configuring the SNMP Agent itself, that is, access and trap configuration. It is split into two parts: SNMP community strings lists the access modifications, and the trap section lists SNMP traps configuration commands.

SNMP Community Strings

SNMP community strings authenticate access to the Management Information Base (MIB). Community strings function as passwords embedded in every SNMP packet. The community string must match one of the two community strings configured in the switch for the message to be processed. There are two community strings, one for each of the following types of access:

- **Read mode** gives read access to all the objects in the MIB, but does not allow write access.
- **Write mode** gives read and write access to all objects in the MIB.

get-comm

Usage:

```
get-comm {read|write|*}
```

This command displays the SNMP community string for a given access mode (read or write). If the access mode is specified as *, both the read and the write community strings are displayed.

```
SYS_console> get-comm *
 Current read  community is: < public >
 Current write community is: < private >
```

set-comm

Usage:

```
set-comm {read|write} <community-string>
```

This command lets you specify the SNMP community string for each of the two access modes: read and write.

```
SYS_console> set-comm write password
New write community is: < password >
```

SNMP Trap Message Commands

When the switch detects an extraordinary event, it generates a trap. A trap is a notification message that may be sent to predefined network manager stations. A trap event may be a reset (cold or warm), detection of a interface link status change, an SNMP authentication failure due to an incorrect community string, etc.

The SNMP trap commands let you manage:

- Whether or not the MultiSwitch 300 issues an authentication trap
- The list of selected network manager stations that the switch-generated traps will be sent to by the SNMP agent. The list has a maximum capacity of five entries.

get-auth

Displays the authentication trap mode: enabled or disabled.

set-auth

Usage:

```
set-auth {enable|disable}
```

This command allows you to modify the authentication trap mode. The default value is enable, meaning that the switch will generate authentication traps. Changing the mode to disable causes the switch to avoid sending authentication traps.

get-trap

Displays the list of traps receiving stations: their IP address and trap SNMP community string.

```
SYS_console> get-traps

             SNMP TRAP TABLE
             ===============
   IPADDR                          COMMUNITY
 -------------------------------------------------
 192.168.001.065   -----------     testing
 -------------------------------------------------
```

add-trap

Usage:

```
add-trap <IPaddress> <trap-community>
```

The add-trap command enters the IP address of the receiving station and the trap community string that will appear in the trap message.

```
SYS_console> add-trap 129.1.1.76 rnd
 Entry 129.1.1.76 - rnd added
             SNMP TRAP TABLE
             ===============
    IPADDR                          COMMUNITY
 ------------------------------------------
 129.001.001.065   -----     public
 129.001.001.007   -----     trapcomm
 129.001.001.076   -----     rnd
 ------------------------------------------
```

del-trap

Usage:

del-trap *<IPaddress>*

The del-trap command can be used to remove a station from the trap table. The station IP address must be provided.

```
SYS_console> del-trap 129.1.1.7
 Entry 129.1.1.7 - trap comm deleted
```

Switching Database Commands

This section contains instructions for managing the switching database with the Administrative Interface.

The switching database consists of 4096 entries. Each active entry contains the information relevant to an end station, characterized by its Ethernet MAC address. Each entry contains the following information:

- **lock**

  If on (denoted as a +), the entry will not be deleted by the switch aging process (static entry). If off (denoted as a -), this is a dynamic entry that may be automatically deleted by the switch aging process if the workstation is not active during an aging time period.

- **self** (not user configurable)

  If on (denoted as a +), the entry is a system address. Such addresses are the switch's individual and group addresses, as well as other address added by the management system. If off (denoted as a -), the entry contains the MAC address of a station on the connected network.

- **dport**

  The destination port to which frames with the stated address will be forwarded. Applies only if the address is not a custom filter.

- The MAC address contained in an entry or given as a parameter is printed as a 6-byte, hexadecimal sequence, separated by dashes:

  `00-00-F8-00-01-29`

- The index contained in the following commands is an integer number between 1 and the maximum size of the switching database table (4096).

The first section, virtual addresses, lists commands relevant to standard MAC addresses, such as determining the behavior of the switch when presented with a particular address. The second section, custom filtering, lists commands pertinent to the custom filtering capabilities of the MultiSwitch 300.

Virtual Addresses

get-lt-entry

Usage:

`get-lt-entry <index>`

Displays the entry at the specified index in the switching database.

```
SYS_console> get-lt-entry 19
 Entry  ---- MAC Address ----  LOCK   SELF    DPORT     MGMT
============================================================
   19     00-00-F8-00-59-E6     -      -       8         -
SYS_console>
```

The entry described is:

- Entry number 19
- MAC address 00-00-F8-00-59-E6
- Not a static entry (it will be aged out. Lock is off.)
- Is not a system address (Self is off.)
- The frame will be forwarded only to the port 8
- Not forwarded to the management (Mgmt is off.)

get-lt-16

Usage:

`get-lt-16 {<index>|*}`

Displays 16 learn table entries starting at the specified index, or * to continue from the last displayed index. The format of the display is similar to the previous command format.

```
SYS_console> get-lt-16 6
 Entry  ---- MAC Address ----  LOCK   SELF    DPORT     MGMT
============================================================
     6     00-00-F8-20-20-D5     +      +      -CUSTOM FILTER-
     7     00-00-F8-20-20-D6     +      +      -CUSTOM FILTER-
     8     00-00-F8-20-20-D7     +      +      -CUSTOM FILTER-
     9     00-00-F8-20-20-D8     +      +      -CUSTOM FILTER-
    10     00-00-F8-20-20-D9     +      +      -CUSTOM FILTER-
    11     00-00-F8-20-20-D10    +      +      -CUSTOM FILTER-
    12     00-00-F8-20-20-D11    +      +      -CUSTOM FILTER-
    13     FF-FF-FF-FF-FF-FF     +      -      -CUSTOM FILTER-
    14     00-80-C2-00-00-00     +      -      -CUSTOM FILTER-
    19     00-20-C5-00-59-E6     -      -       12         -
    20     00-00-92-94-01-54     -      -        1         -
    21     00-C0-1D-01-06-20     -      -        1         -
    22     00-00-F8-2B-0A-26     -      -       11         -
    23     00-00-F8-29-1E-DE     -      -        4         -
    24     00-00-F8-2B-17-37     -      -        4         -
    25     08-00-20-76-72-89     -      -        2         -
SYS_console> _
```

```
SYS_console> get-lt-16 *
 Entry  ---- MAC Address ----  LOCK   SELF    DPORT     MGMT
============================================================
   26     00-00-F8-11-06-AD     -      -       12         -
   27     00-00-F8-2B-59-EA     -      -        3         -
   28     00-00-F8-2D-99-3A     -      -        7         -
   29     00-00-F8-16-80-7C     -      -        5         -
   30     00-00-C0-60-A7-B9     -      -        5         -
   31     00-00-F8-1A-A1-69     -      -        5         -
   32     00-00-F8-29-1E-EB     -      -       11         -
   33     00-00-F8-2E-DF-15     -      -        5         -
   34     00-00-F8-28-B4-1A     -      -        7         -
   35     00-00-F8-2F-93-A7     -      -        4         -
   36     00-40-33-32-A6-58     -      -       12         -
   37     00-00-F8-15-70-5E     -      -        5         -
   38     00-00-F8-1A-A1-5F     -      -       11         -
   39     00-00-F8-28-B7-2A     -      -        5         -
   40     00-00-F8-2B-16-3D     -      -       12         -
   41     00-00-F8-15-B6-83     -      -        4         -
SYS_console> _
```

NOTE

The first few entries belong to the system. These entries contain important information related to the SNMP Agent and should never be modified or removed.

Entries 18 and onward are self-learned MAC addresses, as indicated by the lock = OFF and by self = OFF. These entries were each learned from the port stated in the DPORT field.

---

find-lt-addr

Usage:

`find-lt-addr <mac_address>`

Search for a MAC address in the learn table. If the specified mac_address is found in the switching database, an entry description as in the previous commands is displayed.

```
SYS_console> find-lt-addr 00-00-F8-2B-16-3D
 Entry  ---- MAC Address ----  LOCK   SELF    DPORT     MGMT
============================================================
   40     00-00-F8-2B-16-3D     -      -       12         -
SYS_console> _
```

If the requested MAC address is not in the learn table, an error message is displayed:

```
SYS_console> find-lt-addr 00-00-F8-2b-59-66
 MAC Address - 00-00-F8-2b-59-66 - not in LT
SYS_console> _
```

del-lt-entry

Usage:

`del-lt-entry <index>`

Deletes the learn table entry at the specified index. If the entry deletion was successful or if the entry is not ACTIVE, then the command will be successful.

Deleting entries with the self field set is prohibited since they are system addresses.

The del-lt-entry command is very powerful, allowing you to change the entire switching database with the exception of the system MAC addresses. Therefore, it should be used with care.

```
SYS_console> del-lt-entry 15
 Deleting entry at index - 15 -  OK
SYS_console> del-lt-entry 16
 Deleting entry at index - 16 -  OK
SYS_console> del-lt-entry 1
 Deleting entry at index - 1 -  failed
SYS_console> del-lt-entry 2
 Cannot delete a System Address
 Deleting entry at index - 2 -  failed
SYS_console> _
```

del-lt-addr

Usage:

`del-lt-addr <mac_address>`

Deletes the learn table entry that matches mac_address.

The command fails if mac_address is not found in the learn table. Again, as stated in the previous command, care should be taken when deleting system entries (self=ON).

```
SYS_console> del-lt-addr 00-00-F8-2b-59-4c
 Deleting entry with MAC address - 00-00-F8-2b-59-4c OK
SYS_console> del-lt-addr 00-00-F8-2b-59-4c
 MAC Address - 00-00-F8-2b-59-4c - not in LT
SYS_console> _
```

add-lt-addr

Usage:

`add-lt-entry <mac_address> {lock-off|lock-on} <dport>`

Adds a learn table entry to the switching database. The command parameters are described at the beginning of this chapter.

Note that *dport* is a decimal number representing the number of the destination port.

get-lt-age

Displays the switching database aging time in seconds. The aging time is the timeout period for aging out dynamically learned forwarding information entries. An entry whose MAC address does not appear in the source field of an incoming packet for a period equal to the aging time is discarded. The default value for the aging time is 300 seconds.

```
SYS_console> get-lt-age
 The running aging time is: 300 seconds
```

set-lt-age

Usage:

`set-lt-age {run|nvram|all} <aging_time>`

Lets you modify the switching database aging time. The change may be done:

- In the running database so that the new value is used immediately.
- In the NVRAM, meaning that the change will occur only in the next session.
- In both the running and the NVRAM databases.

The *aging_time* is in seconds. The factory default value is 300 seconds. Use a lower value if the number of active workstations at a given moment is larger than the size of the switching database. The aging time can be anywhere between 10 and 11,000 seconds.

```
SYS_console> set-lt-age run 280
 Aging Period update in the running database OK
SYS_console> set-lt-age all 100
 Aging Period update in NVRAM OK
 Aging Period update in the running database OK
SYS_console> _
```

Custom Filtering Commands

The custom filter entry for an address is shown on the screen as a matrix, in the following format:

Here, the SRC column lists the available source ports (1 through the number of ports on the switch). The other columns each represent an available destination port. If a + mark is encountered, it represents a forwarding path. For example, as displayed below, each source port (with the exception of port 3) will forward this frame to port 3.

```
SYS_console> get-lt-filter 00-00-F8-00-0A-5C
    2     00-00-F8-00-0A-5C  LOCK_ON   SELF_ON  - CUSTOM FILTER -
SRC PORT to : MGMT  P1  P2  P3  P4  P5  P6  P7  P8  P9  P10 P11 P12
============================================================
    1           -   -   -   +   -   -   -   -   -   -   -   -   -
    2           -   -   -   +   -   -   -   -   -   -   -   -   -
    3           -   -   -   +   -   -   -   -   -   -   -   -   -
    4           -   -   -   +   -   -   -   -   -   -   -   -   -
    5           -   -   -   +   -   -   -   -   -   -   -   -   -
    6           -   -   -   +   -   -   -   -   -   -   -   -   -
    7           -   -   -   +   -   -   -   -   -   -   -   -   -
    8           -   -   -   +   -   -   -   -   -   -   -   -   -
    9           -   -   -   +   -   -   -   -   -   -   -   -   -
   10           -   -   -   +   -   -   -   -   -   -   -   -   -
   11           -   -   -   +   -   -   -   -   -   -   -   -   -
   12           -   -   -   +   -   -   -   -   -   -   -   -   -
```

get-lt-filter

Usage:

`get-lt-filter <mac_address>`

This command retrieves the learn table filter for the specified MAC address. See above for an example.

add-cf-entry

Usage:

`add-cf-entry {lock-on|lock-off|perm} <mac_address> <sport> <dport>`

This command adds a custom filter learn table entry for the hardware address *mac_address*. The lock-on parameter indicates that the entry will not be aged out, but will be lost upon reset. The lock-off parameter indicates that the entry can be aged out normally. The *perm* parameter indicates the filter will be written to NVRAM and restored upon reset. *sport* value is a hexadecimal bitmask of incoming ports (bit 0 is port 1, bit 1 is port 2...) , and the *dport* value is a hexadecimal bitmask of outgoing ports

(bit 0 is the management port, bit 1 is port 1...). Packets arriving at the switch with *mac_address* destination address from any port specified in *sport* will be transmitted to all ports specified in *dport.*

```
SYS_console> add-cf-entry lock-on 00-00-F8-11-11-11 62 108
 Add CF LT entry  OK

 CF Entry Update in NVRAM  OK
SYS_console> _
```

For example, the command above will send packets with destination MAC address 00-00-F8-11-11-11 from source ports 2, 6, and 7 (62 in hexadecimal is 0 1 1 0 0 0 1 0 in binary) to destination ports 3 and 8 (108 in hexadecimal is 1 0 0 0 0 1 0 0 0 in binary). All other ports receive a value of 00, meaning that they will filter all frames with this destination MAC address. For example, a packet with MAC address 00-00-F8-11-11-11 with a source port other than *sport* will be filtered accordingly (but any previous filters for this MAC address will still be obeyed).

For example, you may check the above custom filter entry with the get-lt-filter command:

```
SYS_console> get-lt-filter 00-00-F8-11-11-11
   69     00-00-F8-11-11-11  LOCK_ON   SELF_OFF - CUSTOM FILTER -
SRC PORT to : MGMT  P1  P2  P3  P4  P5  P6  P7  P8  P9  P10 P11 P12
================================================================
    1           -   -   -   -   -   -   -   -   -   -   -   -   -
    2           -   -   -   +   -   -   -   -   +   -   -   -   -
    3           -   -   -   -   -   -   -   -   -   -   -   -   -
    4           -   -   -   -   -   -   -   -   -   -   -   -   -
    5           -   -   -   -   -   -   -   -   -   -   -   -   -
    6           -   -   -   +   -   -   -   -   +   -   -   -   -
    7           -   -   -   +   -   -   -   -   +   -   -   -   -
    8           -   -   -   -   -   -   -   -   -   -   -   -   -
    9           -   -   -   -   -   -   -   -   -   -   -   -   -
   10           -   -   -   -   -   -   -   -   -   -   -   -   -
   11           -   -   -   -   -   -   -   -   -   -   -   -   -
   12           -   -   -   -   -   -   -   -   -   -   -   -   -
SYS_console>
```

del-cf-entry

Usage:

```
del-cf-entry {run|all} <mac_address> <sport>
```

This command deletes the custom filter learn table entry for address *mac_address* from source port *sport*. The run option indicates that the entry will be deleted only from the current running table. The all option indicates that the entry should be removed from the non-volatile memory as well as from the current running table.

get-nv-cftbl

This command displays the custom filter table stored in nonvolatile memory.

```
  NVRAM CUSTOM FILTERS TABLE
==============================

 Entry  ---- MAC Address ----
------------------------------
    1     00-00-F8-11-11-11
SYS_console>
```

get-nv-cfilt

Usage:

`get-nv-cfilt <mac_address>`

This command retrieves the custom filter associated with the specified mac_address from the custom filter table stored in nonvolatile memory.

get-sport-hex

Usage:

`get-sport-hex <port_number>`

This command displays the list of source ports in hexadecimal. One or more port numbers may be entered for the *port_number* value, separated by the hyphen symbol (-).

```
SYS_console> get-sport-hex 11
Hex for Source Ports <12> is: 800
SYS_console>

SYS_console> get-sport-hex 3-4-5
Hex for Source Ports <3-4-5> is: 1c
SYS_console>
```

get-dport-hex

Usage:

`get-sport-hex <port_number>`

This command displays the list of destination ports in hexadecimal. One or more port numbers may be entered for the *port_number* value, separated by the hyphen symbol (-).

```
SYS_console> get-dport-hex 11
Hex for Dest Ports <12> is: 800
SYS_console>

SYS_console> get-dport-hex 3-4-5
Hex for Dest Ports <3-4-5> is: 1c
SYS_console>
```

Virtual LAN Commands

Virtual LANs can be used to limit the broadcast domain and to establish virtual work-groups.

- The **run** option indicates that only the currently running configuration is changed. Changes are not restored after a reset.
- The **nvram** option indicates that only the configuration stored in nonvolatile memory is changed. Changes do not take effect until a reset.
- The **all** option indicates that both the currently running configuration and the nonvolatile configuration is changed. Changes take effect immediately and are restored after a reset.

get-con-matrix

Retrieves the current connectivity matrix for the switch. A table similar to the one displayed earlier (Custom Filters) is displayed. Here, the first column is the source port. The other columns are destinations to which frames from a given source port (determined by which row) may be forwarded. Unlearned addresses will be forwarded to all destinations marked with a + in the source port's row. Learned addresses will be forwarded to their destinations only if the destination is marked with a + in the source port's row.

```
SYS_console> get-con-matrix
   VLAN CONNECTIVITY MATRIX
  ==========================
SRC  PORT to :  P1  P2  P3  P4  P5  P6  P7  P8  P9  P10 P11 P12
=============================================================
    1           -   +   +   -   +   +   +   +   -   -   -   -
    2           +   -   +   -   +   +   +   +   -   -   -   -
    3           +   +   -   -   +   +   +   +   -   -   -   -
    4           -   -   -   -   -   -   -   -   -   -   -   -
    5           +   +   +   -   -   +   +   +   -   -   -   -
    6           +   +   +   -   +   -   +   +   -   -   -   -
    7           +   +   +   -   +   +   -   +   -   -   -   -
    8           +   +   +   -   +   +   +   -   -   -   -   -
    9           -   -   -   -   -   -   -   -   -   -   -   -
   10           -   -   -   -   -   -   -   -   -   -   -   -
   11           -   -   -   -   -   -   -   -   -   -   -   -
   12           -   -   -   -   -   -   -   -   -   -   -   -
SYS_console>
```

get-vbc-matrix

Retrieves the current broadcast domain matrix for the switch. See above for a description of the resulting table. Here, though, only the broadcast address will be affected.

```
SYS_console> get-vbc-matrix
   VBC CONNECTIVITY MATRIX
  ==========================
SRC  PORT to :  P1  P2  P3  P4  P5  P6  P7  P8  P9  P10 P11 P12
================================================================
    1           -   +   +   -   +   +   +   +   -   -   -   -
    2           +   -   +   -   +   +   +   +   -   -   -   -
    3           +   +   -   -   +   +   +   +   -   -   -   -
    4           -   -   -   -   -   -   -   -   -   -   -   -
    5           +   +   +   -   -   +   +   +   -   -   -   -
    6           +   +   +   -   +   -   +   +   -   -   -   -
    7           +   +   +   -   +   +   -   +   -   -   -   -
    8           +   +   +   -   +   +   +   -   -   -   -   -
    9           -   -   -   -   -   -   -   -   -   -   -   -
   10           -   -   -   -   -   -   -   -   -   -   -   -
   11           -   -   -   -   -   -   -   -   -   -   -   -
   12           -   -   -   -   -   -   -   -   -   -   -   -
SYS_console>
```

set-vbc-domain

Usage:

```
set-vbc-domain {run|nvram|all} <port_list>
```

This command establishes a virtual broadcast domain. The *port_list* value is a dash separated list of ports to group into a broadcast domain. For example, the following command creates a virtual broadcast domain of ports 2, 5, 6, and 7:

```
set-vbc-domain all 2-5-6-7
```

del-vbc-domain

Usage:

```
del-vbc-domain {run|nvram} <domain_id>
```

This command deletes a virtual broadcast domain, as identified by get-vbc-tbl.

get-vbc-tbl

Usage:

```
get-vbc-tbl {run|nvram}
```

This command retrieves the list of defined virtual broadcast domains.

```
SYS_console> get-vbc-tbl run
 RUNTIME    VIRTUAL BROADCAST DOMAIN TABLE
========================================

  VBC ID     P1  P2  P3  P4  P5  P6  P7  P8  P9  P10 P11 P12
  ============================================================
    1:        -   -   -   +   +   +   -   -   -   -   -   -
SYS_console>
```

set-sec-vlan

Usage:

`set-sec-vlan {run|nvram|all} <port_list>`

This command establishes a security virtual LAN. The arguments are identical to set-vbc-domain. The ports in a virtual LAN are allowed to send and receive packets from other ports in the same virtual LAN.

del-sec-vlan

Usage:

`del-sec-vlan {run|nvram} <lan_id>`

This command deletes the virtual LAN specified by *lan_id*.

get-svlan-tbl

Usage:

`get-svlan-tbl {run|nvram}`

This command shows the table of defined virtual LANs.

```
SYS_console> get-svlan-tbl run
 RUNTIME    SECURITY VIRTUAL LANs TABLE
  ================================

  SVLAN ID   P1  P2  P3  P4  P5  P6  P7  P8  P9  P10 P11 P12
  ============================================================
    1:        +   -   +   -   +   -   -   -   -   -   -   -
    2:        +   +   -   -   -   -   +   -   -   -   -   -
SYS_console>
```

set-mon-port

Usage:

`set-mon-port <port>`

This command sets the port to be monitored. The value *port* is a decimal port number. All traffic from this port will be duplicated on the monitoring port specified by the monitor command.

monitor

Usage:

`monitor <port>`

This command sets the monitoring port. All traffic from the port specified by set-mon-port will be duplicated on port. The value *port* is a decimal port number.

stop-mon

This command ends port monitoring.

get-nv-mon

This command retrieves the NVRAM based monitoring configuration.

save-mon

This command saves the running monitoring configuration to the NVRAM.

clear-nv-mon

This command clears the monitoring configuration from the NVRAM.

Spanning Tree Commands

Spanning Tree automatically configures a loop-free topology in a bridged environment. The Spanning Tree agent is implemented in conformance to the IEEE 802.1d standard. Below are listed the configuration commands pertinent to the operation of the Spanning Tree algorithm.

get-stp

Retrieves the current state of Spanning Tree. Either enable or disable.

set-stp

Usage:

```
set-stp {enable|disable}
```

This command enables or disables the Spanning Tree protocol. Spanning Tree is enabled by default, in accordance with 802.1d. Enabling or disabling Spanning Tree will not take effect until the SNMP agent is reset, via warm-reset, cold-reset, or a power cycle.

get-st-bcfg

This command retrieves the Spanning Tree bridge parameters. If Spanning Tree is disabled, no parameters will be retrieved.

get-st-pcfg

This command retrieves the Spanning Tree port parameter table. If Spanning Tree is disabled, no parameters will be retrieved.

get-st-syscfg

This command retrieves the Spanning Tree state of all of the ports.

set-br-prio

Usage:

```
set-br-prio <priority>
```

This command sets the Spanning Tree bridge priority of the switch. The *priority* value is an integer in the range 0...65535. This is equivalent to setting the MIB variable dot1dStpPriority (RFC 1493).

set-br-maxage

Usage:

`set-br-maxage <maxage>`

This command sets the Spanning Tree bridge MaxAge. This is the amount of time between Spanning Tree configuration messages. Note that *maxage* is in units of seconds in the range 6...40, while the corresponding MIB variable, dot1dStpBridgeMaxAge (RFC 1493), is in units of hundreths of a second, in the range 600...4000, and must be a multiple of 100.

set-br-hellot

Usage:

`set-br-hellot <hello_time>`

This command sets the Spanning Tree bridge Hello Time. *hello_time* is an integer in the range 1...10. Note that *hello_time* is in units of seconds, while the corresponding MIB variable, dot1dStpBridgeHelloTime (RFC 1493), is in units of hundreths of seconds in the range 100...1000, and must be a multiple of 100.

```
SYS_console> set-br-hellot 2
 The Bridge Hello Time was changed
SYS_console>
```

set-br-fwdel

Usage:

`set-br-fwdel <forward_delay>`

This command sets the Spanning Tree bridge Forward Delay. This controls the amount of time between the listening and forwarding Spanning Tree states, and is completely unrelated to the forwarding latency. Note that *forward_delay* is an integer in units of seconds in the range 4...30, while the corresponding MIB variable, dot1dStpBridgeForwardDelay (RFC 1493), is in units of hundreths of seconds in the range 400...3000, and must be a multiple of 100.

set-br-prio

Usage:

`set-prt-prio <port_number> <port_priority>`

This command sets the Spanning Tree port priority. The *port_number* value is the decimal port number, and the *port_priority* value is an integer in the range 0...255. This is equivalent to setting the MIB variable dot1dStpPortPriority (RFC 1493).

set-prt-enb

Usage:

`set-prt-enb <port_number> {enable|disable}`

This command enables or disables a port in the Spanning Tree. The *port_number* value is the integer port number. This is equivalent to setting the MIB variable dot1dStpPortEnable (RFC 1493).

set-prt-pcost

Usage:

`set-prt-pcost <port_number> <path_cost>`

This command sets the Spanning Tree port path cost. The *port_number* value is the integer port number, and the *path_cost* value is an integer path cost in the range 1...65535. This is equivalent to setting the MIB variable dot1dStpPortPathCost (RFC 1493).

Port Configuration Commands

This section contains instructions for configuring and displaying the ports' parameters with the Administrative Interface.

get-port-cfg

The get-port-cfg command displays the current port configuration.

```
SYS_console> get-port-cfg
 PORT_ID LAN_TYPE LINK IF_TYPE SPEED_SEL LAN_SPEED  FDPLX FCTRL
=============================================================
   1      ETH10/100  OFF   TPFD    ASENSE    100Mbps    OFF    ON
   2      ETH10/100  OFF   TPFD    ASENSE    100Mbps    OFF    ON
   3      ETH10/100  OFF   TPFD    ASENSE    100Mbps    OFF    ON
   4      ETH10/100  OFF   TPFD    ASENSE    100Mbps    OFF    ON
   5      ETH10/100  OFF   TPFD    ASENSE    100Mbps    OFF    ON
   6      ETH10/100  OFF   TPFD    ASENSE    100Mbps    OFF    ON
   7      ETH10/100  OFF   TPFD    ASENSE    100Mbps    OFF    ON
   8      ETH10/100  ON    TPFD    ASENSE    100Mbps    OFF    ON
   9      ETH10/100  ON    TPFD    ASENSE    100Mbps    OFF    ON
  10      ETH10/100  ON    TPFD    ASENSE    100Mbps    OFF    ON
  11        NONE     ---- PORT NOT INSTALLED ----
  12        NONE     ---- PORT NOT INSTALLED ----
SYS_console>
```

The information displayed contains:

- The port identifier
- LAN type: ETH10 indicates 10 Mb/s Ethernet
- Link status: ON/OFF
- Physical interface type: AUI , TP , AUI-TP (AUI & TP), etc.
- Physical interface selected: AUI or TP (default)
- Full-duplex mode:

  OFF = standard Ethernet (default), ON =full-duplex
- Flow control: (has no effect if full-duplex mode is enabled)

  ON = enabled (default), OFF = disabled

set-port-dplex

Usage:

```
set-port-dplex <port_number> {half|full}
```

The set-port-dplex command specifies if the given port will be active in full-duplex or in half-duplex (standard Ethernet) mode. The default is half-duplex mode.

```
SYS_console> set-port-dplex 2 full

 Port configured in <full_duplex> mode
 Parameter change in NVRAM OK
SYS_console> _
```

NOTE

The 10 Mb/s, full-duplex, and flow control options are mutually exclusive. Full-duplex flow control operation is available only on 100 Mb/s connections between two MultiSwitch 300s.

---

set-speed-sel

Usage:

```
set-speed-sel <port-number> {asense|100|10}
```

This command specifies if the specified port number will negotiate a 10 Mb/s or 100 Mb/s connection, or if it will auto-select.

NOTE

If the switch is having difficulty auto-negotiating the wire speed, use this command to set the correct value. The asense and full-duplex options are mutually exclusive. You must choose a line speed before selecting full-duplex operation.

---

set-port-fctrl

Usage:

```
set-port-fctrl <port-number> {on|off}
```

This command specifies if the given port will have the flow control feature enabled (on) or disabled (off). The default is flow control enabled (on).

If the port is in full-duplex mode, the status of the flow control option has no effect, unless the connection is 100 Mb/s and both ports are on MultiSwitch 300s.

```
SYS_console> set-port-fctrl 2 off
 Port 2 - flow control <off>
 Parameter change in NVRAM OK
```

Switching Statistics Commands

This section contains instructions for displaying the switching statistics using the Administrative Interface. The following commands provide full physical layer information as well as inter-port switching statistics.

clr-cnt

This command clears the Ethernet and bridging counters.

get-eth-cnt

Usage:

`get-eth-cnt <port-number>`

This command displays the Ethernet statistics counters for the specified port number. This is almost identical to the Ethernet-like statistics group of the Ethernet MIB.

```
SYS_console> get-eth-cnt 1
 Ethernet Statistics for port 1
 ================================
 Transmit    OK    :        0
 Underflow   Errors:        0
 Exces Coll  Errors:        0
 Exces Fctrl Errors:        0
 Receive     EOF   :   238559
 Receive     OK    :   238558
 Overflow    Errors:        0
 CRC         Errors:        1
 Alignment   Errors:        1
 Runt        Errors:        1
 Lost/Fctrl  Errors:        0
 Too Long    Errors:        0
 ================================
SYS_console> _
```

get-colls-cnt

Usage:

`get-colls-cnt <port-number>`

This command displays the Ethernet collision statistics for the specified port number. This is almost identical to the Ethernet-like collisions statistics group of the Ethernet MIB and shows the collision count distribution for this port.

```
SYS_console> get-colls-cnt 1
 Ethernet Collision Distribution for port 1
 ================================================
  1 collision count :     2234
  2 collision count :      121
  3 collision count :        0
  4 collision count :        0
  5 collision count :        0
  6 collision count :        0
  7 collision count :        0
  8 collision count :        0
  9 collision count :        0
 10 collision count :        0
 11 collision count :        0
 12 collision count :        0
 13 collision count :        0
 14 collision count :        0
 15 collision count :        0
 16 collision count :        0
 ================================================
SYS_console> _
```

get-rmon-cnt

Usage:

`get-rmon-cnt <port>`

Retrieves the RMON statistics group 1 counters for the specified port.

get-sdist-cnt

Usage

`get-sdist-cnt <port>`

Retrieves the RMON statistics packet size histogram for the specified port.

get-br-cnt

Usage:

`get-br-cnt <port-number>`

This command displays the switching statistics counters for the specified port number. The command displays:

- Number of packets/bytes received.
- Number of multicast packets.

- Number of packets with unknown destination and subsequently multicast.
- Number of packets transmitted.
- Number of packets lost (if flow control is disabled) or number of packets retransmitted by the originator due to the flow control (if flow control is enabled).
- Number of packets/bytes forwarded to port *n*. Note that if *n* equals *port-number* then the number of packets/bytes represents filtered frames.

```
SYS_console> get-br-cnt 1
 Ethernet Switching Counters for port 1
 ================================================
 Frm   Received OK :         0
 Bytes Received    :         0
 Frm Filtered      :         0
 Frm to all ports  :         0
 Frm multicast     :         0
 Frm lost/fctrl    :         0
 Transmit OK       :     22118

 Forward to port   :      FRAMES           BYTES
------------------------------------------------
        1          :           0              0
        2          :           0              0
        3          :           0              0
        4          :           0              0
        5          :           0              0
        6          :           0              0
        7          :           0              0
        8          :           0              0
        9          :           0              0
       10          :           0              0
       11          :           0              0
       12          :           0              0
 ================================================
SYS_console> _
```

get-mgm-brcnt

Retrieves the counters for the management interface:

```
SYS_console> get-mgm-brcnt
 Management Port Counters
==========================================
 Frm   Received    :     24140
 Bytes Received    :   2710566
 Frm   Filtered    :     12907
 Frm Received Bcast:     14205
 Frm Transmited    :     29047
 Frm Transmit Ucast:      2487
 Frm Transmit Mcast:     26560
 Frm Transmit Bcast:         9
 Received from port:      FRAMES           BYTES
-----------------------------------------------------
        1          :           0              0
        2          :           0              0
        3          :           0              0
        4          :           0              0
        5          :           0              0
        6          :           0              0
        7          :           0              0
        8          :       24140        2710566
        9          :           0              0
       10          :           0              0
       11          :           0              0
       12          :           0              0
 Transmit to port  :      FRAMES           BYTES
-----------------------------------------------------
        1          :        3802         228120
        2          :        3802         228120
        3          :        3802         228120
        4          :           0              0
        5          :        3802         228120
        6          :        3802         228120
        7          :        3802         228120
        8          :        6289         425219
        9          :           0              0
       10          :           0              0
       11          :           0              0
       12          :           0              0
-----------------------------------------------------
SYS_console> _
```

Chapter 8

Using an SNMP Manager

Overview

This chapter contains instructions regarding the configuration and management of the MultiSwitch 300 with an SNMP management system.

The MultiSwitch 300 with an SNMP Agent board installed is a plug and play device. Once connected to the network and powered ON, the MultiSwitch 300 starts operating according to factory set default values. However, to ensure proper operation and maximum performance specific to your network configuration and to provide SNMP access, you must configure some environment-specific parameters through the Administrative Interface.

The following steps should be taken:

1) Connect a terminal to the Administrative Interface Port.

2) Log in to the Administrative Interface. (See Chapter 6, Accessing the SNMP Agent.)

3) Initialize all the MultiSwitch 300 parameters to their default values. Use the following command sequence:

```
SYS_console> init-nvram

SYS_console> warm-reset
```

4) Wait until you see the LOGIN prompt again. Log in to the Administrative Interface. Now all system parameters have been initialized to their default values.

IP Setup

1) Modify the system IP configuration to match your IP network. Use the set-ip-cfg command to provide an IP address, a netmask, and a broadcast address. (See Chapter 7, IP Commands.) For example:

```
SYS_console> set-ip-cfg 129.1.1.64 255.255.255.0 129.1.1.255
```

Check that the actual IP configuration matches the desired one:

```
SYS_console> get-ip-cfg
 The device IP address, netmask and broadcast are:
             IP address   : 129.001.001.064
             IP netmask   : 255.255.255.000
             IP broadcast : 129.001.001.255
```

2) Set the default gateway address using the set-gatew command (For more details, see Chapter 7, IP Commands.) This should be a station that can route IP packets to non-local IP networks. For example:

```
SYS_console> set-gatew 129.1.1.1
```

Confirm that the default gateway IP address was properly accepted:

```
SYS_console> get-gatew
 Device default gateway address is : 129.001.001.001
```

SNMP Setup

1) Set up the SNMP communities strings for the two access modes: read and write (For more details, see Chapter 7, SNMP Commands.) Confirm that the read and write communities were properly accepted:

```
SYS_console> set-comm read public
New read community is: < public >
SYS_console> set-comm write private
New read community is: < private >
SYS_console> get-comm *
 Current read  community is: < public >
 Current write community is: < private >
SYS_console> _
```

2) Setup the trap receiver table: add the Network Manager Station(s) that are to receive system generated traps:

```
SYS_console> add-trap 129.1.1.76 public
   Entry 129.1.1.76 - public added
             SNMP TRAP TABLE
            ===============
   IPADDR                   COMMUNITY
------------------------
129.001.001.065   ------     public
129.001.001.076   ------     public
------------------------
```

Chapter 9

Troubleshooting the SNMP Manager

Procedure for Troubleshooting

This chapter provides troubleshooting hints for problems you may encounter when trying to manage the MultiSwitch 300 using an SNMP management system.

- If your SNMP manager has trouble communicating with the SNMP Agent in the switch, check your SNMP configuration parameters.

Your Network Administrator can help determine if your IP configuration (IP address. netmask, and broadcast address) is correct. If the SNMP management workstation is on a different network, be sure that you defined an appropriate default gateway IP Address (see Chapter 7, IP Commands).

- Check the community string configuration by using the get-comm * command.
- If you are not receiving any traps, check that you entered the network management workstation address in the trap receiver table correctly. Display the table using the get-trap-tbl command. Check that both the IP address and the community string are correct.
- If the network management station does not receive authentication failure traps, check for the authentication mode using the get-auth command.
- Check that you have a correct physical connection to the switch. Test that the switch port is configured with the desired physical interface: TP or AUI. If you are using the TP interface, check the LINK status.
- Test the connection to the network management station by pinging it. Use the Administrative Interface: ping <IPaddress> <count-number>.
- If the network's physical topology has changed recently (for example, a network management station has been moved from one segment to another), the ARP cache may be out of date. You can use the del-arp-entry command to flush the cache.

Appendix A

Product Specifications

Overview

Introduction

This appendix lists the specifications for the MultiSwitch 300.

In This Appendix

Topic	Page
Technical Specifications	A-2
Physical and Electrical Specifications	A-3
Environmental Specifications	A-4
Acoustical Specifications	A-5

Table A-1: Technical Specifications

Parameter	Specification
Buffers	64 Kb per port
Addresses	4096
Addresses Table	Transparent, automatic self-learning at full wire speed. Cache aging time manageable. Custom filtering by hardware address and ports.
Store and Forward Switching	Provides complete runt and error filtering on all packets. Flow control prevents packet loss.
Network Management	In-band and out-of-band SNMP w/MIB II, private MIB, and out-of-band serial console support
Filter/Forward Rate	700,000/700,000 p/s
Status Indicators	RX, TX, Speed, Link, Coll/FD, Flow Control
General Indicators	Management activity, SNMP presence, power supply status, device failure detection
Boot and Configuration	NVRAM configuration loaded on power up and fully downloadable. Firmware local/ remote downloadable.
Interfaces	UTP RJ-45, RS232 DB-9, two slots for dual plug-in modules
Standards Supported	FDSE (Full Duplex Switched Ethernet), IEEE 802.3, IEEE 802.3u, IEEE 802.1d (Bridge/Spanning Tree), SNMP (RFC 1157), MIB II (RFC 1213), Bridge MIB (RFC 1493), RMON Group 1, 2, 3, and 9 (RFC 1757)

Table A-2: Physical and Electrical Specifications

Parameter	Specification
Power	
	170 W (max)
• Input	100 Vac to 120 Vac @ 2 A
	220 Vac to 240 Vac @ 1 A
• Output	110 W (max)
	22 A @ 5 Vdc
Dimensions	
Height	6.35 cm (2.50 in)
Width	43.9 cm (17.28 in)
Depth	35.6 cm (14.02 in)
Weight	6.5 kg (14.33 lb)
Mounting	Standard 19-inch rack with mounting brackets. 1-inch minimum clearance, sides and back.

Table A-3: Environmental Specifications

Parameter	Specification
Environment	
Operating Temperature	0°C to 40°C (32°F to 104°F)
Storage Temperature	-10°C to 65°C (14°F to 149°F)
Relative Humidity	Less than 95% noncondensing
Altitude	
• Operating	Sea level to 2400 m (8000 ft)
• Non-operating	Sea level to 4900 m (16000 ft)
Emissions and Safety	FCC Part 15, Class A
	ETL (UL-1950), TUV, CSA, CE, C-Tick

Table A-4: Acoustics

Declared values per ISO 9296 and ISO 7779

Product	Sound Power Level L_{WAd}, B	Sound Pressure Level L_{pAm}, dBA (bystander positions)
	Idle/Operate	Idle/Operate
DLMFE	6.3	49

Current values for specific configurations are available from Digital representatives.

1 B = 10 dBA.

Table A-5: German Acoustical Specifications

Schallemissionswerte - Werteangaben nach ISO 9296 und ISO 7779/DIN EN27779

Produkt	Schalleistungspegel L_{WAd}, B	Schalldruckpegel L_{pAm}, dBA (Zuschauerpositionen)
	Leerlauf/Betrieb	Leerlauf/Betrieb
DLMFE	6,3	49

Aktuelle Werte für spezielle Ausüstungsstufen sind über die Digital Equipment Vertretungen erhältlich.

1 B = 10 dBA.

Appendix B

Console Command Line Reference

Overview

Introduction

This appendix lists all of the available console commands and a brief description of each.

In This Appendix

Topic	Page
Console Commands	B-2
System Commands	B-3
IP Commands	B-4
SNMP Commands	B-5
Switching Database Commands	B-6
Virtual LAN Commands	B-7
Spanning Tree Commands	B-8
Port Configuration Commands	B-9
Switching Statistics Commands	B-10

Console Commands

Table B-1: Console Commands

Command	Description
help-kbd	List the console functional keys
banner	Display banner
clear	Clear screen
login	Exit Admin Interface
logout	Exit Admin Interface and any active Telnet session
set-prompt	Change the console prompt
set-passwd	Change the console password

System Commands

Table B-2: System Commands

Command	Description
sys-stat	Show system status
get-stst-level	Show the selftest level
set-stst-level	Change the selftest level
warm-reset	Warm reset of the device
cold-reset	Cold reset of the device
get-last-err	Displays information about the last fatal error
init-nvram	Initializes NVRAM to default values
set-line-slip	Transfers the serial line to SLIP mode
get-sw-file	Retreives the SNMP Agent Software filename
set-sw-file	Sets the SNMP Agent Software filename for download
get-rsw-file	Retrieves the SNMP Agent Software remote filename
set-rsw-file	Sets the SNMP Agent Software remote filename - for download
get-tftp-srvr	Retrieves the TFTP download server IP address
set-tftp-server	Sets the TFTP download server IP address
sw-dnld	Starts the SNMP Software download from the predefined server
get-par-file	Retrieves the SNMP Agent Parameters filename
set-par-file	Sets the SNMP Agent Parameters filename for automatic setup
par-upld	Starts the parameter upload to the predefined server
set-fg-param	Sets the Ethernet frame generator parameters
start-fg	Starts the Ethernet frame generator
stop-fg	Stops the Ethernet frame generator

IP Commands

Table B-3: IP Commands

Command	Description
get-ip	Show current IP address
set-ip	Set IP address
get-ip-cfg	Show current IP configuration
set-ip-cfg	Set IP address, netmask, and broadcast
clear-ip-cfg	Clears the NVRAM based IP configuration
set-slip	Set slip IP address
get-slip	Get slip IP address
get-slip-cfg	Show current IP configuration
set-slip-cfg	Set IP address, netmask, and broadcast
get-gatew	Show default gateway
set-gatew	Define default gateway
get-arp-tbl	Display the ARP table
del-arp-entry	Deletes an entry/all entries of the ARP table
add-arp-entry	Add an entry to the ARP table
get-bootp	Retrieve the state of the BOOTP process
set-bootp	Enables or disables the BOOTP process activation
ping	IP traffic generator
ping-stop	Stop the ping process
get-def-ttl	Retrieves the running default TTL value
set-def-ttl	Modifies the running default TTL value

SNMP Commands

Table B-4: SNMP Commands

Command	Description
get-comm	Shows current read and/or write community
set-comm	Changes the read or write community
get-auth	Shows the traps authentication mode
set-auth	Shows the traps authentication mode
get-traps	Shows destination stations in the trap list
add-trap	Adds a destination station to the trap list
del-trap	Deletes a destination station from the trap list

Switching Database Commands

Table B-5: Switching Database Commands

Command	Description
get-lt-entry	Gets an LT entry at index
get-lt-16	Gets 16 LT entries starting at a given index
find-lt-addr	Searches for an address in the LT
del-lt-entry	Removes an LT entry at index
del-lt-addr	Removes an LT with a given address
add-lt-entry	Adds an LT entry
add-cf-entry	Adds a Custom Filter LT entry
del-cf-entry	Deletes a Custom Filter entry
get-nv-cftbl	Displays the NVRAM stored Custom Filters Table
get-nv-cfilt	Displays the NVRAM stored Custom Filters for a given MAC address
get-lt-age	Retrieves the LT aging period
set-lt-age	Sets the LT aging period
get-sport-hex	Get hex for list of source ports
get-dport-hex	Get hex for list of dest ports

Virtual LAN Commands

Table B-6: Virtual LAN Commands

Command	Description
set-vbc-domain	Defines a Virtual Broadcast Domain
del-vbc-domain	Deletes a Virtual Broadcast Domain
get-vbc-tbl	Displays the Virtual Broadcast Domain table
set-sec-vlan	Defines a Security Virtual LAN
del-sec-vlan	Deletes a Security Virtual LAN
get-svlan-tbl	Displays the Security Virtual LAN table
get-lt-filter	Retrieves the filter for a given MAC address
get-con-matrix	Retrieves the VLAN connectivity matrix
get-vbc-matrix	Retrieves the VBC connectivity matrix
set-mon-port	Sets the monitoring port
monitor	Starts port monitoring
stop-mon	Stops port monitoring
get-nv-mon	Retrieves the NVRAM based monitoring configuration
save-mon	Save the running monitoring configuration to NVRAM
clear-nv-mon	Clears the NVRAM based monitoring configuration

Spanning Tree Commands

Table B-7: Spanning Tree Commands

Command	Description
get-stp	Display the Spanning Tree session state
set-stp	Enables/disables the Spanning Tree for the next session
get-st-bcfg	Retrieves the Spanning Tree bridge parameters
get-st-pcfg	Retrieves the Spanning Tree port parameters table
get-st-syscfg	Retrieves the Spanning Tree system ports configuration
set-br-prio	Sets the Spanning Tree bridge priority
set-br-maxage	Sets the Spanning Tree bridge maximum age
set-br-hellot	Sets the Spanning Tree bridge hello time
set-br-fwdel	Sets the Spanning Tree bridge forward delay
set-prt-prio	Sets the Spanning Tree port priority
set-prt-enb	Sets the Spanning Tree port to enable or disable
set-prt-pcost	Sets the Spanning Tree port path cost

Port Configuration Commands

Table B-8: Port Configuration Commands

Cammand	Description
get-port-cfg	Displays the configuration of all the ports
set-port-dplex	Sets the port mode to half or full duplex
set-speed-sel	Selects the port speed of 10Mbps, 100Mbps, or Asense
set-port-fctrl	Sets the port flow control mode to ON or OFF

Switching Statistics Commands

Table B-9: Switching Statistics Commands

Command	Description
clr-cnt	Clears the switch counters: Ethernet and bridging
get-eth-cnt	Gets the Ethernet counters per port
get-colls-cnt	Gets the collision distribution counters per port
get-rmon-cnt	Gets the Ethernet RMON counters per port
get-sdist-cnt	Gets packet size distribution counters per port
get-br-cnt	Gets the switching counters per port
get-mgm-brcnt	Gets the switching counters of the mgmt port

Appendix C

System Default Values

Overview

Introduction

This appendix lists the default values for the Administrative Interface of the MultiSwitch 300.

In This Appendix

Topic	Page
System Default Values	C-2

Table C-1: System Default Values

Command Set	Value	Default
console	Password	NONE
	Prompt	SYS_console>
system	Software Filename	flash12.hex
	Parameter Filename	param12.hex
ip	BOOTP	disable
	TTL	10 (in range 1...255)
snmp	Read Community	public
	Write Community	private
	Authentication Mode	enable
	Traps Manager	NONE
switch-db	Aging Time	300 seconds
port configuration	Port Duplex	HALF
	Port Select	AUTO
	Port Flow Control	ON
spanning tree	Spanning Tree	enable
	Bridge Priority	32768 ((0-65535)
	Bridge Max Age	20 seconds (6.0-40.0)
	Bridge Hello Time	2 seconds (1.0-10.0)
	Bridge Forward Delay	15 seconds (4.0-30.0)
	Port Priority	128 (0-255)
	Port Cost	1000/LAN speed in Mb/s

Appendix D

Associated Documents

Overview

Introduction

This appendix lists associated documentation and related communication information for the DIGITAL MultiSwitch 300.

In This Appendix

Topic	Page
Documents	D-2
How to Order Additional Documentation	D-3
Correspondence	D-4

Documents

The following documents provide information relating to the MultiSwitch 300. To order any of the following documents, refer to the section entitled How to Order Additional Documentation.

Title and Order Number	Description
DIGITAL MultiSwitch 300 Installation and User's Guide EK-DLMFE-IN. A01	Provides installation, setup, and configuration information for the MultiSwitch 300.
DIGITAL MultiSwitch 300 Manager User's Guide AA-R4D9A-TE	Provides information on the setup and use of the SNMP Manager application for the MultiSwitch 300.

How to Order Additional Documentation

To order additional documentation, use the following information:

To Order:	Contact:
By Telephone	USA (except Alaska, New Hampshire, and Hawaii): 1-800-DIGITAL (1-800-344-4825) Alaska, New Hampshire, and Hawaii: 1-603-884-6660 Canada: 1-800-267-6215
Electronically (USA only)	Dial 1-800-DEC-DEMO (For assistance, call 1-800-DIGITAL)
By Mail (USA and Puerto Rico)	DIGITAL EQUIPMENT CORPORATION P.O. Box CS2008 Nashua, New Hampshire 03061 (Place prepaid orders from Puerto Rico with the local DIGITAL subsidiary: 809-754-7575)
By Mail (Canada)	DIGITAL EQUIPMENT of CANADA LTD. 940 Belfast Road Ottawa, Ontario, Canada K1G 4C2 Attn.: A&SG Business Manager
Internationally	DIGITAL EQUIPMENT CORPORATION Attn.: A&SG Business Manager c/o local DIGITAL subsidiary or approved distributor
Internally	U.S. Software Supply Business (SSB) DIGITAL EQUIPMENT CORPORATION 8 Cotton Road Nashua, New Hampshire 03063

Correspondence

Documentation Comments

If you have comments or suggestions about this document, send them to the Network Products Engineering.

Attn.: Documentation Project Manager
FAX: (508) 486-6093
E-MAIL: doc_feedback@lkg.mts.dec.com

Online Services

To locate product-specific information, refer to the following online services:

BBS To read the Bulletin Board System, set your modem to 8 bits, no parity, 1 stop bit, and dial 508-486-5777 (U.S.).

WWW The Digital Equipment Corporation Network Products Business Home Page on the World Wide Web is located at the following addresses:

North America:	http://www.networks.digital.com
Europe:	http://www.networks.europe.digital.com
Australia:	http://www.digital.com.au/networks

Appendix E

Service Information and Support

Overview

Introduction

This appendix provides service and support information for the DIGITAL MultiSwitch 300.

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Warranty Service

This product has a limited one year RETURN TO DIGITAL WARRANTY. Please refer to the Network Products Warranty and Service Information Notice (EK-NETWW-CM) that accompanies the product for more detailed information.

Warranty support services include product advisory assistance available from DIGITAL's Customer Support Centers. This support is designed to help customers who have questions regarding the use and setup of their networking product. This includes:

- Assistance in using the product documentation
- Verifying that correct procedures or comannds are being used
- Answering general questions on such issues as product compatibility, configuration rules and guidelines, and software/firmware release levels
- Assistance in verifying that product hardware is functioning or malfunctioning