Installation and Reference for the Model 58000 10/100 Ethernet Switch

Part No. 893-878-B
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Bay Networks

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This is to certify that the Bay Networks Model 58000 10/100 Ethernet Switch is shielded against the generation of radio interference in accordance with the application of Council Directive 89/336/EEC, Article 4a. Conformity is declared by the application of EN 55 022:1987 Class B (CISPR 22:1985/BS 6527:1988).

Compliance with the Class B regulations is dependent upon the use of shielded cables. The user is responsible for procuring the appropriate cables.

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This equipment is in the 1st category (information equipment to be used in commercial and/or industrial areas) and conforms to the standards set by the Voluntary Control Council for Interference by Data Processing Equipment and Electronic Office Machines that are aimed at preventing radio interference in commercial and/or industrial areas.

Consequently, when this equipment is used in a residential area or in an adjacent area thereto, radio interference may be caused to equipment such as radios and TV receivers.

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Preface

Congratulations on your purchase of the Bay Networks™ Model 58000 10/100 Ethernet Switch, which provides Ethernet frame switching at 10 and 100 megabits per second (Mb/s).

In this guide, the Model 58000 10/100 Ethernet Switch is referred to as the Model 58000 switch or the switch.

Purpose

This guide describes the features and capabilities of the Model 58000 switch and explains how to install, configure, and replace the different components that comprise the switch. This guide also provides information about planning your network.

Audience

This guide is intended for network administrators who are responsible for installing, configuring, or maintaining a switched backbone network. Users should:

- Understand Bay Networks network management concepts and terminology.
- Be familiar with the tools and procedures for installing and operating sensitive electronic equipment.
- Understand IEEE 802.3 10BASE-T Ethernet and 100 BASE-T Fast Ethernet networking concepts.
- Understand Ethernet frame switching concepts.
- Be familiar with the Bay Networks System 5000™ hub.
- Have worked with Bay Networks networking equipment (helpful, but not required).

Conventions

This section describes the conventions used in this guide.

Special Message Formats

This guide uses the following formats to highlight special messages:

NOTE: *This format is used to highlight information of importance or special interest.*

CAUTION: *This format is used to highlight information that will help you prevent equipment failure or loss of data.*

WARNING: *This format is used to highlight material involving possibility of injury or equipment damage.*

Use of Enter, Type, and Press

This guide uses enter, type, and press to describe the following actions:

- When you read “enter,” type the text and press the Enter key.
- When you read “type,” type the text, but do not press the Enter key.
- When you read “press,” press only the alphanumeric or named key.

Other Conventions

This guide uses the following additional conventions:

italics	Book titles and UNIX file, command, and directory names.
`courier font`	Screen text, user-typed command-line entries.
Initial Caps	Menu titles and window and button names.
[Enter]	Named keys in text are shown enclosed in square brackets. The notation [Enter] is used for the Enter key and the Return key.
[Ctrl]+C	Two or more keys that must be pressed simultaneously are shown in text linked with a plus (+) sign.
Model 500x chassis	Used when either the Model 5000 chassis or the Model 5005 chassis is applicable.

Related Publications

For more information about products related to the Model 58000 switch, refer to the following publications:

- *Installation and Reference for the Model 58000-1xx Media Dependent Adapters* (Bay Networks part number 893-877-A)

  This guide describes Model 58000-1xx media dependent adapters (MDAs) and provides detailed instructions on how to install the MDAs on the switch.

- *Installation and Reference for the Model 5000 Chassis* (Bay Networks part number 893-598-B)

  This guide describes the Model 5000 chassis and provides instructions for installing and operating the chassis.

- *Using Optivity Campus 6.0 for Windows* (Bay Networks part number 893-786-D)

  This guide provides an overview of the virtual LAN features of Optivity® Campus 6.0 for Windows and describes how to use the Optivity LANarchitect™ integrated application to create, modify, and manage a virtual LAN within various Bay Networks switch products.

- *Using Optivity LAN 7.0 for UNIX* (Bay Networks part number 893-568-G)

  This guide provides an overview of the virtual LAN features of Optivity LAN™ 7.0 for UNIX and describes how to use the Optivity LANarchitect integrated application to create, modify, and manage a virtual LAN within various Bay Networks switch products.

For information about 100BASE-T specifications, order *Bay Networks Guide to Understanding 100BASE-T* (Bay Networks part number 345A-1105-BK). This publication provides:

- Detailed information about the 100BASE-T specifications.
- 100BASE-T cabling information.
- Detailed information about the 100BASE-T products currently available from Bay Networks.

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Customers and resellers holding Bay Networks service contracts can visit the special libraries to acquire advanced levels of support documentation and software.

To open an account and receive a local dial-up number, call CompuServe at 1-800-524-3388 and ask for representative number 591. In the United Kingdom, call Freephone 0800-289378. In Germany, call 0130-37-32. In the rest of Europe, call 44-272-760681. Outside the U.S., Canada, and Europe, call 614-529-1349 and ask for representative number 591, or you can consult your listings for an office near you. Once you are online, you can reach our forum by typing the command GO BAYNETWORKS at any ! prompt.

InfoFACTS

InfoFACTS is the Bay Networks free 24-hour fax-on-demand service. This automated system contains libraries of technical and product documents designed to help you manage and troubleshoot your Bay Networks products. The system can return a fax copy to the caller or to a third party within minutes of being accessed.

To use InfoFACTS in the U.S. or Canada, call toll-free 1-800-786-3228. Outside North America, toll calls can be made to (408) 764-1002. Calls from outside North America must be made from a fax machine handset. International faxes MUST be initiated from and responded to at the same fax machine.

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The Customer Support Web Server offers technical documents, software agents, and an email capability for communicating with our technical support engineers. In addition, a feature of the Customer Support Web Server allows service-contracted customers and resellers to view information on open or closed cases associated with their contracted site.

Bay Networks maintains a World Wide Web Home Page that you can access at the universal resource locator (URL) http://www.baynetworks.com. The Customer Support Web Server is a menu item on that Home Page. A direct connection to the Internet and a Web Browser (such as Mosaic or Netscape) are required.

How To Get Help

For additional information or advice, contact the Bay Networks Technical Response Center in your area. Table 1 provides the names and telephone numbers of the Bay Networks Technical Response Centers (TRCs).

Table 1. Bay Networks Technical Response Centers

TRC location	Direct dial contact	Toll free contact
North America TRC Santa Clara, California Billerica, Massachusetts Serving the U.S., Canada, Mexico, Central America, and South America	 Dial **408-764-1000** Dial **508-436-3700**	**800-2LANWAN** (800-252-6926) toll free from U.S. and Canada
Europe TRC Valbonne, France Serving Europe, Africa, and the Middle East	**33-92-966-968**	Not applicable

Table 1. Bay Networks Technical Response Centers (continued)

TRC location	Direct dial contact	Toll free contact
Asia Pacific TRC Sydney, Australia Serving Australia, New Zealand, and the Pacific Rim	**61-2-903-5800**	**088-064-008** (toll free from Australia)
Japan TRC Tokyo, Japan Serving Japan	**81-3-3288-0331**	Not applicable

Express Technical Support from the North America TRC

When calling the Bay Networks North America TRC, use Express Routing Code #140 to obtain express technical support for the Model 58000 switch. Entering the express code expedites your call through the menuing system and routes it directly to the support group that is best qualified to answer your technical questions about the Model 58000 switch.

Chapter 1 Overview of the Model 58000 10/100 Ethernet Switch

This chapter introduces the Model 58000 switch and provides a summary of the following information:

- Functionality and capabilities of the switch
- Mechanical and operational features of the switch
- A physical description of the switch
- How the switch operates in relation to the chassis

About the Model 58000 Switch

The Model 58000 10/100 Ethernet Switch (see Figure 1-1) is a System 5000 switch that provides Ethernet frame switching for large and scalable switched networks. The Model 58000 switch is a double-wide module that occupies two consecutive slots of a Model 500x chassis (see Figure 1-2).

As a network center switch, the Model 58000 switch provides high-speed switching and increases the effective bandwidth for System 5000 attached users. The switch provides the following key benefits:

- 2 gigabits per second (Gb/s) internal throughput and scalable 10/100 Mb/s bandwidth
- Integrated high-speed switching between the 12 backplane segments of the System 5000
- Dedicated 10 or 100 Mb/s links for distributed network segments
- 100 Mb/s “big pipe” connections to high-utilization devices such as department servers, power users, and uplinks to data centers or other hubs
- Full integration with the latest release of Bay Networks Optivity® network management software
- Simple Network Management Protocol (SNMP) functionality for all other modules in the Model 500x chassis

For more information about the features of the Model 58000 switch, see Features next in this chapter.

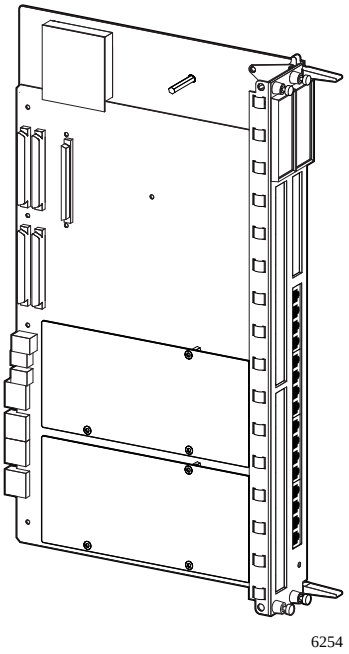


Figure 1-1. Model 58000 10/100 Ethernet Switch

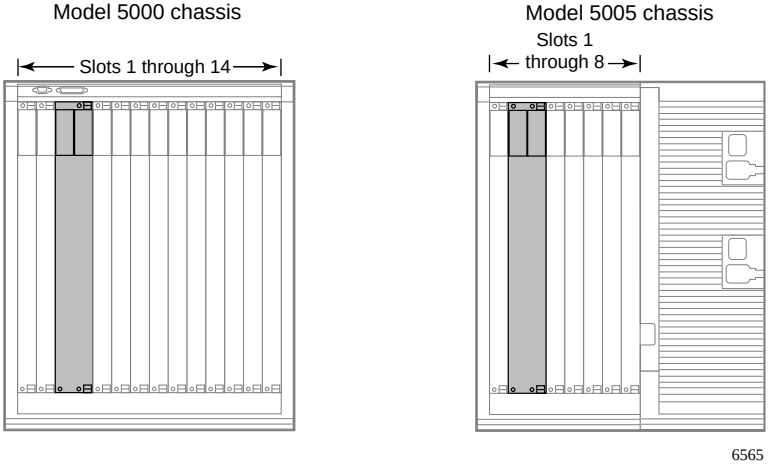


Figure 1-2. Location of Model 58000 switch in chassis

Features

The Model 58000 10/100 Ethernet Switch has the following features:

- Double-wide module that fits into the Model 5000 chassis (14 slots) and Model 5005 chassis (8 slots)
- 16 front-panel 10 Mb/s switch ports:
  - All 16 ports are configurable for half- or full-duplex mode.
  - The first 12 ports (1 through 12) can be connected to the System 5000 backplane in half-duplex mode only.
- Single front-panel media dependent adapter (MDA) slot to install one of three types of MDAs:
  - 100BASE-FX for support of 100BASE-FX (fiber) links
  - 100BASE-TX for support of 100BASE-TX (UTP) links
  - Combination 100BASE-FX/TX for support of both 100BASE-FX and 100BASE-TX links
- Support by each MDA port of 100 Mb/s transmission rate in half-duplex mode and 200 Mb/s transmission rate in full-duplex mode (100 Mb/s in each direction)
- Switched and dedicated 100 Mb/s transmission (as opposed to shared 100 Mb/s transmission) by both ports on each MDA
- Support by 100 MDA ports of the Bay Networks flow-control mechanism (This feature can be disabled through the console port or through SNMP.)
- Plug-in card slot for installation of expansion modules such as the MDA expansion module, which enables the installation of up to four additional MDAs
- Hot-swap surge protection circuitry that allows transparent insertion and removal of a module in an operating Model 500x chassis

- Smart-swap capability, in which the configuration information from a replaced module is automatically downloaded to the replacement module
- Management by Bay Networks Optivity LAN 7.0 (or later) for UNIX and Optivity Campus 6.0 (or later) for Windows network management software
- Configuration and status reporting through front-panel LED display and System 5000 service port, and remotely through SNMP
- Internal throughput of up to 2 Gb/s
- Support for dedicated end stations (single address/port) and shared-media LAN segments (multiple address/port)
- Redundant link capability for network fault tolerance
- Compatibility with the Model 28115 LattisSwitch and the Model 28104 LattisSwitch, including virtual LAN support using Optivity network management software (For more information about virtual LANs, see Network Performance Improvement in Chapter 2, Planning a Switched Network.)
- Support for connections to the Model 3328 Ethernet Switching Engine, the BayStack Ethernet Workgroup Switch, and the Centillion 100 switch
- Advanced agent level network management support for the System 5000 Model 53xx Ethernet host modules

Chassis Backplane Connections

The first 12 ports of the Model 58000 switch can be configured to connect to the 12 internal Ethernet segments of the System 5000 backplane. There is a one-to-one mapping between port number and backplane segment number (port one maps to segment one, port two maps to segment two, and so on) when the ports are connected to the backplane.

Figure 1-3 shows the first 12 ports of the switch connected to the 12 internal Ethernet segments of the Model 5000 backplane. Ports 13 through 16 are connected directly to the switch fabric without connectivity to the backplane segments.

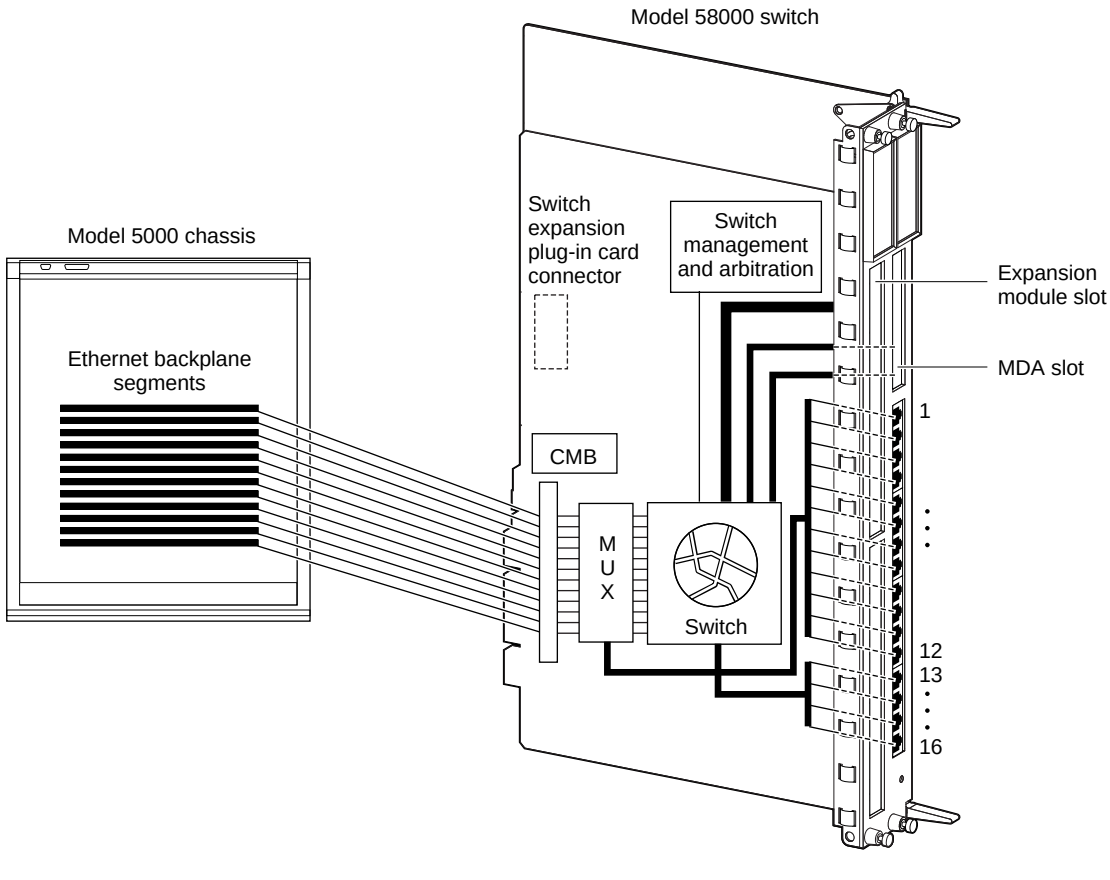


Figure 1-3. Connecting to the Model 5000 backplane

MDAs and the Expansion Module

The switch has a slot for installing a media dependent adapter (MDA) and a slot for installing an expansion module. For more information about the MDA slot and the expansion module slot, see Physical Description later in this chapter.

MDAs

An MDA is a modular two-port adapter that supports 100Mb/s Ethernet connections over either 100BASE-FX (fiber) ports or 100BASE-TX (UTP) ports. Currently, one of three types of MDAs can be installed into the MDA slot of the switch:

- A multimode fiber optic MDA (Model 58000-104) providing 100 Mb/s half/full-duplex Ethernet transmission over 62.5/125 µ multimode fiber cable
- An unshielded twisted pair (UTP) MDA (Model 58000-105) providing 100 Mb/s half/full-duplex Ethernet transmission over Category 5 UTP cable
- A combination MDA (Model 58000-106) providing 100 Mb/s half-duplex and 100 Mb/s full-duplex Ethernet transmission over 62.5/125 µ multimode fiber cable and Category 5 UTP cable

Figure 1-4 shows the three MDAs.

Expansion Module

An expansion module is an interface card that can be installed on the Model 58000 switch to provide additional switching and connection capabilities. You can install an MDA expansion module that can hold up to four additional 100BASE-T MDAs, or you can install any other expansion module when available.

Figure 1-5 shows the MDA expansion module.

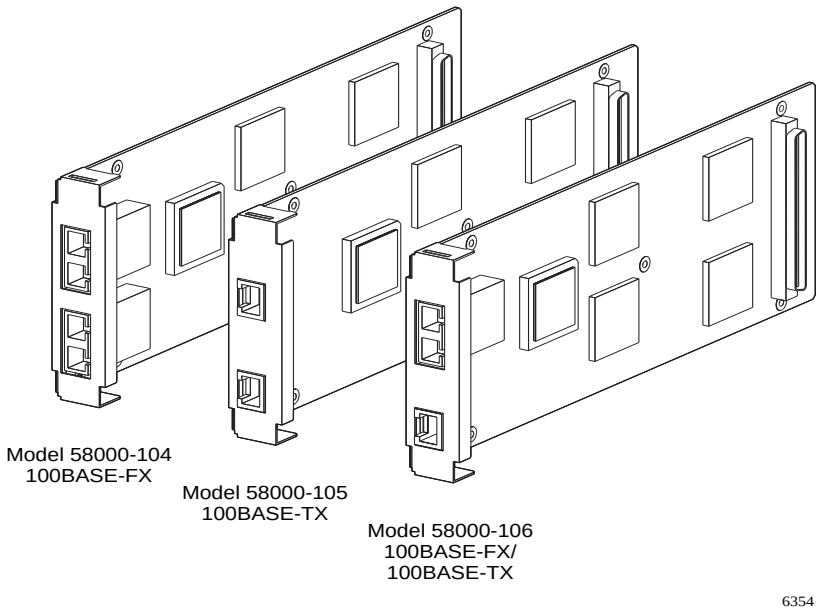


Figure 1-4. Model 58000-xxx MDAs

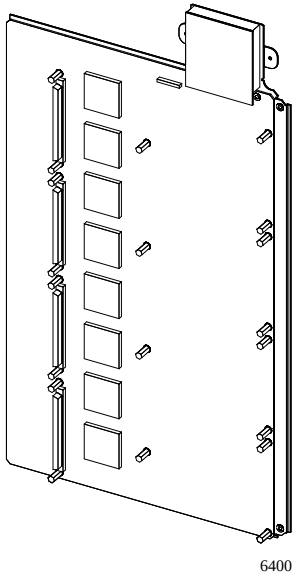


Figure 1-5. MDA expansion module

Fully Equipped Model 58000 Switch

Figure 1-6 shows an exploded view of a fully equipped Model 58000 switch, with five MDAs and the MDA expansion module installed.

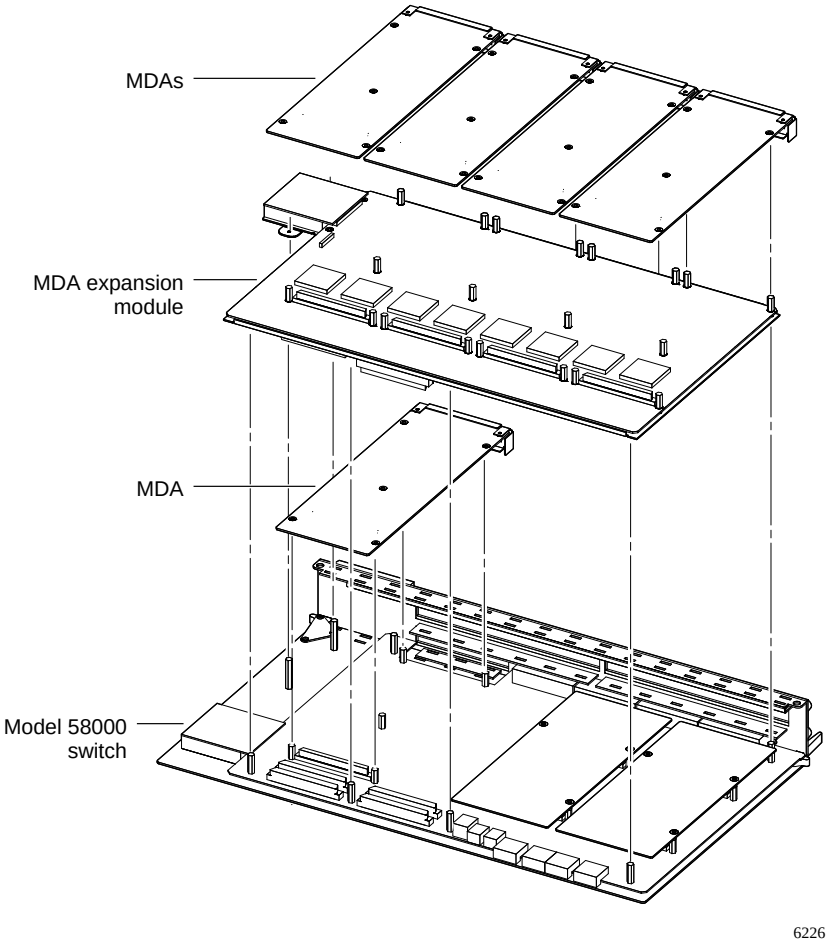


Figure 1-6. Fully equipped Model 58000 switch

NOTE: *Your network requirements will determine the number and type(s) of MDAs you may need and whether you will require an expansion module to be added to the switch.*

Physical Description

The Model 58000 switch is an assembly that consists of a printed circuit board mounted on a double-wide metal frame. Inserter/extractor levers and captive retaining screws are at the top and bottom of the front panel (see Figure 1-7). The switch occupies two slots in the Model 500x chassis.

The switch provides an MDA slot for installing one MDA and a plug-in card slot for installing an expansion card, such as the MDA expansion module (which holds up to four additional MDAs) or, when available, any other expansion module.

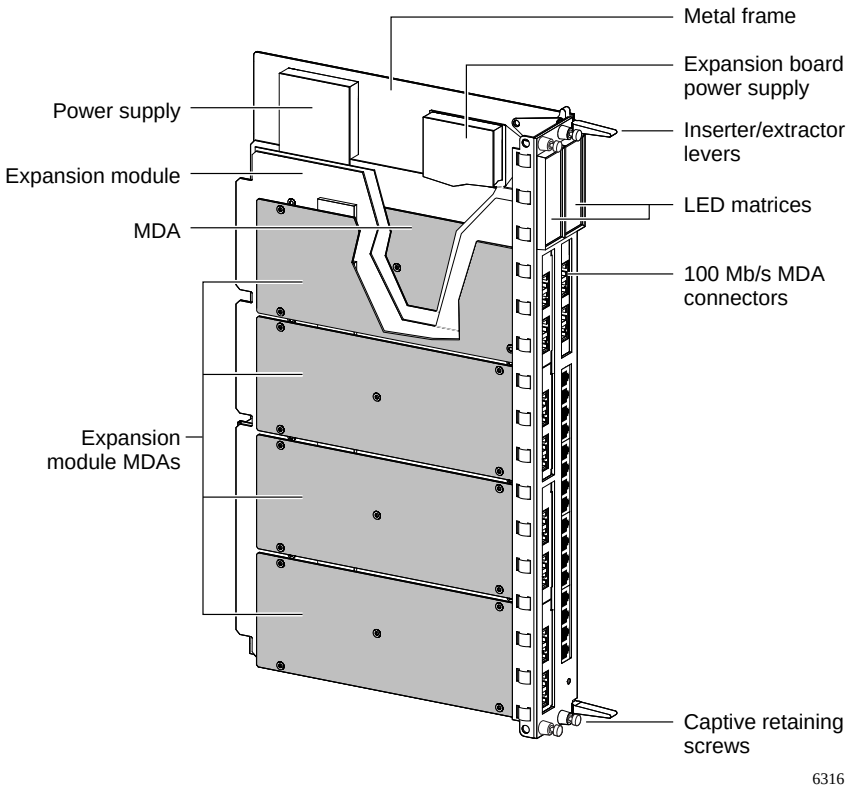


Figure 1-7. Hardware features of the switch (with MDA expansion module installed)

Front-panel Features

The front panel of the Model 58000 switch includes the following features:

- Two LED matrices
- An MDA slot
- An expansion module slot
- 16 RJ-45 connectors for 10BASE-T connections
- A reset button

LEDs

The LEDs on the front panel (see Figure 1-8) display status information about the operational state of the switch. The right matrix consists of the following bicolor (green or amber) LEDs:

- A single LED, called the “annunciator”
- Module-level LEDs
- A group of port-level LEDs for ports 1 through 12—identifying the legacy/shared Ethernet backplane segments to which the switch module is connected
- A group of port-level (front only) LEDs for ports 13 through 16—indicating status of front panel 10BASE-T ports

The left LED matrix consists of bicolor LEDs (green or amber) that indicate port activity, such as whether data is present in the transmit or receive direction or whether a collision has occurred.

For descriptions of the meanings of these LEDs, refer to Appendix B.

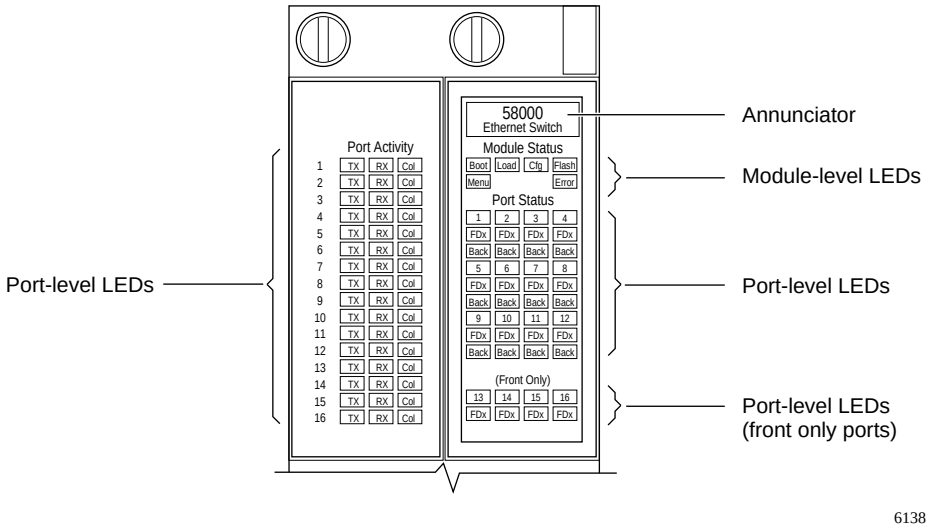


Figure 1-8. LED display on the Model 58000 switch

MDA Slot

A single MDA slot on the right-hand side of the switch can house one MDA, providing 100BASE-FX, 100BASE-TX, or combination 100BASE-TX/FX transmission capabilities (see Figure 1-9). A filler panel is installed over the slot if it is unused.

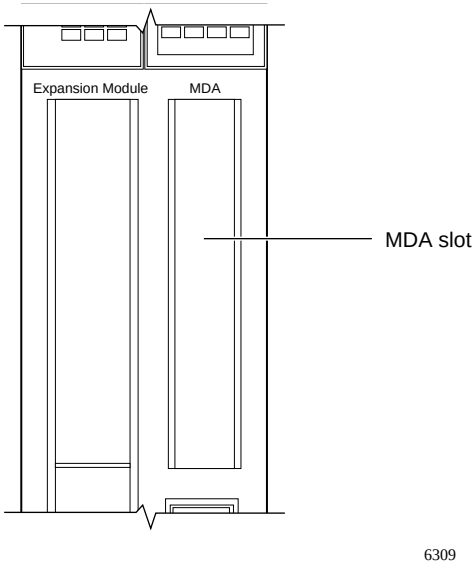


Figure 1-9. MDA slot

Expansion Module Slot

The Model 58000 switch has a slot (see Figure 1-10) to add an expansion module (such as the MDA expansion module or another expansion module when available).

When the MDA expansion module is installed in the Model 58000 switch, up to four additional MDAs can be added to the expansion module for a maximum of eight 100BASE-T ports. MDAs can be installed in any available slot on the expansion module, without regard to the order in which they are installed. Gaps are acceptable on the MDA expansion module between installed MDAs.

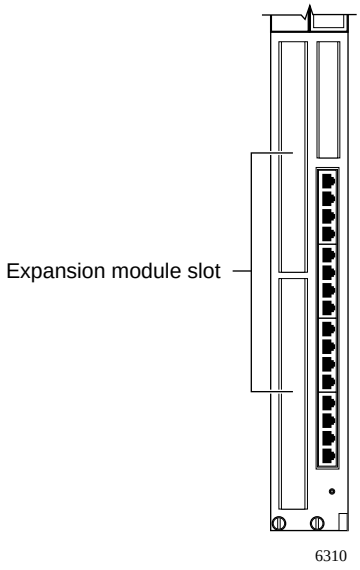


Figure 1-10. MDA expansion module slot

RJ-45 Connectors for 10BASE-T Ports

The Model 58000 switch has 16 10BASE-T ports. The first 12 of these ports can be accessed through the RJ-45 connectors on the front panel or through the 12 Ethernet segments on the System 5000 backplane.

The remaining four ports (ports 13 through 16) can be accessed only through the RJ-45 connectors on the front panel of the switch.

Figure 1-11 shows the location of the 10BASE-T ports on the switch.

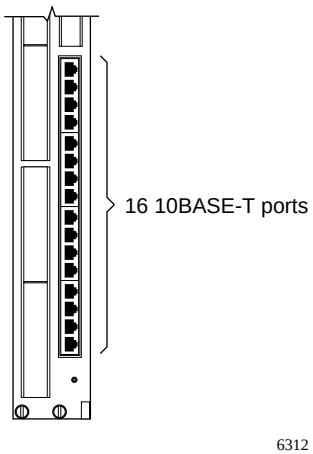


Figure 1-11. Location of 10BASE-T ports on the switch

Reset Button

A single recessed reset button on the front of the Model 58000 switch allows for the manual reset/reboot of the module (see Figure 1-12). During a system reset, the switch reboots and retrieves the current (or next boot) switch configuration parameters stored in memory and uses these parameters after the reset cycle is complete.

CAUTION: *Resetting a switch that is connected to other switches in a switch community affects all switches in the community. All other switches will transition to a configuring mode. During this time, the switches will not forward any frames.*

The reset button is recessed within a hole to prevent the reset button from being pressed accidentally. You should use a tool with a solid, pointed end (like a jeweler's screwdriver) to press the reset button.

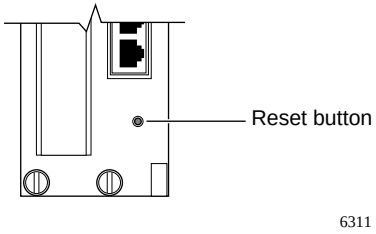


Figure 1-12. Switch reset button

Chapter 2 Planning a Switched Network

This chapter provides information about the considerations required when planning and operating a network with the Model 58000 switch. This chapter discusses the following topics:

- Network performance improvement
- LattisSpan Protocol
- Model 58000 switch operation
- Restrictions to using Model 58000 switches in bridged and routed networks
- Connection of Model 58000 switches
- Network configurations of the Model 58000 switch
- Model 58000 switch software upgrades

Network Performance Improvement

One of the major challenges network managers face is the need to expand network capacity and improve network performance while controlling cost and manageability.

This section provides information about how the Model 58000 switch addresses network capacity and network performance issues. The following topics are covered:

- Switching-based microsegmentation
- Microsegmentation with the Model 58000 switch
- Virtual network segmentation
- Virtual networking with the Model 58000 switch
- Virtual networking in switch communities

Switching-based Microsegmentation

The most widely used approach to increasing network performance is to physically divide the network into smaller segments. Each segment then supports fewer users, resulting in more available bandwidth for each user.

The two most common technologies used to microsegment networks are routing-based microsegmentation and, more recently, switching-based microsegmentation. Although routers serve an important function in segmenting networks based on administrative boundaries, switching-based microsegmentation provides further segmentation inside those boundaries, offers higher performance at a lower cost, and is easier to administer.

Frame switching is easy to implement and manage because it operates like a single, high-performance network segment. Adding frame switching to an existing repeater-based network requires no additional network address administration or configuration, unlike routing-based networks, which typically require reassignment of addresses when additions, moves, or changes are made.

In microsegmentation, each end station is usually assigned to a network segment based on its functional requirements. End stations performing similar functions are placed on the same segment with common shared resources, such as file servers and printers. This arrangement minimizes the need for frames from a source workstation to travel through internetworking devices to reach the destination workstation.

Microsegmentation with the Model 58000 Switch

Installing a Model 58000 switch into a Model 500x chassis allows you to microsegment your LAN to improve network performance and increase network capacity.

In a typical network configuration, up to five Model 5308P host modules are installed in a Model 500x chassis. Each Model 5308P host module has 24 10BASE-T Ethernet ports, for a total of 120 ports among all five host modules. The 24 host module ports could all be connected to a single backplane segment. This type of configuration can cause traffic congestion when all 24 ports contend for the same backplane segment.

With microsegmentation, the number of host module ports assigned per backplane segment could be limited to a maximum of 10. For example, the first 10 ports of the first Model 5308P host module could be connected to backplane segment one, the second 10 ports of the first Model 5308P host module could

be connected to backplane segment two, and the remaining four ports of the first Model 5308P and the first six ports of the second Model 5308P could be connected to backplane segment three, and so on. This allocation of ports per backplane segment provides each user with the equivalent of 1 Mb/s transmission capability, a great increase over the throughput capacity of the 24 port per segment configuration cited previously.

The purpose of the Model 58000 switch is to provide connectivity between all the System 5000 backplane segments, enabling connectivity between all 120 users of this switched LAN configuration. By installing the switch in the Model 500x chassis and connecting to the backplane segments, the switch allows the users connected to the host modules to communicate with one another, all at approximately 1 Mb/s throughput.

Without microsegmenting the network into 10 users per segment and installing the Model 58000 switch to provide connectivity between the backplane segments, this performance improvement would not be possible.

In addition, the 100BASE-T MDA ports (either UTP or fiber optic) of the Model 58000 switch provide 100 Mb/s throughput to the LAN servers. This increased throughput provides traffic congestion relief for workstations accessing application software and files on the servers.

Figure 2-1 illustrates how the Model 58000 switch provides connectivity between host modules through the backplane segments, allowing for the advantages of microsegmentation (increased throughput capacity) to be realized by all 120 LAN users. Also depicted are the 100 Mb/s connections to the LAN servers.

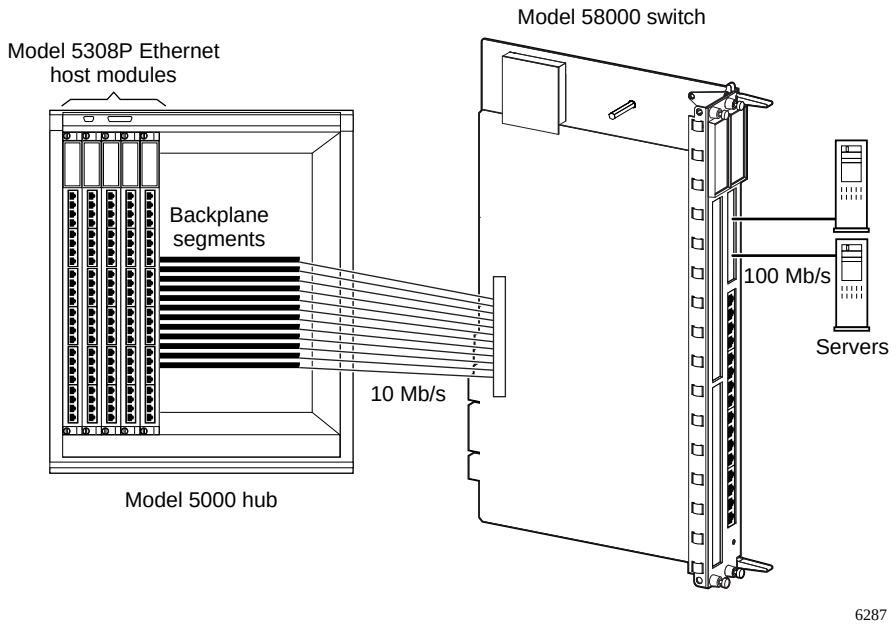


Figure 2-1. Microsegmentation with the Model 58000 switch

Virtual Network Segmentation

With virtual network segmentation, each port connects to a segment that is a single collision domain. However, network management applications are used to group multiple ports into a single broadcast domain, called a virtual LAN.

Creating virtual LANs to segment your network involves assigning ports (or, in effect, the end stations attached to these ports) to different broadcast domains using a network management application. Creating virtual LANs does not involve physically reconfiguring the network. It provides the benefits of physical segmentation, but with more flexibility for future network changes and growth.

Managing and configuring networks through network management software control is referred to as “virtual networking.” Figure 2-2 illustrates how you can use virtual networking to logically divide two areas of a network without changing the physical network topology.

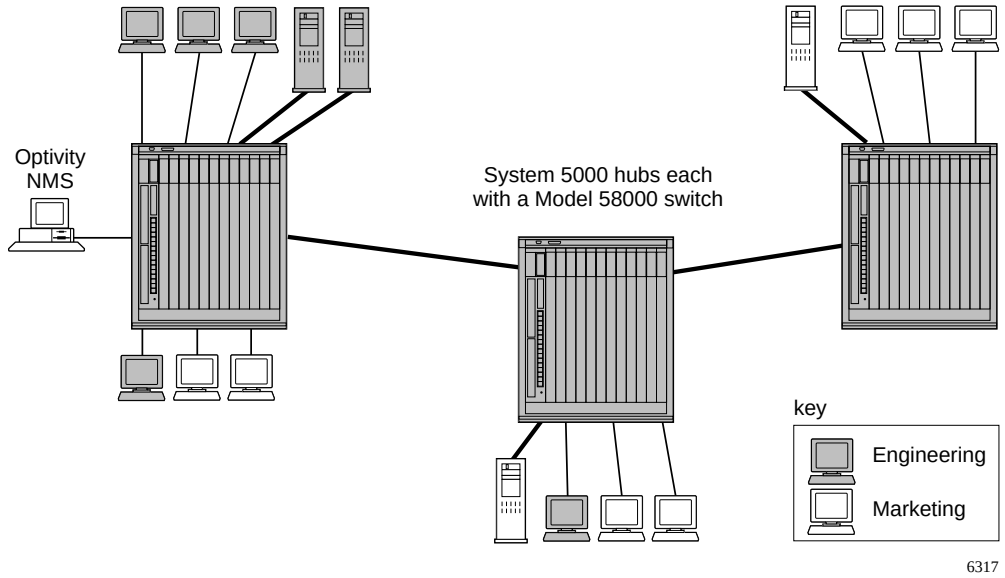


Figure 2-2. Virtual networking

Virtual Networking with the Model 58000 Switch

The Model 58000 switch managed by the Optivity network management application supports virtual networking. The network administrator simply assigns individual ports to a virtual LAN using the drag-and-drop capabilities offered by Optivity.

Virtual networking, enabled through Optivity, eliminates the need to change the physical cabling when performing network moves, additions, and changes. Virtual networking also allows the network manager to control the amount of broadcast traffic by managing the size of the virtual LAN.

Virtual Networking in Switch Communities

In a community of Model 58000 switches, the virtual LAN capabilities are extended to all devices and a maximum of 64 virtual LANs are supported in the switch community. A switch community can consist of any one of the following combination of Bay Networks LattisSpan Ethernet frame switches that are connected by LattisSpan trunk links:

- A group of Model 58000 switches
- A group of Model 58000 switches and BayStack 281xx switches

When the ports connecting the switches are configured for auto mode, switch-to-switch links are automatically designated trunk links. For more information about LattisSpan trunk links, see The Difference Between LattisSpan Trunk and Feeder Ports later in this chapter.

NOTE: *The switch communities described and illustrated in this chapter include only Model 58000 switches. However, you can interconnect Model 58000, BayStack 281xx, and other LattisSpan-based switches to form a single switch community. All configuration guidelines and constraints described in this chapter also apply to a community of Model 58000 switches and to communities with a mixture of interoperable switches. Major differences between switches involve the types of interfaces and number of ports on each individual switch model.*

As shipped from the factory, Model 58000 switch ports are configured as part of a single virtual LAN, and the Model 58000 switch automatically forwards all frames to the appropriate destination ports. The only exceptions are broadcast and multicast frames, which are forwarded to all ports in the virtual LAN.

The network manager can use the Optivity network management software to assign any port to a specific virtual LAN. This port assignment restricts broadcast and multicast frames to that virtual LAN and restricts unicast transmissions to those end stations that exist on ports configured to be members of that virtual LAN.

For more information about using the Model 58000 switch and Optivity to create and manage virtual LANs, refer to the documentation that shipped with your Optivity software.

Address Learning in Communities with Multiple Virtual LANs

In networks where more than one virtual LAN exists, the following learning scenarios apply:

- If the Model 58000 switch receives a unicast frame for a destination end station whose address *has not* yet been learned (but the source address of the station from which the frame originated *has* been learned), the switch broadcasts the frame to all other ports in the same virtual LAN as the source address.
- If the Model 58000 switch receives a unicast frame for a destination end station whose address *has not* yet been learned and the source address of the station where the frame originated is still unknown (that is, *has not* been learned), the first frame(s) is dropped. However, the source address is learned soon after the first frame is received; therefore, the frames that are received after the first frame address is learned are not dropped.

LattisSpan Protocol

This section briefly discusses the LattisSpan switch topology management protocol used by the Model 58000 switch and describes how the LattisSpan protocol varies from the IEEE 802.1d Spanning Tree protocol.

LattisSpan, a Bay Networks protocol used between Model 58000 switches and other Bay Networks switches, is a variation of the IEEE 802.1d Spanning Tree algorithm used by many bridges. The LattisSpan Protocol differs from the IEEE 802.1d Spanning Tree Protocol in the following ways:

- LattisSpan extends 802.1d protocol to support virtual LANs.
- LattisSpan provides information about network topology to the network management station, including active and standby links, and distributes virtual LAN information throughout the switch community.
- LattisSpan packets, often called PDUs (protocol data units), use a different multicast MAC address from spanning tree packets.

NOTE: *Multicast addresses 010081000200 and 010081000201 must always be discarded or blocked from traversing internetworking devices that bridge traffic between Model 58000 switch communities.*

Model 58000 Switch Operation

This section discusses the operation of the Model 58000 switch within switch communities and covers the following topics:

- MDA port and cable options
- Link speeds
- Full-duplex operation
- Flow control
- Model 58000 switch address tables and limitations
- Configurable port type feature

MDA Port and Cable Options

Before connecting network devices to the Model 58000 switch, determine the type(s) of MDA(s) you need to install in the switch. Also decide what type of cable to use to connect these devices.

When connecting network devices to the Model 58000 switch, always observe the maximum segment length allowed by the IEEE 802.3 10BASE-T and 100BASE-T standards.

Table 2-1 shows the MDA options, cable options, and maximum segment lengths for the Model 58000 switch. Refer to the IEEE 802.3 10BASE-T and 100BASE-T standards for more information about cable options and maximum segment lengths for 10 Mb/s and 100 Mb/s signals.

NOTE: *English and metric measurements given in Table 2-1 are rounded to the nearest foot or meter.*

Table 2-1. Model 58000 switch MDA and cable options

MDA or built-in port	Number and type of ports	Port speed	Cable options	Maximum segment length
10BASE-T port	16 RJ-45	10 Mb/s	Category 3, 4, or 5 UTP	328 ft (100 meters)
100BASE-FX MDA port	Two SC	100 Mb/s	62.5/125 micron multimode fiber optic or 50/125 micron multimode fiber optic	1352 ft (412 meters) between ports operating in the half-duplex mode or up to 6562 ft (two kilometers) between ports operating in the full-duplex mode. **Note:** For more information about 100BASE-FX port specifications, refer to Appendix A , "Technical Specifications" of *Installation and Reference for the Model 58000-1xx Media Dependent Adapters.*
100BASE-TX MDA port	Two RJ-45	100 Mb/s	Category 5 UTP	328 ft (100 meters)
100BASE-FX/TX MDA ports	One SC	100 Mb/s	62.5/125 micron multimode fiber optic or 50/125 micron multimode fiber optic	1352 ft (412 meters) between ports operating in the half-duplex mode or up to two kilometers between ports operating in the full-duplex mode. **Note:** For more information about 100BASE-FX port specifications, refer to Appendix A, " Technical Specifications" of *Installation and Reference for the Model 58000-1xx Media Dependent Adapters.*
	One RJ-45	100 Mb/s	Category 5 UTP	100 meters

Link Speeds

Use the 10Mb/s ports and the 100 Mb/s MDA ports to connect to 10 Mb/s and 100 Mb/s devices. Using the 100BASE-T MDA ports in full-duplex mode achieves the greatest aggregate throughput of the Model 58000 switch, and provides for greater distances between hubs.

Avoid using 10 Mb/s links between connected Model 58000 switches because 10BASE-T operates at 10 Mb/s half-duplex or full-duplex mode and does not provide sufficient bandwidth for high-speed switched connections. When used, 10 Mb/s trunk link connections result in greatly diminished throughput along the link.

Full-duplex Operation

Model 58000 switches support full-duplex mode for MDA ports operating at 100 Mb/s. For full-duplex mode, the CSMA/CD protocol is turned off and frame transmissions occur in both directions along the link at the same time, which increases the total bandwidth of the trunk link to 200 Mb/s and allows link distances to be greater between switches. Full-duplex mode can be used on links between the following devices:

- Two Model 58000 switches that are connected using 100 Mb/s MDA ports
- A Model 58000 switch and an end station (if the Ethernet end station supports full-duplex operation)

The 16 10BASE-T ports on the front of the Model 58000 switch module also support full-duplex mode when they are connected to external devices from the front of the switch. The first 12 of these 10BASE-T ports can connect to the backplane at half-duplex mode only.

NOTE: *Unless specifically configured for full-duplex operation, the 100BASE-T MDA ports and the 10BASE-T front panel connected ports default to half-duplex mode. You can configure each port for either half- or full-duplex operation using the service port screens. For instructions on how to configure ports, refer to Chapter 6, "Configuring the Model 58000 Switch."*

Flow Control

The Model 58000 switch uses a proprietary flow-control feature on 100 Mb/s full-duplex links to control traffic and avoid congestion on the link. If the receive port buffer becomes full, the Model 58000 switch issues a flow-control signal to the device at the other end of the link to suspend transmission. When the receive buffer is no longer full, the Model 58000 switch issues a signal to the end station to resume the transmission.

These flow-control signals may not be supported by other vendors' full-duplex product implementations, so be aware of possible problems when congestion occurs on the ports operating in this mode. Typically, these flow-control signals are interpreted as CRC errors, but they should have no greater impact on the receiving device.

If you experience interoperability problems with other vendors' equipment while using the full-duplex implementation, disable flow control on the 100 Mb/s full-duplex port connected to the interoperable device. If the problem persists, reconfigure the associated Model 58000 switch (and the adapter card installed in the attached station) for half-duplex operation. For instructions on how to disable and enable flow control, refer to Modifying Port Configurations in Chapter 6, "Configuring the Model 58000 Switch."

Address Tables and Limitations

Network traffic typically includes frames between hosts, printers, and file servers and the user end stations that access them most frequently. The primary job of the Model 58000 switch is to deliver frames rapidly between these network devices by "switching" the network traffic from segment to segment.

The Model 58000 switch enables this switching capability by tracking the MAC addresses associated with each physical device that sends frames through its ports. When a Model 58000 switch receives a frame, it "learns" each address and adds the address to its address table. Once the address of a particular device is learned, the Model 58000 switch automatically switches incoming frames addressed to that device directly to the switch port where the device is connected.

This concept is important for the Model 58000 switch, because the traffic is actually switched, not routed. Routers do not forward broadcast or multicast frames across their ports; however, Model 58000 switches forward broadcast and multicast packets across their ports within the same or “source” virtual LAN.

The resulting increase in network performance that switching offers can be applied to networks in various ways; however, you should understand certain switching concepts before you install the Model 58000 switch into your network. The most significant concept related to Model 58000 switches has to do with the address tables resident within each switch and the number of allowable MAC addresses that can be stored and shared within those tables within the switched network.

Address Tables in a Single Model 58000 Switch

All Model 58000 switch ports are factory configured as part of a single virtual LAN, and the switch has the capability to store 1024 MAC addresses on that virtual LAN. As additional virtual LANs are created (using Optivity), each new virtual LAN is allotted memory to store an additional 1024 MAC addresses. Figure 2-3 shows multiple virtual LANs within a single Model 58000 switch.

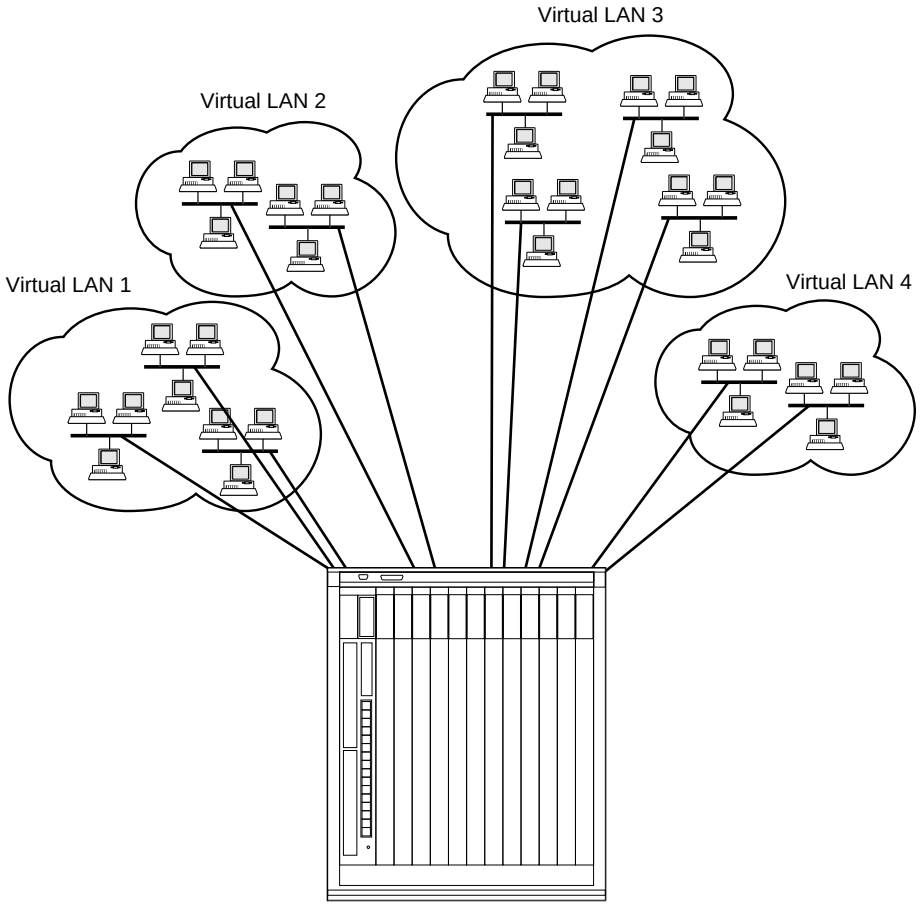


Figure 2-3. Multiple virtual LANs within a single Model 58000 switch

The maximum number of allowable virtual LANs in a single Model 58000 switch is equal to the total number of ports in the switch. For example, if the Model 58000 switch is configured without any MDAs, the switch would have 16 ports and the number of virtual LANs allowed would be 16. With an MDA installed on the switch, the total number of ports would be 18 and the number of virtual LANs allowed would be 18.

A configuration of this type typically serves no purpose because a port, which is the only port in its virtual LAN, cannot pass frames to any other port. To take advantage of switching requires at least two ports in each virtual LAN.

The real power of the Model 58000 switch emerges when you interconnect switches and implement multiple virtual LANs across multiple switched ports (see Figure 2-4). The maximum number of virtual LANs allowed in a community of Model 58000 switches is 64. However, implementing multiple virtual LANs across multiple switches affects the total number of allowable MAC addresses for a switch community.

CAUTION: *Implementing multiple virtual LANs across multiple switches imposes restrictions on the maximum number of MAC addresses you can have on your network.*

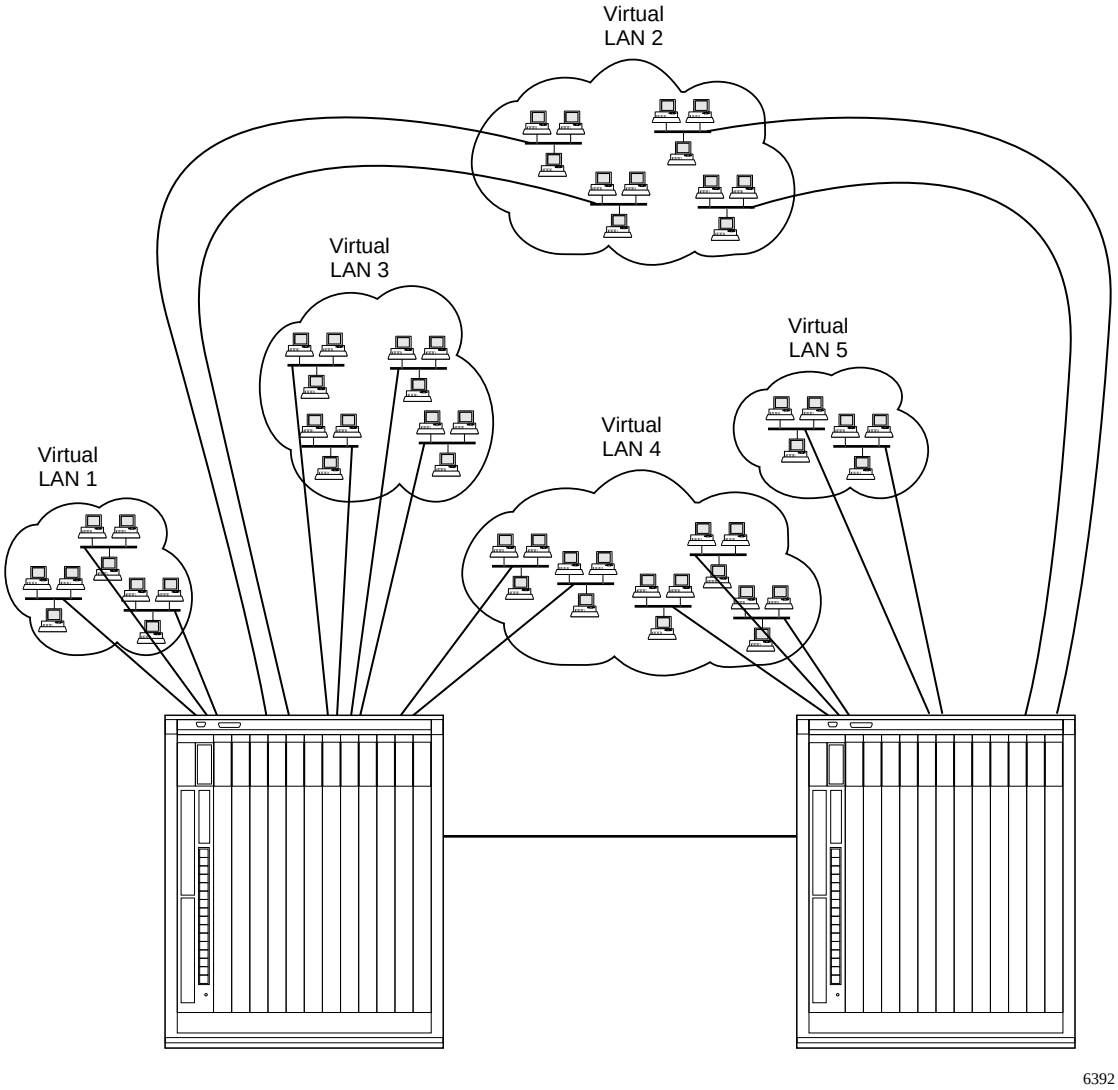


Figure 2-4. Multiple virtual LANs across multiple Model 58000 switches

Address Tables in Multiple Model 58000 Switches on the Same Network

As stated earlier, each Model 58000 switch can store 1024 addresses per virtual LAN. Addresses are shared and distributed between connected Model 58000 switches across trunk links in a process called global address learning. When a trunk link is used to connect the Model 58000 switches, global address learning between the hubs is automatic.

Global address learning (where the station MAC addresses for all the devices attached to the Model 58000 switch are shared between the switches) is activated every time a trunk link to another Model 58000 switch is established. The master switch in a switch community will, upon receipt of a LattisSpan frame from the newly connected Model 58000 switch, begin the spanning tree process to establish primary paths between all the switches in the community. It will also redistribute all addresses learned by the switches throughout the community. Once the switch completes the spanning tree process, it can participate in the LattisSpan global address learning process.

CAUTION: *When the network topology changes (for example, when a new switch is added to the community, a new trunk link is established, or a trunk link is disconnected or fails), all the switches in a community transition from an "operational" state to a "configuring" state for a time ranging from 20 to 120 seconds. During this time, the switch uses a topology reconfiguration process (LattisSpan convergence process) to construct a loop-free topology and share virtual LAN information. The Model 58000 switch does not forward any frames during the LattisSpan convergence process.*

If more than one trunk link exists between two Model 58000 switches, the LattisSpan protocol automatically designates one trunk as active and the other as standby. The active and standby links of a Model 58000 switch are determined according to the speed of the trunk link and the priorities of the ports that support the trunk links.

If trunk links are operating at different speeds, the trunk link operating at the higher speed is designated the active link because faster links have priority over slower links. If both trunk links are operating at the same speed, a full-duplex link has priority over a half-duplex link. If the link speeds and duplex modes are the same for each link, the link connected to the port with the highest priority is designated the active link.

Under normal network conditions, standby trunk link connections are in blocking state and only forward LattisSpan frames that are used as part of the topology process.

Using Virtual LANs in Model 58000 Switch Communities

When virtual LANs span across trunk links that connect Model 58000 switches in a community, the total number of all MAC station addresses for the shared virtual LANs must be 1024 or fewer addresses. For multiple virtual LANs (VLANs) to span across switches, a trunk link must connect the switches (see Figure 2-5).

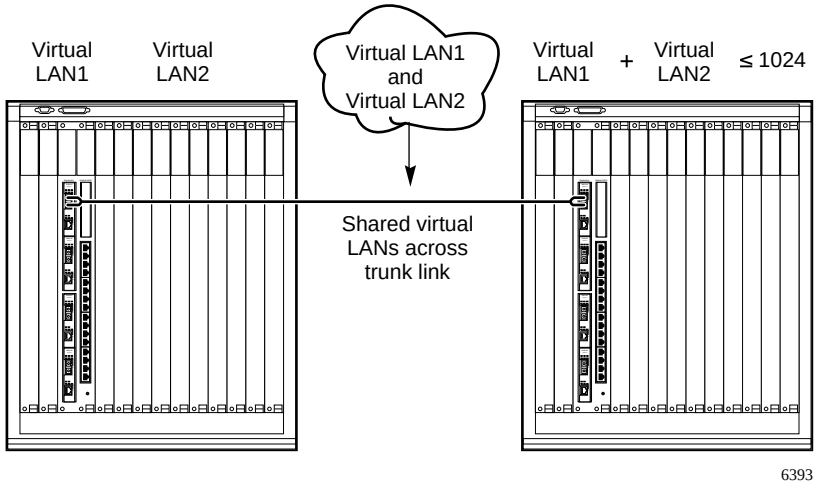


Figure 2-5. Address allocation across trunk links where virtual LANs are shared

You can build Model 58000 switch communities using up to 32 interconnected switches with a combined total of up to 64 virtual LANs. You must always consider the maximum station MAC address count *for the community* when building large switched networks.

NOTE: *If an external device, such as a bridge/router that bridges nonroutable protocols, is used to bridge traffic between virtual LANs, the MAC addresses of the end stations generating the bridged traffic must be counted once, for each virtual LAN on which the bridged traffic appears.*

For information about the maximum number of "hops" between Model 58000 switches in a community, see Seven-switch Limit Between End Stations later in this chapter.

Configurable Port Types

You can configure the ports of the MDAs installed in the Model 58000 switch to operate in one of two modes: automatic (auto) mode or forced feeder (feeder) mode. All ports are preconfigured, by default, to operate in auto mode. Auto ports use the LattisSpan trunk detection process to configure the port automatically as a LattisSpan *trunk* port or *feeder* port. These ports operate differently, and it is important to understand the difference between the ports before configuring them to operate in auto or feeder mode.

The Difference Between LattisSpan Trunk and Feeder Ports

The link that connects LattisSpan trunk ports is a LattisSpan trunk link. Such a link carries traffic for multiple virtual LANs between Model 58000 switches and shares station MAC addresses between connected switches. Trunk ports do not learn addresses of the individual end stations connected to the port. In addition, if an Ethernet segment is used as a trunk link between two switches, the switches will not learn the addresses of any end stations attached to the segment. This means there is no connectivity to those end stations on that segment. A LattisSpan trunk link joins the switches at each end of the link into a single switch community.

The link that connects LattisSpan feeder ports is a LattisSpan feeder link. The feeder link carries traffic for a single virtual LAN. Feeder ports learn the addresses of all end stations on the segment connected to the port; therefore, connectivity is provided to the end stations on that segment.

When a feeder link is used to connect two switches, only the network traffic is carried between the two switches (the connected switches do not share global station MAC address information). A single switch community is not formed when two switches are connected by a feeder link.

Auto Mode

In auto mode, a switch port uses the LattisSpan trunk detection process to automatically configure the port as a *trunk* port or a *feeder* port. When a switch is connected to another switch, the connecting ports are automatically designated as trunk ports. A port that is connected to an end station or Ethernet segment is automatically designated as an active feeder port (if there are no additional switches connected to the segment).

Feeder Mode

When switch ports are configured to operate in feeder mode, the switch uses the LattisSpan forced feeder detection process to configure ports automatically as *active* feeder ports or *standby* feeder ports. This process enables the switch to select, per community, one active feeder among ports of the same virtual LAN that are connected to the same Ethernet segment. The active feeder port learns the MAC addresses of the devices communicating on the segment and carries network traffic.

Additional feeder ports in the same community that are connected to the same Ethernet segment where an active feeder port is connected are designated standby feeder ports. Standby feeder ports do not learn MAC addresses of the devices on the segment. A standby feeder port takes over communications upon the failure of an active feeder port within a 10-second time frame. This configuration allows port-level and switch-level redundancy within single or multiple switch communities (see Redundant Feeder Link Configurations later in this section for example redundant switch connection configurations).

Feeder Port Priority Assignment

The LattisSpan forced feeder detection process enables the switch to select active feeder ports based on prioritized attributes. Decisions are made in the following order:

- Master switch priority values are examined—the switch with the lower master switch priority value has the higher priority.
- Master switch MAC addresses are examined—the master switch with the lower MAC address has the higher priority.
- Switch MAC addresses are examined—the switch with the lower MAC address has the higher priority.
- Port IDs (switch MAC address and port number) are examined—the port with the lowest number on the switch with the lower MAC address has the highest priority.

This switch algorithm applies to each port that is connected to a common Ethernet segment and determines which port is the active feeder port. When making connections to a common Ethernet segment, all ports connecting to the segment should be configured to operate in feeder mode.

If one of the ports connecting to a common Ethernet segment is not configured to operate in feeder mode, the switch does not use the LattisSpan forced feeder detection process to determine which feeder port will be active. In this case, the port that is not operating in feeder mode (port is configured for auto mode) is designated the active feeder port, regardless of the prioritized attributes of the port (see Figure 2-6).

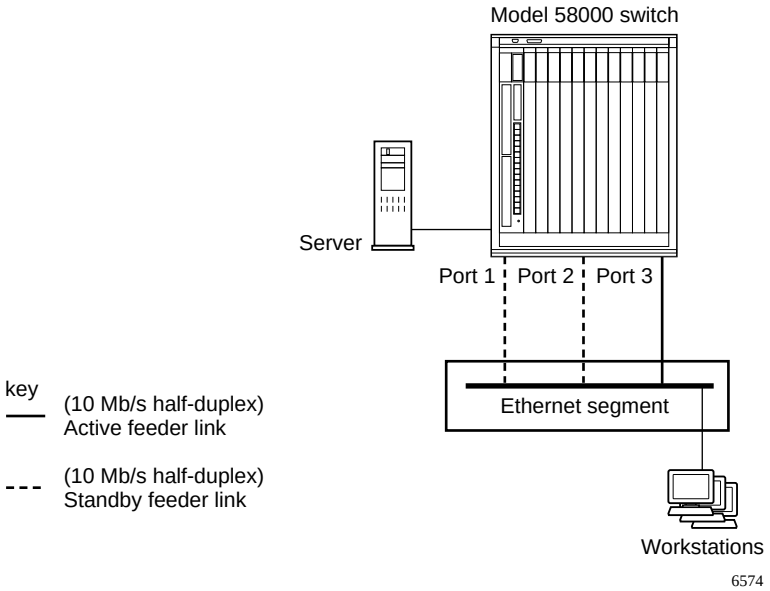


Figure 2-6. Sample configuration: auto port overrides forced feeder ports

If the configuration shown in Figure 2-6 had all ports configured for feeder mode, port 1would be designated the active feeder port. Port 1 would be designated the active feeder port because it has the lowest port number—the port ID attribute is used to determine the highest priority port. Ports 2 and 3 are designated standby feeder ports. However, port 3 is operating in auto mode, so it is designated the active feeder port, and ports 1 and 2 are designated standby feeder ports.

Redundant Feeder Link Configurations

You can use feeder mode to quickly configure redundant port-level and switch-level connections in networks with simple virtual LAN configurations.

Figure 2-7 shows redundant connections between a single switch and a single Ethernet segment. This configuration provides port-level redundancy between the switch and the devices connected to the Ethernet segment.

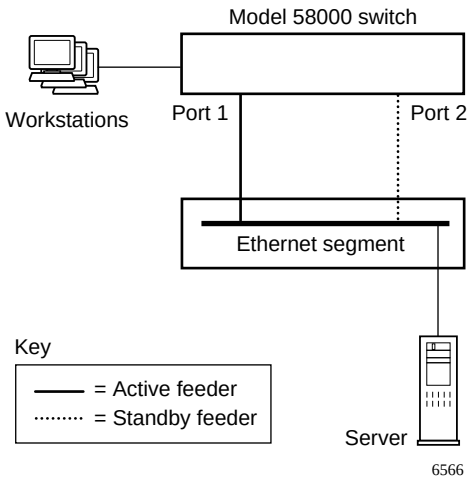


Figure 2-7. Redundant connections from a single switch to an Ethernet segment

In Figure 2-7, the Model 58000 switch ports 1 and 2 are connected to a repeater (hub) that contains a single Ethernet segment. Switch ports 1 and 2 operate in feeder mode and are part of the same virtual LAN. Port 1 is automatically configured as an active feeder port, and port 2 operates in standby feeder mode. If port 1 or the link connected to port 1 fails, the port is partitioned and port 2 is enabled. Port 2 resumes communications between the switch and the hub.

When port 1 (or the link connected to port 1) is reenabled, the switch renegotiates the active and standby ports based on the prioritized attributes discussed earlier in this section. For example, in Figure 2-7, if port 1 fails, port 2 becomes the active feeder port. When port 1 reestablishes connection, the switch designates port 1 as the active feeder port because it has the lower port number.

Figure 2-8 shows redundant connections from two switches within the same switch community to two different Ethernet segments. This configuration provides switch-level and port-level redundancy between the devices connected to two different Ethernet segments.

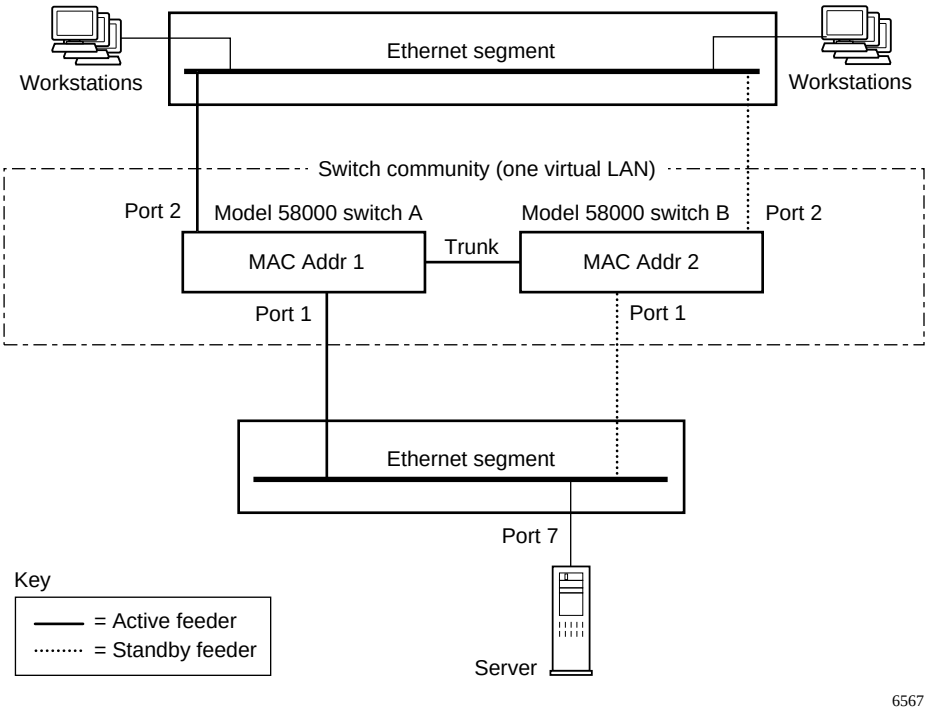


Figure 2-8. Redundant connections of two switches in a community to two Ethernet segments

In Figure 2-8, two Model 58000 switches are connected by a trunk link to form one switch community. The trunk link enables the switches to share community management information and network traffic. Ports 1 and 2 on switches A and B are configured to operate in feeder mode and are part of the same virtual LAN.

Port 1 on both switches is connected to an Ethernet segment in one hub, and port 2 on both switches is connected to an Ethernet segment in another hub. Because switch A has the lower MAC address, ports 1 and 2 of switch A are designated active feeder ports, while ports 1 and 2 of switch B are designated standby feeder ports (switch B has a higher MAC address).

If any active feeder ports or the active feeder links on switch A fail, the active feeder port is partitioned and the standby feeder port is enabled. The newly enabled port resumes communications between the switch and the active devices on the connected Ethernet segment until the partitioned port reestablishes connection.

Figure 2-9 shows redundant connections from multiple switches in the same community to three different Ethernet segments within a hub. This configuration provides switch-level and port-level redundancy between the devices connected to three different Ethernet segments.

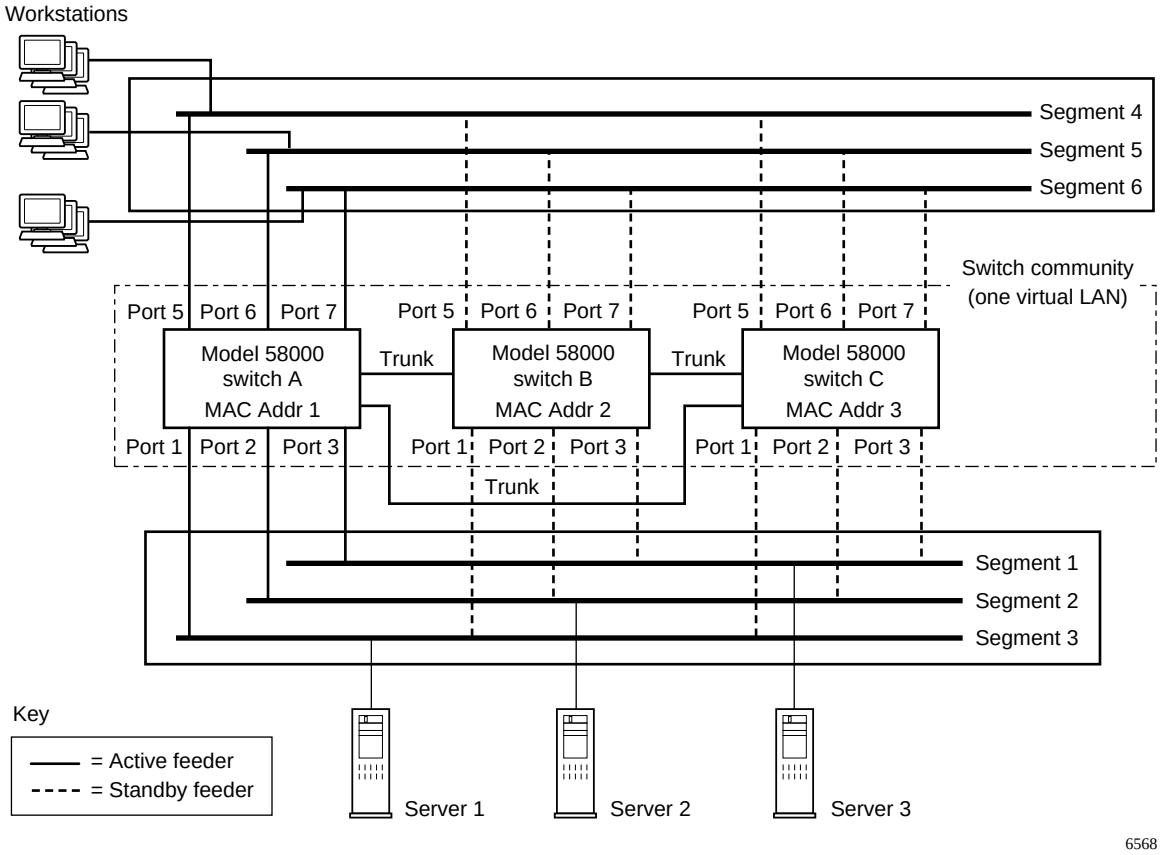


Figure 2-9. Redundant connections of three switches in a community to three Ethernet segments

In Figure 2-9, three Model 58000 switches are connected by trunk links to form one switch community. The additional trunk link between switches A and C ensures that the switches remain in a single community if the trunk link between switches B and C fails. Switch ports 1 through 3 and 5 through 7 are configured to operate in feeder mode and are all part of the same virtual LAN. Of the ports that are connected to the same Ethernet segment, one port is designated an active feeder port and additional ports are designated standby feeder ports.

For example, port 1 of switches A, B, and C is connected to Ethernet segment 3 of an Ethernet hub. Port 1 of switch A is designated the active feeder port (switch A has a lower MAC address), while port 1 of switches B and C are designated standby feeder ports (switch B has a higher MAC address).

If any active feeder ports or active feeder links on switch A fail, the active feeder port is partitioned and the standby feeder port on switch B is enabled. The newly enabled port resumes communications between the switch and the active devices on the connected Ethernet segment until the partitioned port reestablishes connection.

Figure 2-10 shows redundant connections between switches in *different* switch communities to two Ethernet segments. This configuration provides community-level and port-level redundancy between the devices connected to two different Ethernet segments.

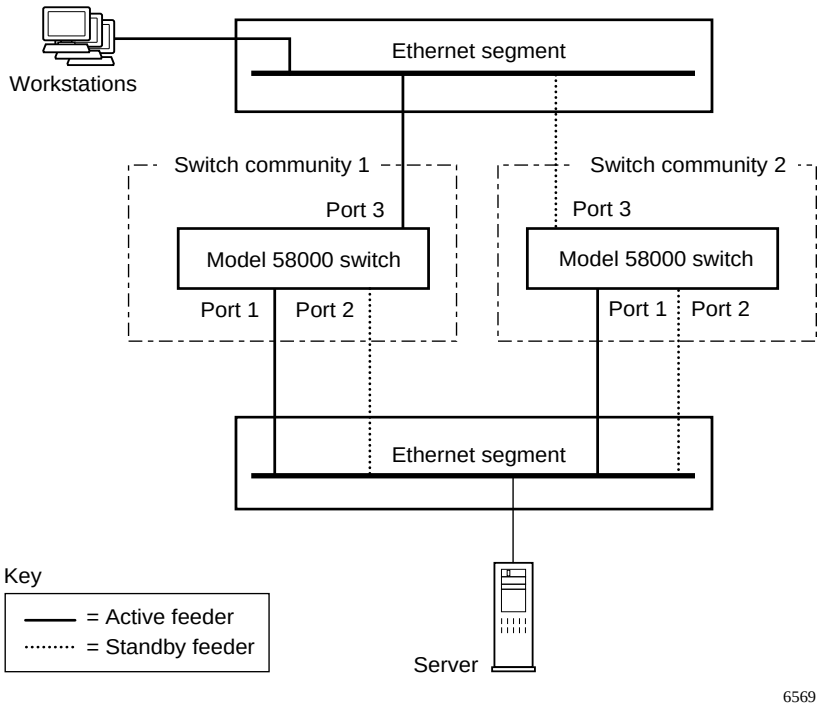


Figure 2-10. Redundant connections of different community switches to two Ethernet segments

In Figure 2-10, the switches are not connected by a trunk link. This means that each switch is part of a different switch community; therefore, the switches do not share community management information and network traffic.

Ports 1 through 3 are configured to operate in feeder mode and are all part of the same virtual LAN. Switch ports 1 and 3 in community 1 are designated active feeder ports, and switch port 2 is designated a standby feeder port. Switch port 1 in community 2 is designated the active feeder port, and switch ports 2 and 3 are standby feeder ports.

If an active feeder port or an active feeder link on a switch fails, the active feeder port is partitioned and the standby feeder port is enabled. The newly enabled port resumes communications between the switch and the active devices on the connected Ethernet segment until the partitioned port reestablishes connection.

Multiple Switch Operation in a Duplicate MAC Address Environment

Special consideration is necessary when your equipment is operating in an environment where frames with the same MAC source address can be delivered to different switch ports in a community. This situation commonly occurs in networks that use the following devices:

- Workstations with multiple network interfaces
- Routers (particularly the routers that support DECnet routing)
- Bridges (including combination bridge/routers)

In networks with multiple-interface workstations and routers, it is possible, but not always convenient, to reconfigure the workstation or router to avoid the duplicate MAC address problems. However, sometimes bridges or bridge/routers cannot be reconfigured to avoid MAC address problems. In these bridges or bridge/routers, a bridging function within the device (for example, a nonroutable protocol) is required to bridge traffic between virtual LANs and the device cannot be reconfigured to prevent a duplicate MAC address environment.

Duplicate MAC address environments are not compatible with LattisSpan trunks. In a duplicate MAC address environment, the switch network must be configured so that the virtual LANs, where the duplicate MAC addresses are present, do not span multiple switches in any one community.

When a duplicate MAC address spans multiple switches in a community, connectivity problems may arise. When a device presents the same MAC address to two different switch ports, the switch learns the MAC address on two different virtual LANs associated with two different ports. In this case, the switch cannot inform its neighbor switches of a unique virtual LAN associated with that MAC address. The neighbor switches need to know what virtual LAN the MAC address belongs to in order to properly handle the frames the switch receives from the MAC address over a LattisSpan trunk link. The problem arises when the neighbor switches cannot determine the virtual LAN for the frames that originated from the device associated with the duplicate MAC address.

The Model 58000 switch enables you to make each switch its own community by connecting the switches with forced feeder links. Figure 2-11 shows a configuration where two switches are connected by forced feeder links.

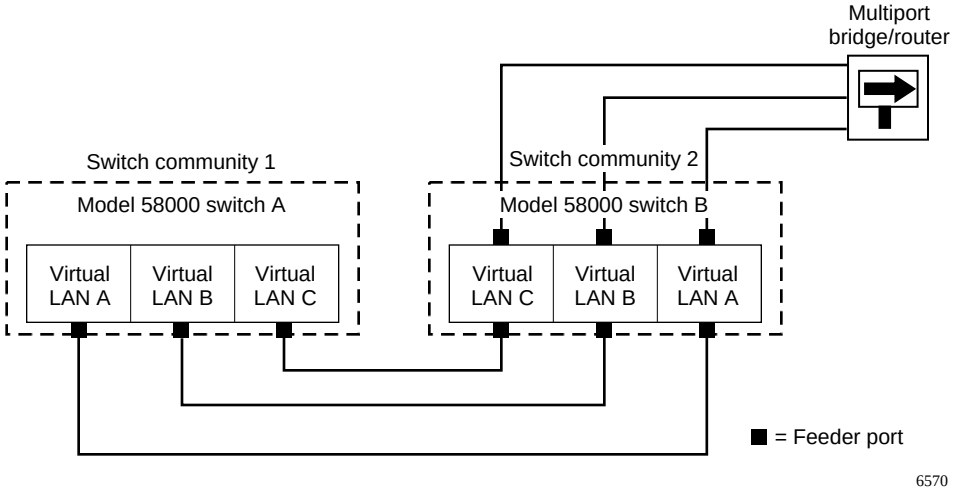


Figure 2-11. Using forced feeder ports for switch community connections

In Figure 2-11, duplicate MAC addressing results from the use of a bridge/router to carry data between virtual LANs distributed across two switch communities. Each switch has ports assigned to separate virtual LANs (virtual LAN A, B, and C). One port from each virtual LAN on each switch is connected and configured as a feeder port. This configuration allows network traffic from each virtual LAN to pass between independent switch communities.

A feeder port from each virtual LAN of switch B is connected to a separate port on a multiport bridge/router. Network traffic specific to each virtual LAN is transmitted throughout each virtual LAN between the switch communities, while the bridge/router directs data between virtual LANs. The feeder link from each virtual LAN on switch B to the router is seen as a separate segment.

You can also use feeder ports to make redundant connections between independent switch communities (see Figure 2-12).

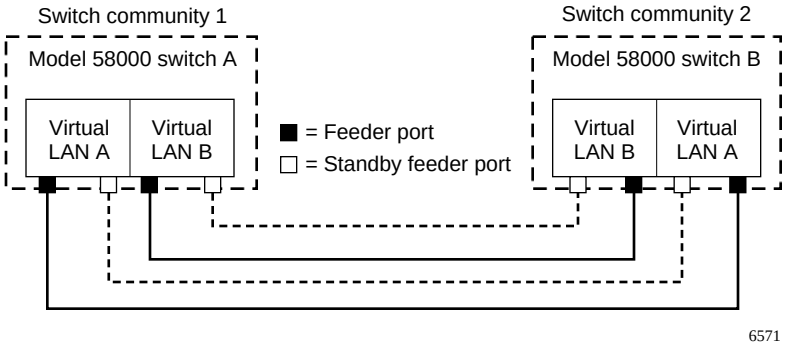


Figure 2-12. Using forced feeder ports for redundant switch community connections

In Figure 2-12, two feeder ports from each virtual LAN (virtual LAN A and B) of switches A and B are interconnected to enable redundancy between independent switch communities. One port is automatically designated an active feeder port, and the second port is designated a standby feeder port. If the active feeder port fails, the port is partitioned and the standby feeder port is enabled.

Using separate forced feeder links for each virtual LAN to carry traffic between switches provides the following additional benefits:

- Because the overall traffic is shared among the various links (on a per-virtual LAN basis), the overall bandwidth between the switches is greater than that available on a single link.
- With LattisSpan trunks, the total number of MAC addresses for all of the virtual LANs carried on the trunk is 1024. With per-virtual LAN links, up to 1024 addresses per virtual LAN are supported (as long as the total number of addresses in a community does not exceed 8192).

Connecting Switch Communities with Feeder Links in the Same Virtual LAN

Interconnecting different switch communities with feeder links that are in the same virtual LAN requires careful planning and configuring. When connecting switch communities with feeder links that are in the same virtual LAN, adhere to the following guidelines:

- Use only one “edge” switch per community to make your feeder link connections. If you use more than one edge switch per community to make feeder link connections, make sure the master switch in the community with multiple edge switches has the highest switch priority. For more information about how master switch priorities are assigned, see Modifying the Master Switch Priority in Chapter 6, “Configuring the Model 58000 Switch.”

NOTE: *Edge switches are used to interconnect switch communities.*

- Use a tree (or star) topology to connect three or more switch communities.

If the master switch in the community with multiple edge switches does not have the highest switch priority, you may create a data loop between the interconnected switches. Data loop configurations are not supported because a broadcast storm (excessive transmission of address resolution requests) or duplicate frame problems may arise.

Figure 2-13 shows a supported configuration that uses more than one edge switch for feeder link connections between communities, with the master switch in switch community 2 having the highest switch priority. In this example, switch D is the master switch.

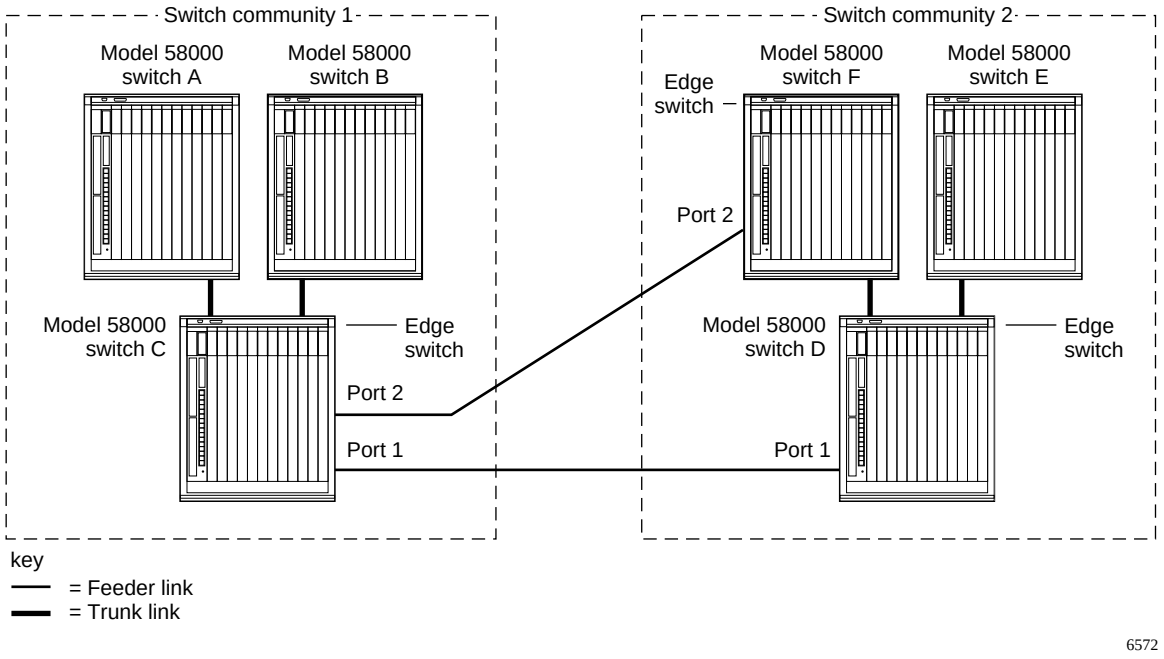


Figure 2-13. Multiple edge switches across switch communities

In this configuration, ports 1 and 2 of switch C, port 1 of switch D, and port 2 of switch F are all configured for feeder mode and are all part of the same virtual LAN. All feeder ports are designated active feeder ports—standby feeder links can be detected only on the local switch. No data loop occurs because the master switch in community 2 (switch D) has a higher priority than the edge switch in the switch C community.

Another way to avoid creating data loop configurations is to make sure all redundant feeder link connections are made between the designated edge switch in each community (see Figure 2-14).

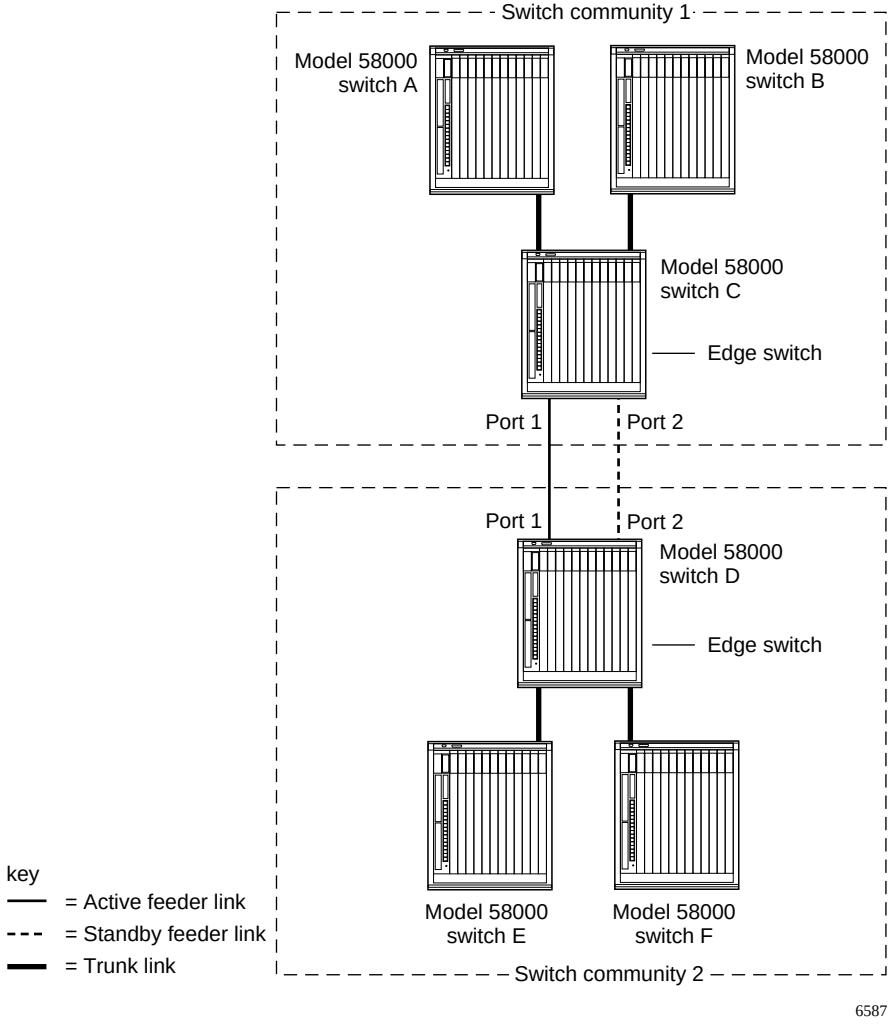


Figure 2-14. Connections across switch communities using one edge switch per community

Figure 2-14 shows the legal feeder link connections between a designated edge switch in each community. In this configuration, ports 1 and 2 of switches C and D are configured for feeder mode and are part of the same virtual LAN.

Because the feeder links are connected only to the edge switch in each community, one of the links is designated an active link and the other link is designated a standby link. Redundancy and connectivity between communities is provided without causing data loop or connectivity problems in the community.

Use a tree topology configuration to connect three or more switch communities. This configuration provides redundancy between communities as well as providing network connectivity. Remember to maintain the edge switch rule, discussed earlier in this section, when designing the tree topology configuration. Doing so prevents you from accidentally creating a data loop configuration. Figure 2-15 shows an unsupported configuration that contains a loop of switch communities.

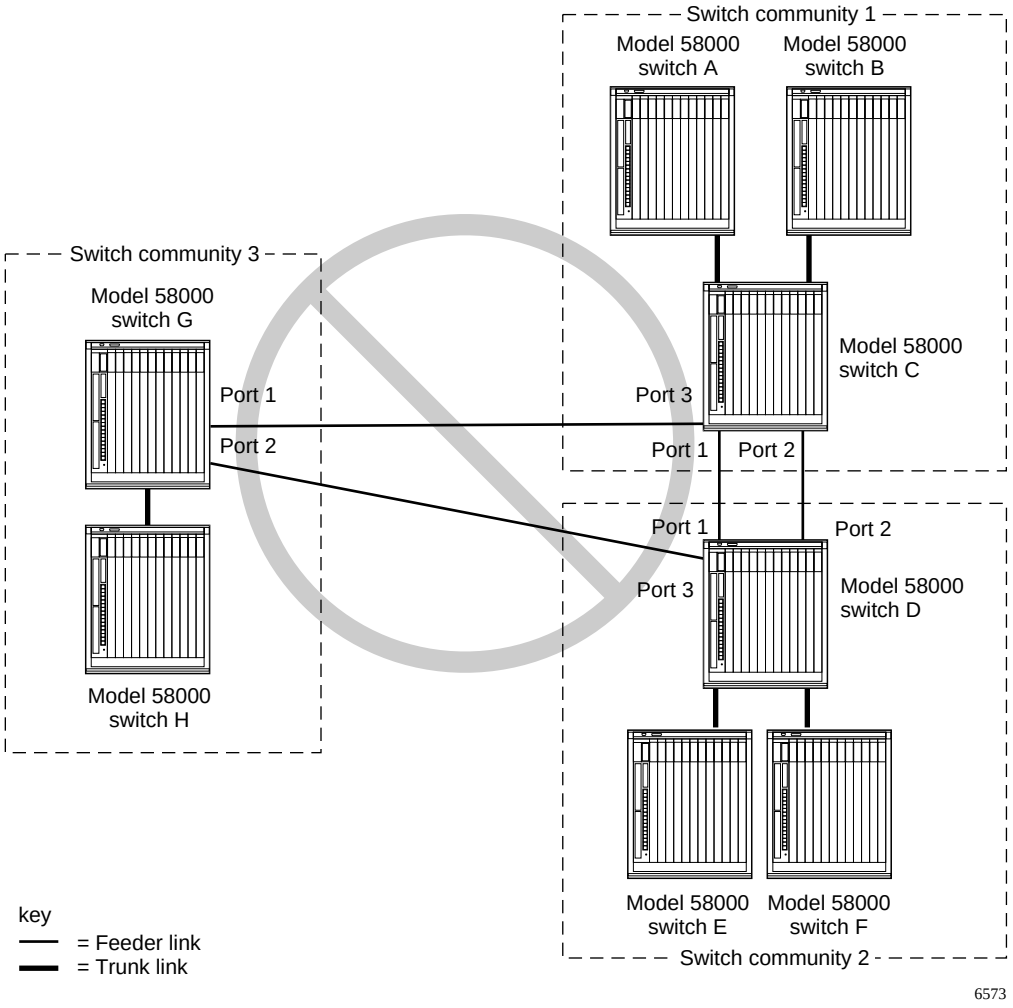


Figure 2-15. Unsupported configuration: Loop of switch communities

In this configuration, ports 1 and 2 of switches C, D, and G and port 3 of switches C and E are all configured for feeder mode and are all part of the same virtual LAN. The feeder links from switch G to switches C and D create a data loop because these switches can receive data that was originated at one of their switch ports.

Figure 2-16 shows a community of switches that are configured in a tree topology.

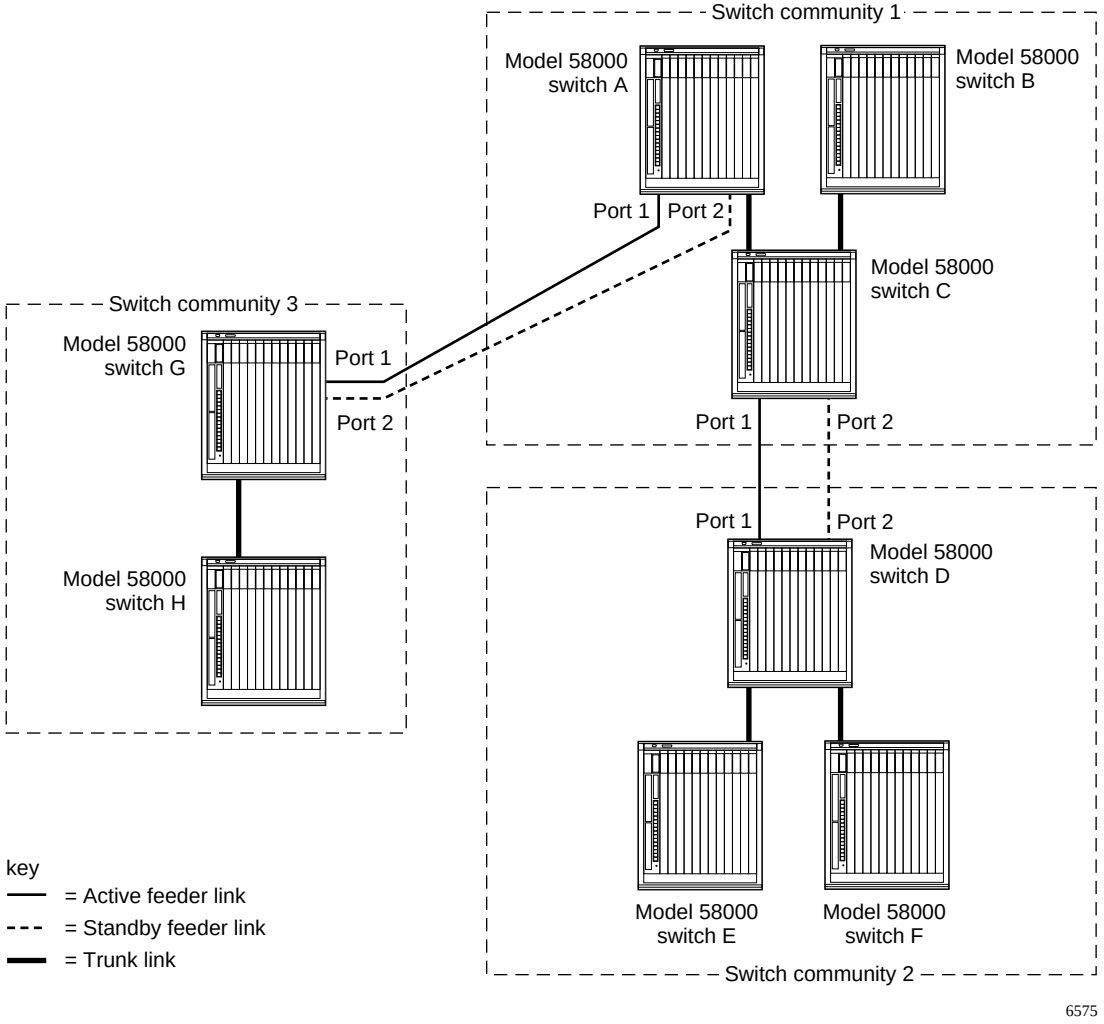


Figure 2-16. Connections across switch communities using a tree topology

In this configuration, each switch community is connected with redundant feeder links between the appropriate edge switches. Ports 1 and 2 of switches A, C, D, and G are configured to operate in feeder mode and are all part of the same virtual LAN. Port 1 of switches A, C, D, and G are designated active feeder ports, while port 2 of switches A, C, D, and G are designated standby feeder ports. If one of the active feeder ports (or active feeder links) fails, the active feeder port is partitioned and the standby feeder port resumes communications between the switch communities.

Restrictions on Using Model 58000 Switches in Bridged and Routed Networks

Bridges and routers in networks provide some restrictions for deploying Model 58000 switches and creating virtual LANs. Two core concepts about routers and switches must be understood:

- Virtual LANs created by Model 58000 switches are equivalent to a broadcast domain. Broadcast and multicast frames are always forwarded to other devices within a given virtual LAN.
- Routers segment the broadcast domain. Routers do not forward broadcast or multicast frames through their interfaces (unless they are configured to support bridging protocols).

This section discusses the effect of LattisSpan topology management packets within bridged and routed network environments.

Filtering LattisSpan Packets in Bridged Networks

Special consideration must also be given to using Model 58000 switches in networks that include routers with bridging software enabled, MAC-level bridges, and repeaters.

NOTE: *When you use any of these devices to connect two or more Model 58000 switches, LattisSpan multicast packets must be filtered and discarded by the internetworking device. LattisSpan multicast packets should be prevented from passing through the internetworking device. However, LattisSpan multicast packets can pass through devices, such as a fiber optic repeater and a remote bridge, that are used to extend the distance of a LattisSpan trunk link.*

The Model 58000 switch uses special multicast packets to execute the topology management process. All Model 58000 switches within a community exchange topology information using these LattisSpan multicast packets to establish trunk ports, break loops, and construct topology databases. As router or bridge connections to the Model 58000 switch are established (using the RJ-45 ports) the new source addresses are learned and added to the port MAC Store Table after the new devices send data to the switch.

If Model 58000 switches are connected so that LattisSpan packets from one Model 58000 switch traverse the internetworking device and reach another switch, the topology management software reconfigures the associated ports as *trunk* ports if these ports are configured in the auto (default) mode.

Because trunk links between connected Model 58000 switches do not participate in *local* address learning (only *global* address learning), the new source addresses received from the internetworking device therefore are not learned or stored.

NOTE: *Global learning is accomplished by the sharing of station MAC addresses between connected Model 58000 switches. Local learning is dynamic learning by an individual Model 58000 switch port of the source addresses of the frames it receives on that port.*

LattisSpan multicast packets must be blocked from passing through internetworking devices in configurations where devices (such as routers) have bridging enabled and have multiple Ethernet interfaces. For example, one interface attaches to one port of the first Model 58000 switch belonging to community 1, and another interface attaches to a separate port of a second Model 58000 switch belonging to community 2.

Without filtering the LattisSpan multicast packets across the auto mode ports, the preceding configuration results in connectivity and communication protocol-related problems and cannot be supported. However, most internetworking devices allow you to add static entries to their address tables, so you can update the tables to discard these LattisSpan multicast packet types when necessary.

NOTE: *The multicast addresses 010081000200 and 010081000201 must always be discarded or blocked from traversing internetworking devices that interconnect Model 58000 switch communities.*

Unsupported Configurations

The following Model 58000 switch configurations are not supported:

- Where a repeater is placed between two Model 58000 switch ports configured for auto mode. In this scenario, blocking LattisSpan multicast packets is not possible; therefore; this design should never be used and cannot be supported.

NOTE: *LattisSpan multicast packets can pass through devices, such as a fiber optic repeater, that are used to extend the distance of a LattisSpan trunk link. In this scenario, LattisSpan multicast packets do not have to be blocked from the repeater or remote bridge.*

- Installing the Model 58000 switch in a network where the following MAC address limits are exceeded:
  - 1024 MAC addresses per virtual LAN
  - 1024 MAC addresses for all of the virtual LANs on a LattisSpan trunk link
  - 8192 MAC addresses per switch community

Exceeding these limits causes performance degradation and can cause instabilities with the network. Exceeding these limits can also lead to a loss of connectivity between some devices in the network.

Connecting Model 58000 Switches

Model 58000 switches can be connected to form Model 58000 switch communities using 100 Mb/s MDA ports. The link that connects two Model 58000 switches together is called a trunk link.

This section provides information on the following topics:

- Trunk link creation
- Address learning across trunks links
- Redundant trunk links
- The seven-switch limit between end stations

For more information about connecting Model 58000 switches together, see Connecting Model 58000 Switches Together in Chapter 5, “Connecting to the Network.”

Creating Trunk Links

The Model 58000 switch recognizes all connections to other Model 58000 switches (through “Auto” mode ports) as trunk links. These links can exist between MDA 100 Mb/s ports provided that the proper cables are attached. Although it is physically possible to configure 10 Mb/s point-to-point connections between any two Model 58000 switches, this configuration is not supported. This type of configuration can introduce instabilities in the network. For more information, see Link Speeds earlier in this chapter.

Table 2-2 describes the possible port configurations and operating modes of Model 58000 switch ports (built-in 10BASE-T ports and 100BASE-T MDA ports).

Table 2-2. Port configurations and operating mode

MDA or built-in port	Default operating mode	Configuration options
10BASE-T built-in port	Default mode = 10 Mb/s half-duplex	Configurable to operate at 10 Mb/s full-duplex mode. If the port is not connected to the backplane, it can operate in half- or full-duplex. (Ports 1–12 can be configured only for half-duplex when connected to System 5000 backplane.)
100BASE-FX MDA port	Default mode = 100 Mb/s half-duplex; flow control enabled	Configurable to operate at 100 Mb/s full-duplex. Flow control can be disabled as a configuration option.
100BASE-TX MDA port	Default mode = 100 Mb/s half-duplex; flow control enabled	Configurable to operate at 100 Mb/s full-duplex. Flow control can be disabled as a configuration option.

The maximum number of Model 58000 switches that can be connected together within a switch community is 32. However, only seven Model 58000 switches can be connected between end stations. (See Seven-switch Limit Between End Stations later in this chapter for more information about the maximum allowable network diameter of a network that includes Model 58000 switches.)

For connection instructions and illustrations, see Connecting Individual Workstations, Servers, and Other Ethernet Devices in Chapter 5, "Connecting to the Network."

Address Learning Across Trunk Links

A single Model 58000 switch learns the addresses of all the stations *directly attached* to its ports through a "local" address learning method. The Model 58000 switch learns new source addresses after a new end station sends its first frame to the switch. The switch learns and stores source addresses in a MAC address table associated with each switch port.

If two Model 58000 switches are connected by a trunk link, local learning is disabled on the trunk link, and the two switches share address information directly through the global address learning process.

CAUTION: *No stations should be attached (individually or through repeaters) to the trunk link connecting Model 58000 switches because the global address learning process does not learn the addresses of any such end stations. Trunk links must be strictly point-to-point connections.*

After installing a Model 58000 switch or connecting new devices to a Model 58000 switch, make sure end stations are not connected to trunk links. Doing so helps avoid common connectivity-related problems along trunk links.

NOTE: *If the switch ports that connect the switches are configured for feeder mode, the link is not designated a trunk link. In this case, you can connect end stations to the link through a shared-media hub. For information about configuring ports for feeder mode, refer to Configurable Port Types earlier in this chapter.*

To identify which ports are assigned to support trunk links, review the service port System Information screen. Ports used to connect to other Model 58000 switches are identified as "trunk" ports on this screen. For information about the service port menus, refer to Chapter 6."

Redundant Trunk Links

Support for redundant links is an important consideration in network design. The Model 58000 switch detects redundant links and puts them into standby mode. If the primary link fails, the standby link is activated and network operation is restored. Redundant links can be created using the ports that are configured as trunk links between Model 58000 switches.

When multiple Model 58000 switches are interconnected with redundant links, active and standby links are determined automatically by the Bay Networks LattisSpan protocol. See Address Tables in Multiple Model 58000 Switches on the Same Network earlier in this chapter for a description of how active and standby trunk links are detected.

NOTE: *It may take up to 90 seconds for the standby trunk link to become active. During this time, the switch does not forward frames.*

Seven-switch Limit Between End Stations

The maximum number of switches that can be connected within a switch community is 32. However, the maximum number of Model 58000 switches between any two end stations is seven. Figure 2-17 illustrates a switch community using the maximum number of Model 58000 switches between end stations.

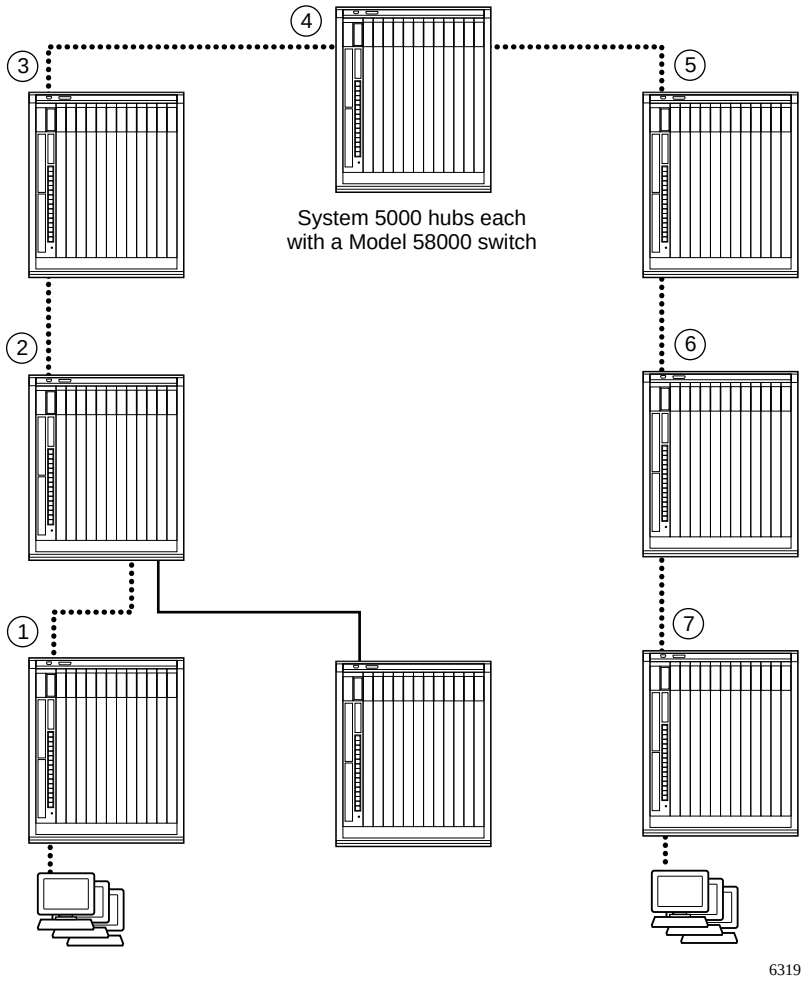


Figure 2-17. Maximum of seven Model 58000 switches between any two end stations

If a network is configured with redundant links, you must make sure that every path between any two end stations has no more than seven Model 58000 switches (*even* if network traffic is redirected to another Model 58000 switch) due to a link or device failure. Each packet sent between end stations may never traverse the same link more than once.

Figure 2-18 shows a network that is not supported because it includes a path with eight switches between end stations.

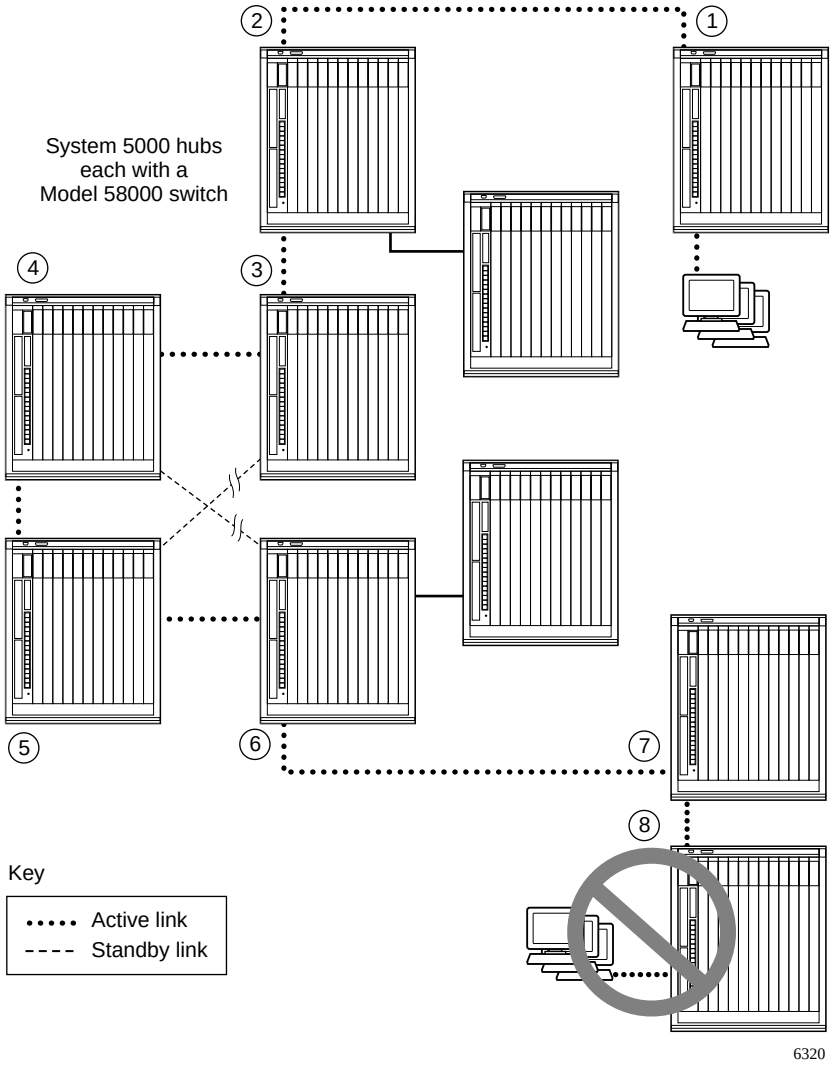


Figure 2-18. Unsupported configuration exceeds seven Model 58000 switches between end stations

Network Configurations of the Model 58000 Switch

Depending on your network requirements, you may choose to use the Model 58000 switch in any of the following network configurations:

- In the network center as part of a switched collapsed backbone configuration, connecting to wiring closets and through routers to other WANs (the primary configuration)
- In a wiring closet as part of a switched collapsed backbone configuration, connecting to the network center
- Within a regional office, where the switch supports connections through a branch office router to other WANs

Within each of these network configurations, the switch allows you to divide the network into smaller segments, with only a few users per segment. This type of network microsegmentation provides each user with more bandwidth. The switch also offers high-speed access to the enterprise network or to the centralized services (such as, corporate servers and routers) of the data center.

This section describes these various switched network configurations of the Model 58000 switch.

Network Center Switch Configuration

The primary configuration of the Model 58000 switch is as a network center switch within a System 5000 hub in a collapsed backbone configuration. Within this network design, the System 5000 hub with the Model 58000 switch is collocated in a network center environment with other critical resources, such as servers and routers (see Figure 2-19).

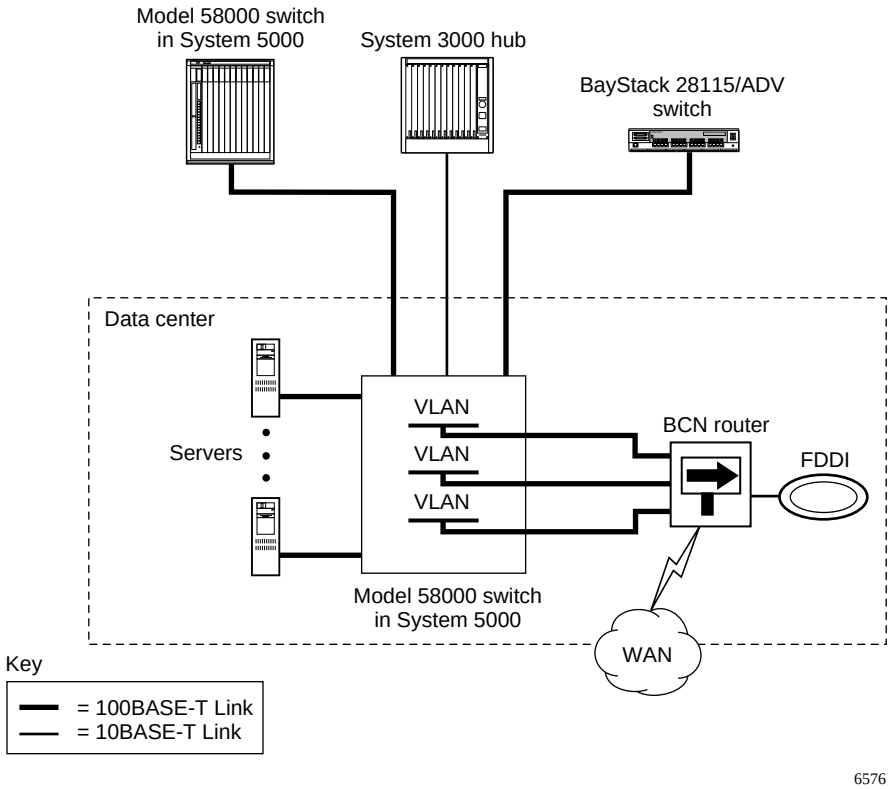


Figure 2-19. Network center switch within collapsed backbone

In this configuration, workgroup switches and hubs located on other floors or in remote sites can be connected to the Model 58000 switch. Figure 2-19 shows a sample configuration with another Model 58000 switch, a System 3000™ hub, and a BayStack 28115/ADV switch situated in various wiring closets all connecting to the Model 58000 switch.

NOTE: *Shared-media hubs, such as System 3000 devices, do not support full-duplex implementations; therefore, they should not be connected to the Model 58000 switch using full-duplex links.*

You could use 100 Mb/s UTP ports to connect devices up to 100 meters (328 ft), and 100 Mb/s fiber ports operating in full-duplex mode to connect devices up to two kilometers. The System 5000 host modules (Model 5308P) also can be connected through the backplane segments of the System 5000 hub to the Model 58000 switch.

The Model 58000 switch is connected to the network center servers through the 100BASE-T MDA ports, providing high-speed access to the critical resources of the servers for both sets of end users in this example—the workgroup hub end users on other floors or in remote sites and the System 5000 end users connected locally. The switch also provides high-speed connectivity to a high-capacity router, which provides routing between virtual LANs and connects to other WANs or to a campus FDDI backbone.

This high-speed connectivity for local and remote users to critical centralized resources, along with the microsegmentation capability of the switch, are the primary features of the Model 58000 switch.

Wiring Closet Switch Configuration

Another configuration for the Model 58000 switch is as a wiring closet switch within a collapsed backbone configuration (see Figure 2-20). In this configuration, the switch is located in a wiring closet with local servers. Connectivity is provided to the network center through the high-speed 100BASE-FX MDA ports of the switch.

In this example, the BayStack 28104/ADV switch is collocated in the network center with central servers and a router. The BayStack 28104/ADV switch also connects to other wiring closets with a System 3000 hub and a BayStack 28115/ADV switch.

The Model 58000 switch offers the same features to the System 5000 end users when the switch is located in the wiring closet as when it is located in the network center. The benefits of microsegmentation and high-speed connectivity to critical resources are the same in both configurations.

In this wiring closet configuration example, however, the Model 58000 switch is not directly connected to a high-capacity router. The BayStack 28104/ADV switch takes over this function, providing virtual LAN connectivity and access through the router to the WAN and a campus FDDI backbone.

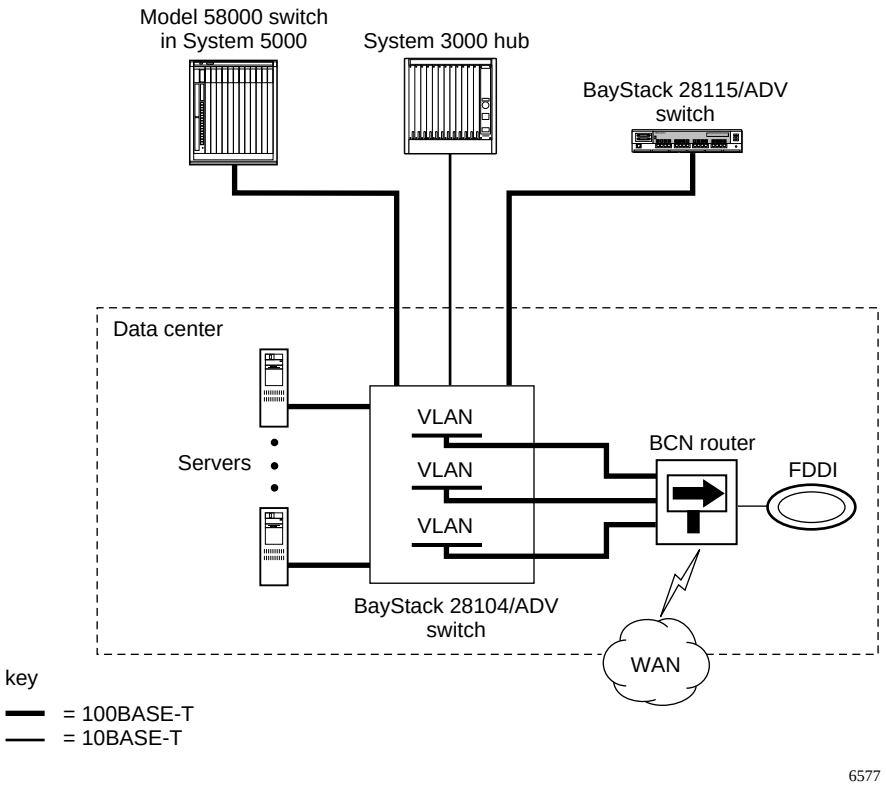


Figure 2-20. Wiring closet switch within collapsed backbone

Regional Office Wiring Closet Switch

The Model 58000 switch can also be used as a regional office wiring closet switch (see Figure 2-21). In this configuration, the switch is located with servers and a router in a wiring closet of a company's regional office. Connectivity is provided to the servers and router through the high-speed 100BASE-T MDA ports of the switch. Local System 5000 end users can access the critical resources of the servers and can connect to the WAN.

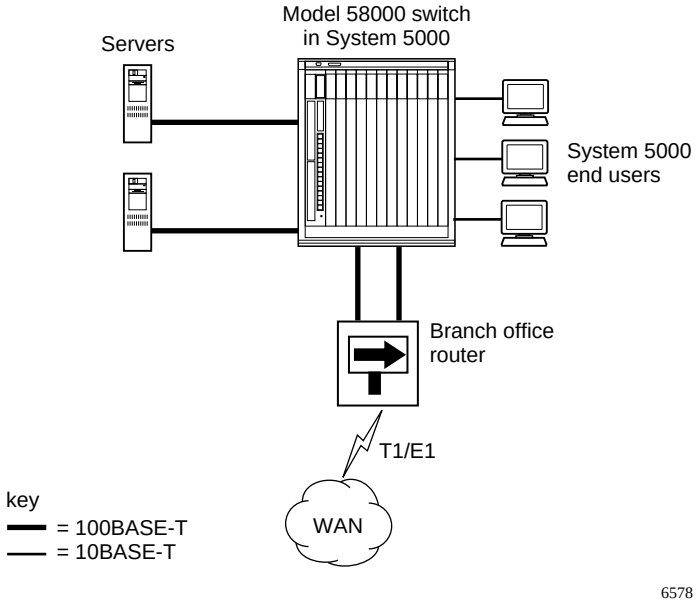


Figure 2-21. Regional office wiring closet switch

Planning for Model 58000 Switch Software Upgrades

In the future, you may want to upgrade the Model 58000 switch software to take advantage of new features or obtain enhancements to current software features. This section includes guidelines for planning future software upgrades.

To upgrade your software, you need a computer in your network that can perform a TFTP server function to download the new software to the switch. This method provides a quick and convenient way for downloading the software image from one location to as many remote locations as required for your network configuration. You can download new software to the switch from one of the following sources:

- A network management station running Optivity network management software
- A computer running TFTP server software

Downloading Software from a Network Management Station

If you plan to install Optivity network management software on a network management station in your network, you can use an integrated application of Optivity to download the new software image to all switches in your network. Optivity allows you to set operational parameters for switches at the network management station. When all required operational parameters are set, you can download the new software from the network management station.

Downloading Software from a Boot Server

You can use TFTP software to download new software from a server in your network if you do not plan to manage your network with Optivity. TFTP software is readily available for personal computers and most other computers. This method requires you to configure a server and the applicable switches to enable remote downloading of software to the switch.

Chapter 3 Preparing To Install the Model 58000

This chapter discusses the procedures required to prepare for the installation of the Model 58000 switch into a Model 500x chassis.

This chapter covers the following topics:

- Package contents of the Model 58000 switch
- Guidelines for unpacking the Model 58000 switch
- Configuration jumper settings
- Tools and equipment required for installation

Package Contents

The package contents of the Model 58000 switch include the following items:

- Model 58000 switch, with four captive retaining screws
- Pan-head screws
- Four 10BASE-T crossover cables
- This guide
- Warranty card

Guidelines for Unpacking the Model 58000 Switch

Electrostatic discharge can damage the components on circuit boards. When you unpack the Model 58000 switch, take the following precautions to prevent damage to the board:

- Do not remove the board from its antistatic plastic bag until you are ready to install it.
- Do not touch pins, leads, or solder connections.
- Handle the board by the edges only, and avoid touching the backplane connector area.
- Store or ship the board and components in antistatic packaging.

Use proper grounding techniques when you install the switch. You can use a foot strap and grounded mat or wear a grounded static discharge wrist strap.

Check the switch for damage. If you find damage, contact your sales or customer service representative at the organization from which you purchased the equipment.

Configuration Jumper Settings

Before installing the Model 58000 switch, verify that the jumpers on the switch module are set correctly. Each jumper requires a factory installed two-position shorting plug.

All three jumpers will be set to position 1-2 at the factory, as shown in Figure 3-1. Currently, the functions for these jumpers are not defined and are reserved for future use.

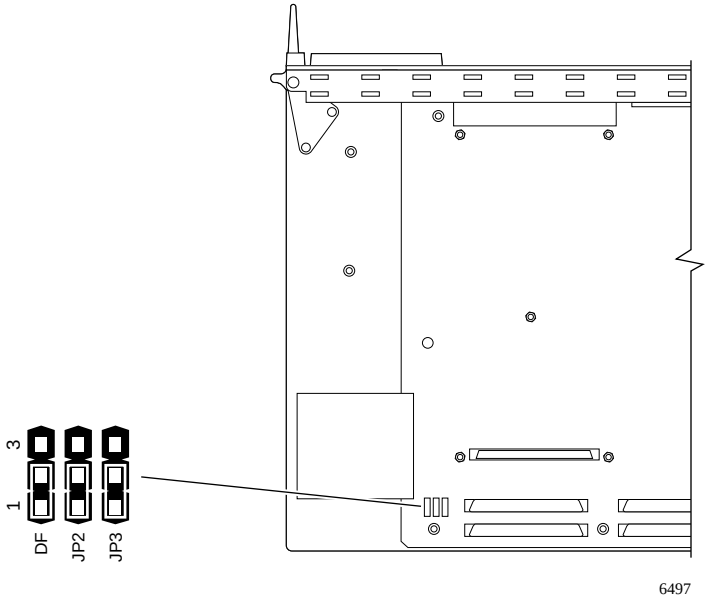


Figure 3-1. Jumpers on the Model 58000 switch

NOTE: *These jumper settings take effect only after a module reset.*

Tools and Equipment

The following tools and equipment are required for installing and removing the Model 58000 switch:

- Flat-tip screwdriver to tighten and loosen captive retaining screws
- Phillips screwdriver to install and remove Phillips screws (if MDAs will be added or removed from the switch)
- An antistatic wrist strap and leash to wear when handling switches

CAUTION: *The Model 58000 switch, MDA expansion module, and MDAs use electronic components that are sensitive to static electricity. Static discharge from your clothing or other items around you can cause damage.*

Take all possible precautions to prevent static discharge damage when working with modules. Keep each module in its protective conductive bag until you are ready to install it. Before you handle a module, be sure to put on a grounded antistatic wrist strap and leash and stand on a mat to free yourself of static.

If you lack a grounded antistatic wrist strap and mat, make sure you stand in one place where you work (so you do not generate static electricity by friction), and free yourself of static by touching the metal of a grounded chassis before handling a module.

Chapter 4 Installing and Removing the Model 58000 Switch

This chapter provides information and procedures on installing and removing the Model 58000 switch.

After installing the switch, you need to connect the appropriate network devices to the switch and configure the switch for network operation. For information and instructions on connecting network devices to the switch, refer to Chapter 5, Connecting to the Network. For information and instructions on configuring the switch, refer to Chapter 6, Configuring the Model 58000 Switch.

This chapter covers the following topics:

- Installation overview
- Installing an MDA on the Model 58000 switch
- Installing an expansion module on the Model 58000 switch
- Installing the Model 58000 switch in the Model 500x chassis
- Verifying the installation
- Removing the Model 58000 switch
- Removing an MDA and an expansion module from the Model 58000 switch

Installation Overview

Installing the Model 58000 switch into the Model 500x chassis for the first time requires the following tasks, depending on your network configuration:

- Install an MDA on the switch
- Install the MDA expansion module (or another expansion module when available) onto the switch
- Install additional MDAs onto the MDA expansion module after the expansion module is installed on the switch
- Install the switch into the Model 500x chassis

Figure 4-1 shows an exploded view of the switch, the MDA expansion module, and the MDAs before they are assembled and installed into the Model 500x chassis.

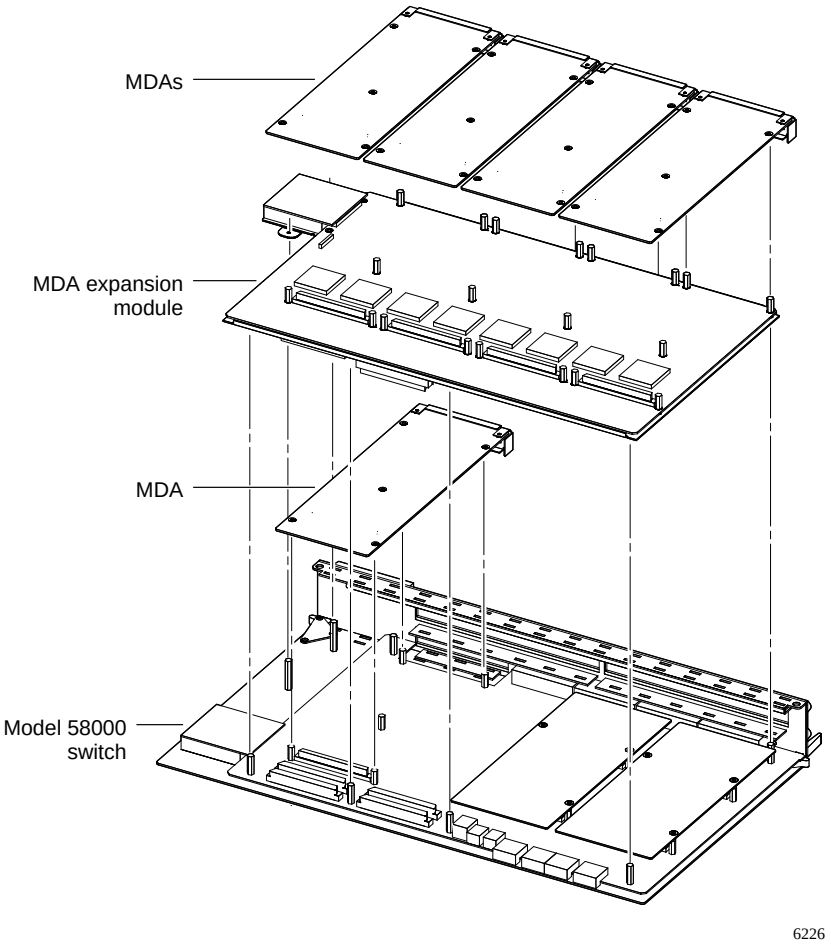


Figure 4-1. Exploded view of switch, MDA expansion module, and MDAs

The remainder of this chapter provides procedures for these tasks.

Installing an MDA on the Model 58000 Switch

To determine the requirements for installing the appropriate MDA on the switch, consider the following network configuration requirements:

- Determine the types of network devices you will connect to the MDA ports. They should operate at a data rate of 100 Mb/s.
- Determine the types of cables you need to connect these devices. Make sure that the cables you choose comply with the 100 Mb/s data rate and specific port type of the MDA.
- Make sure that all cable connections are within their cable length limits.

Use Table 2-1 in Chapter 2, “Planning a Switched Network” to determine which MDAs you need to install on the switch. This table identifies the types of MDAs you can install and lists the port, cable, and maximum segment length specifications for each MDA. For more information about the MDAs that are available for the switch, refer to the documentation that shipped with your MDA.

For guidelines and requirements regarding 100 Mb/s connections, refer to the Institute of Electrical and Electronics Engineers (IEEE) 100BASE-T 802.3 standards. For information about cable for Ethernet networks, refer to the Electronic Industries Association/Telecommunications Industry Association (EIA/TIA) wiring standard EIA/TIA 568.

NOTE: *Refer to the documentation that shipped with your MDA(s) for specific instructions about installing an MDA on the switch.*

Installing an Expansion Module on the Model 58000 Switch

The Model 58000 switch has one MDA slot plus a plug-in card slot for installing the MDA expansion module or another expansion module when available. The MDA expansion module holds up to four additional MDAs. MDAs can be added to any of the available connectivity slots on the MDA expansion module.

NOTE: *Refer to the documentation that shipped with your expansion module for specific instructions about installing it on the switch. Refer to the documentation that shipped with your MDA(s) for specific instructions about installing an MDA on the MDA expansion module.*

Installing the Model 58000 Switch into the Model 500x Chassis

The Model 58000 switch is a double-wide module that you can install in the Model 5000 or Model 5005 chassis. Install the Model 58000 switch in any two consecutive slots on the chassis.

CAUTION: *Connecting a switch to a switch community affects all switches in the community. All other switches will transition to a configuring mode. During this time, the switches will not forward any frames.*

After you install the switch, the switch software identifies the location of the switch as the higher number slot. For example, if the switch is installed in slots one and two, the switch software locates the switch in slot two.

To install the Model 58000 switch into the Model 500x chassis, follow these steps:

1. **Remove the filler panels from the chassis slots where you will install the switch.**
2. **Make sure the inserter/extractor levers are in their fully extended positions.**
3. **Slide the switch into two slots in the chassis until you feel it engage the backplane connector. Carefully push the switch into place (see Figure 4-2).**

NOTE: *The switch is a double-wide module. It can occupy any two consecutive slots of the 14 slots on the Model 5000 chassis, or any two consecutive slots of the eight slots on the Model 5005 chassis.*

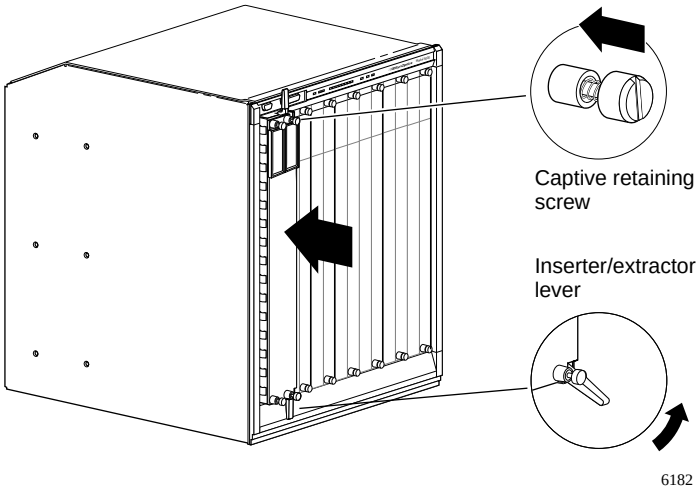


Figure 4-2. Inserting the switch into the chassis

4. **Rotate the inserter/extractor levers toward each other to seat the backplane connectors.**
5. **Align and finger-tighten the captive mounting screws. Finish tightening them with the flat-tip screwdriver.**

Connecting Cables

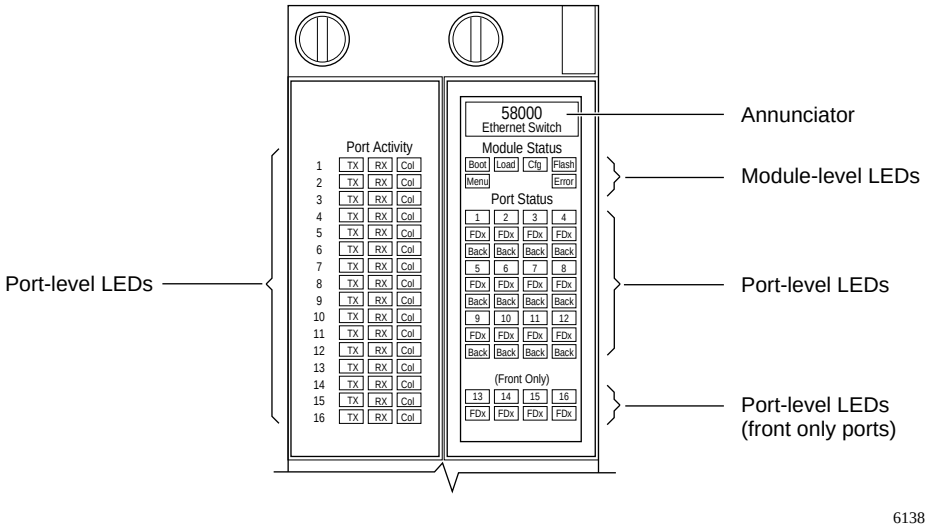
When the Model 58000 switch has been installed in the chassis, connect cables as needed to the 10 Mb/s built-in ports on the front panel of the switch or to the additional 100 Mb/s MDA ports when MDAs are installed in the switch. See Connecting Individual Workstations, Servers, and Other Ethernet Devices in Chapter 5, “Connecting to the Network,” for instructions on connecting cables to the switch.

When you have completed all cable connections, continue with Verifying the Installation next in this chapter.

Verifying the Installation

After you install the Model 58000 switch into an operating Model 5000 or Model 5005 chassis, or turn on the power to a chassis, verify that the installation is successful by checking the LEDs on the Model 58000 switch (see Figure 4-3). For more information about the operation of the LEDs on the switch, see Appendix B,"LED Functionality."

For more information about the operation of LEDs on the MDAs, see the documentation that shipped with your MDA(s).



6138

Figure 4-3. LEDs on the Model 58000 switch

When the Model 58000 switch first receives power, it performs an LED test. All LEDs on the switch light amber, then green; then they turn off.

Immediately after the LED test, the Model 58000 switch executes a self-test of board components. During the self-test, the annunciator lights amber and all other LEDs on the switch remain off.

After completing the self-test, the Cfg LED lights green while the system is performing initialization. Wait until the Cfg LED is off before operating the Model 58000 switch.

When the Model 58000 switch is successfully configured by system-level software, the annunciator lights green.

NOTE: *The annunciator lights green only if the Model 58000 switch is installed and operating properly.*

After the switch is configured successfully, “hello” packets are sent from the 10 Mb/s port and 100 Mb/s ports to end stations connected to these ports. During this time, for any switch port linked to a network port, the corresponding link LED is on and the corresponding TX LED blinks. If a port fails, the LED for that port is off.

LEDs on the Model 58000 switch function as follows:

- The port number LEDs on ports 1 through 16 light up in the following colors during these conditions:
  - Green if a link is attached
  - Amber if the port is partitioned through network management or other means
  - Off (clear) if the link status of the port is off
- The FDx LED lights green if the port is configured for full-duplex mode and is off (clear) if the port is configured for half-duplex mode.
- The Back LED (ports 1 through 12) lights green if the port is connected to the System 5000 backplane and is off (clear) if the port is connected through the front panel.
- Under Port Activity, the TX LEDs light green to indicate the presence of data in the transmit direction, and the RX LEDs light green to indicate the presence of data in the receive direction. The Col LEDs light amber when a collision or congestion occurs and are off (clear) when no collision or congestion occurs.

Removing the Model 58000 Switch

CAUTION: *Removing a switch that is connected to other switches in a switch community affects all switches in the community. All other switches will transition to a configuring mode. During this time, the switches will not forward any frames.*

To remove the switch from the Model 500x chassis, follow these steps:

1. **Use a flat-tip screwdriver to loosen the four captive retaining screws that secure the switch to the chassis.**

   These screws are spring-loaded to pop outward when they are unscrewed from the chassis. The screws are held in place on the switch front panel by locking washers.

2. **Rotate the top and bottom inserter/extractor levers away from the center of the switch front panel to release the switch from the backplane connector.**

3. **Slide the switch out of the chassis (see Figure 4-4).**

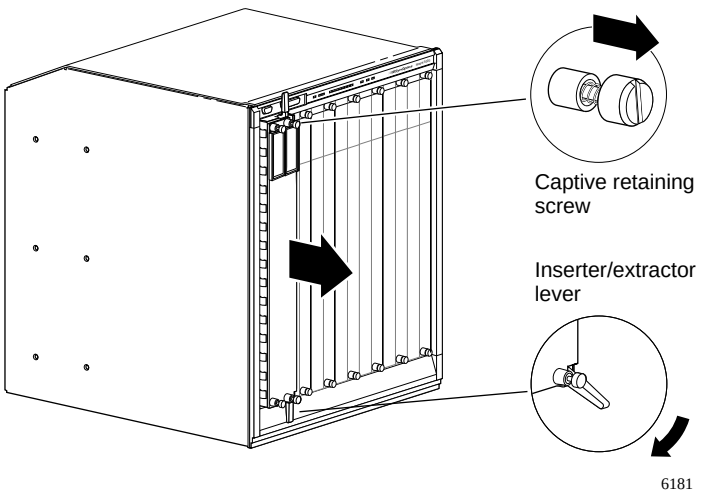


Figure 4-4. Removing the switch

   Hold the front panel with one hand while you support the bottom of the switch with the other hand.

4. **Install two filler panels on the chassis slots to maintain the cooling air flow within the chassis.**

Removing an MDA

Refer to the documentation that shipped with your MDA(s) for instructions on removing an MDA from the Model 58000 switch.

Removing the Expansion Module

Refer to the documentation that shipped with your expansion module for instructions on removing an expansion module from the Model 58000 switch.

Chapter 5 Connecting to the Network

This chapter provides the information and instructions for connecting the following network devices to the Model 58000 switch:

- Terminal for diagnostics and configuration
- Individual workstations, servers, or other Ethernet devices
- Other Model 58000 switches

CAUTION: *Connecting a switch to a switch community affects all switches in the community. All other switches will transition to a configuring mode. During this time, the switches will not forward any frames.*

After connecting the appropriate network devices to the switch, you configure the switch for network operation. For information and instructions on configuring the switch, refer to Chapter 6, Configuring the Model 58000 Switch.

Connecting the Terminal to the Service Port

The Model 58000 switch does not have a service port, so you must connect the terminal for viewing diagnostics and accessing configuration menus to the service port on the Model 500x chassis. This port is used for connecting a terminal to view diagnostic messages during the boot process and to set basic system parameters.

NOTE: *The only type of terminal that is compatible with the Model 58000 switch is a VT100-compatible terminal. The screens are not readable if you use other types of terminals.*

For information about connecting the terminal to the service port of the Model 5000 chassis, refer to *Installation and Reference for the Model 5000 Chassis*. For information about connecting the terminal to the service port of the Model 5005 chassis, refer to *Installation and Reference for the Model 5005 Chassis*.

Connecting Individual Workstations, Servers, and Other Ethernet Devices

Devices can connect to the built-in 10BASE-T ports on the Model 58000 switch or to the 100BASE-T MDA ports when one or more MDAs are added to the switch. The type of cable you use to connect workstations or other Ethernet devices to the Model 58000 switch is determined by the segment distance between the Ethernet device and the Model 58000 switch and the type of media dependent adapters (MDAs) you use.

Table 5-1 summarizes port and cable options for built-in 10BASE-T ports and 100BASE-T MDA ports.

Table 5-1. Requirements for 10BASE-T and 100BASE-T connectivity

Built-in port or MDA port	Number and type of ports	Port speed	Cable options	Maximum segment length
10BASE-T (built-in port)	16 RJ-45	10 Mb/s	Category 3, 4, or 5 UTP	328 ft (100 meters)
100BASE-FX (MDA port)	Two SC	100 Mb/s	62.5 micron multimode fiber optic or 50/125 micron multimode fiber optic	6562 ft (Up to two kilometers) (full-duplex) 1352 ft (412 meters) (half-duplex)
100BASE-TX (MDA port)	Two RJ-45	100 Mb/s	Category 5 UTP	328 ft (100 meters)
100BASE-FX/TX	One SC	100 Mb/s	62.5 micron multimode fiber optic or 50/125 micron multimode fiber optic	6562 ft (Up to two kilometers) (full-duplex) 1352 ft (412 meters) (half-duplex)
	One RJ-45	100 Mb/s	Category 5 UTP	328 ft (100 meters)

When connecting the switch to other network devices using the RJ-45 10 BASE-T ports or the RJ-45 100BASE-T MDA ports, make sure you use the correct type of UTP cable—straight-through cable or crossover cable. The switch ports follow the MDI-X convention. RJ-45 ports on other devices such as end stations may follow the MDI convention.

Use straight-through cable to connect unlike devices (MDI-X-to-MDI connections) as shown in Figure 5-1. For example, use straight-through cable when connecting the switch to an end station.

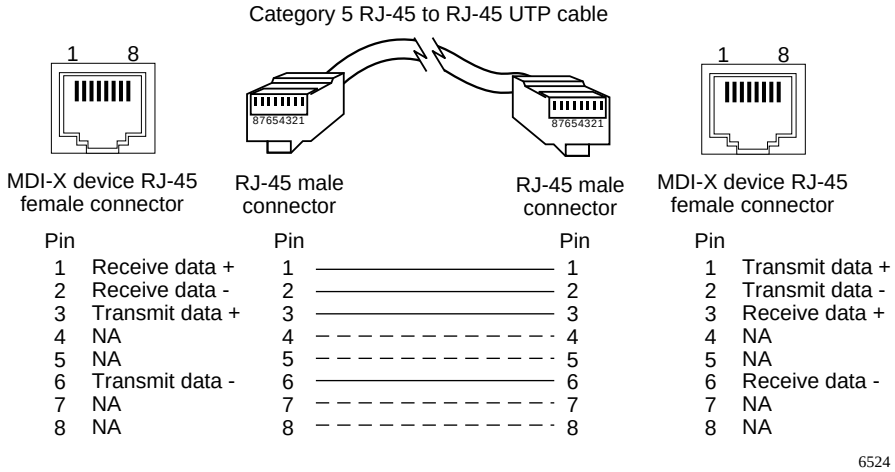


Figure 5-1. Straight-through UTP cable

Use crossover cables to connect like devices (MDI-X-to-MDI-X connections) as shown in Figure 5-2. For example, use a crossover cable when connecting two switches together.

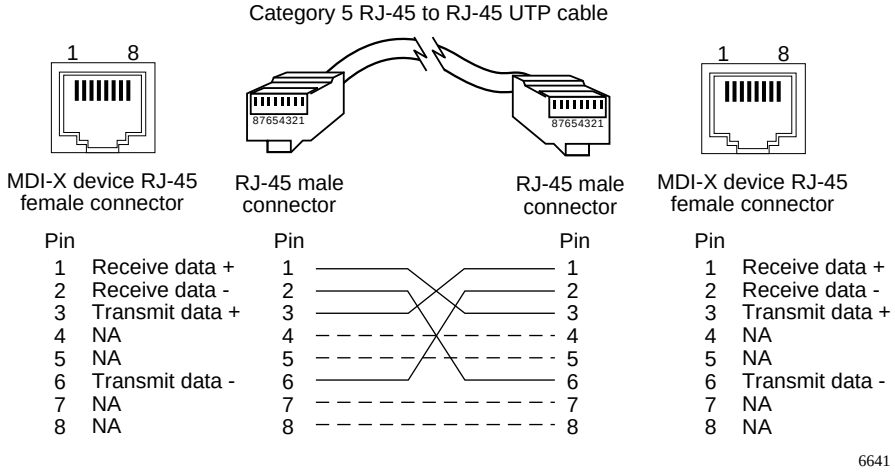


Figure 5-2. Crossover UTP cable

To connect individual Ethernet devices to the Model 58000 switch, follow these steps:

1. **Insert one end of the cable into the desired port on the front panel of the switch or the desired port on the MDA.**
2. **Connect the other end of the cable to the desired network device.**

The appropriate LED should light green to indicate that the device is connected to the switch and a link is established. Additional LEDs on the MDAs may light because of other configuration conditions. For more information about the lighting of front panel LEDs, see Appendix B, "LED Functionality." Refer to the documentation that shipped with your MDAs for a description of the MDA LEDs.

Connecting Model 58000 Switches Together

Model 58000 switches can be connected using 100 Mb/s MDA ports.

CAUTION: *Do not use 10 Mb/s ports to connect switches. Doing so can severely degrade your network performance or can prevent your network from becoming operational.*

Connecting two Model 58000 switches requires the use of either a Category 5 UTP crossover cable or a 62.5 micron multimode fiber cable, connected to a 100 Mb/s MDA port on each Model 58000 switch.

To connect the switches, follow these steps (see Figure 5-3):

1. **Connect one end of a Category 5 UTP crossover cable or 62.5 micron multimode fiber optic cable to an MDA port on one Model 58000 switch.**
2. **Connect the other end of the cable to an MDA port on the other Model 58000 switch.**

Make sure your cable distances adhere to the requirements for 100 Mb/s connections.

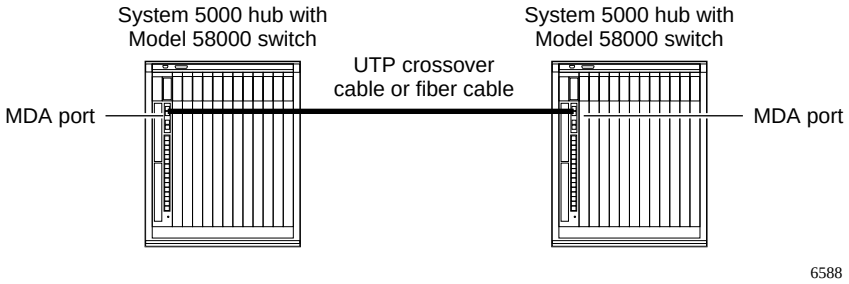


Figure 5-3. Connecting two Model 58000 switches from MDA port to MDA port

Chapter 6 Configuring the Model 58000 Switch

This chapter covers the following topics:

- System configuration parameters of the Model 58000 switch
- An overview of system menus
- Using the system configuration menus to configure system parameters

After installing the Model 58000 switch, you must configure a set of minimum system parameters. See Minimum System Parameters later in this chapter for more information.

You can perform advanced configuration for the Model 58000 switch using Optivity network management software. For more information about how to manage the Model 58000 switch with Optivity, refer to the user documentation that shipped with your Optivity software.

System Configuration

This section describes the default configuration parameters of the Model 58000 switch and the minimum system parameters that must be configured after the Model 58000 switch is installed.

Default Configuration

Table 6-1 lists the default configuration parameters. You can modify these parameters using the system configuration menus (see Using the System Configuration Menus later in this chapter).

Table 6-1. Configuration parameters

Parameter name	Default setting
Attachment port mode	Half-duplex
IP address (at initial installation)	0.0.0.0
Default gateway address	0.0.0.0
Subnet mask	255.255.255.0
Master switch priority	8000
Boot load mode	Local

Table 6-1. Configuration parameters (continued)

Parameter name	Default setting
Image load mode	Local
Boot router IP address	0.0.0.0
TFTP load server IP address	0.0.0.0
TFTP retry count	5
Image file name	NULL string
Switch mode	Basic
Read community string	“public”
Read-write community string	“private”
Flow control	Enabled for 100 Mb/s and full-duplex only

Minimum System Parameters

The minimum system parameters enable the Model 58000 switch to boot on to the network and to communicate with your network management station.

After configuring these minimum parameters, you can continue to use the system configuration menus or use the network management software to configure additional parameters and monitor the Model 58000 switch.

You must configure the following minimum system parameters:

- IP address

NOTE: *The simplest and most robust configuration results when the Model 58000 switch you are installing resides on the same subnet as your network management station. This configuration helps avoid sending SNMP management packets across other subnets and possibly through routers. For this configuration, make sure that the subnet reference in the IP address of your Model 58000 switch matches that of your network management station. Additionally, Bay Networks recommends that the IP addresses of all Model 58000 switches in a switch community reside on the same subnet. (Example: Model 58000 switch 1 should have an IP address of 123.123.24.1 and Model 58000 switch 2 should have an IP address of 123.123.24.2.) Putting the IP addresses of all Model 58000 switches on the same subnet will help you avoid connectivity-related problems on your network.*

- Default gateway address (if separated from the network management station by a router)
- Subnet mask
- SNMP community strings (This parameter is optional and available only through system configuration menus.)

Menu Overview

This section describes the system configuration menu organization and provides a description of the standard menu areas. These menus appear on the terminal connected to the System 5000 service port. For instructions and information about connecting a terminal to the service port of the Model 500x chassis, refer to *Installation and Reference for the Model 5000 Chassis*.

System Configuration Menu Map

The system configuration menus are organized as shown in Figure 6-1.

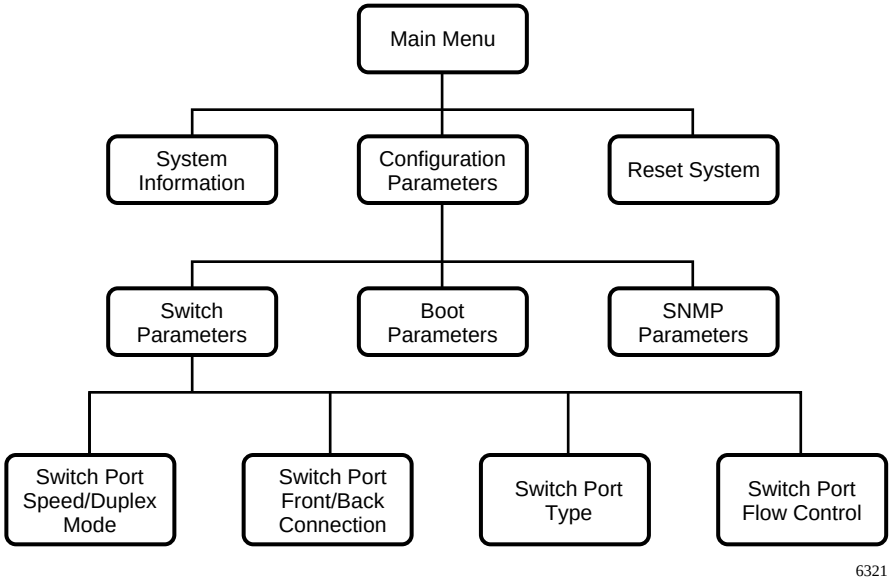


Figure 6-1. System configuration menu map

Menu Structure

All Model 58000 switch system configuration menus have a similar format. The screen layout is based upon common 80-character by 24-line ASCII terminal display characteristics. The menus are divided into three parts—the menu header, the command and status field, and the command line.

A sample system configuration menu is displayed in Figure 6-2.

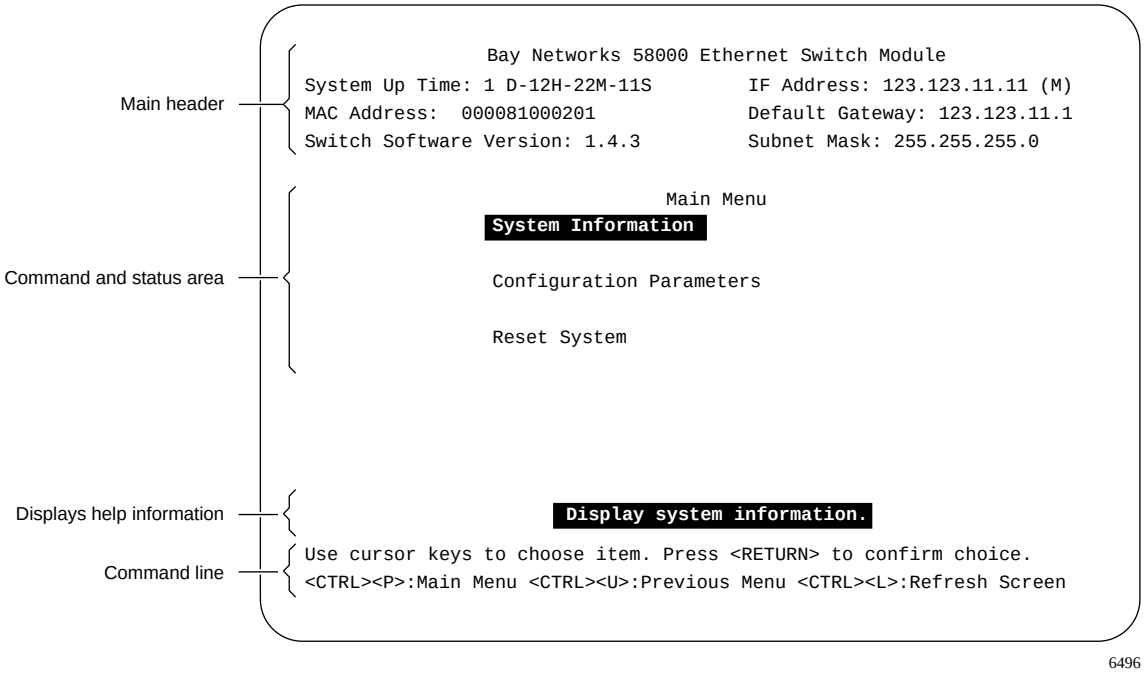


Figure 6-2. Sample system configuration menu

Menu Header

The menu header is at the top of the menu and includes switch system information. Table 6-2 briefly describes the system information included in the menu header.

The System Information menu provides an extensive list of system information. Refer to Displaying System Information later in this chapter for instructions on how to display the System Information menu.

Table 6-2. Menu header information

Item	Description
Header title	Displays the model number or product name for the Model 58000 switch.
System Up Time	The time elapsed since last power up or reset.
MAC Address	The 6-byte MAC address of the Model 58000 switch (hexadecimal notation).
Switch Software Version	The release software version.
IP Address	The IP address of the Model 58000 switch. The letter (M) after the IP address indicates that this is a master switch.
Default Gateway	The IP address of the default gateway for the Model 58000 switch.
Subnet Mask	The IP subnet mask for the Model 58000 switch.

Command and Status Area

The command and status area makes up the middle portion of the menu. This part of the menu includes the title of the menu and a list of status information and/or a list of commands.

Command Line

The command line at the bottom of every menu includes the following commands for interacting with the system:

- Up and down arrow keys to move cursor (cursor moves as a highlight box).
- [Enter] to select the highlighted menu item or complete a text input.
- [Ctrl]+P to return to main menu.

- [Ctrl]+U to return to previous menu.
- [Ctrl]+L to refresh the screen and update displayed system information.
- [Ctrl]+C to abort the current input.
- [Ctrl]+T to break the connection to the System 5000

Menu Help Display

To display help information about any menu item, move the cursor to highlight that menu item. A short description of the item is displayed just above the menu command area of the screen.

Using the System Configuration Menus

You use the terminal that is connected to the System 5000 service port to access the system configuration menus. From these menus, you can view system information and configure the Model 58000 switch.

This section provides information and procedures on how to use the system configuration menus to:

- Display system startup messages.
- Display the Main Menu.
- Display system information.
- Display local virtual LAN information.
- Configure the minimum system parameters.
- Modify master switch priority.
- Modify port configurations.
- Display and modify boot parameters.
- Display and modify SNMP parameters.
- Reset the Model 58000 switch.
- Download an image file.

Displaying Startup Messages

The following messages are displayed on the terminal connected to the service port of the Model 500x chassis, when the Model 58000 switch is powered on or reset. These messages describe the outcome of the internal switch diagnostics and ASIC tests.

```
Bay Networks Model 58000 Ethernet Switch Module
Power-up Diagnostics Version 1.4.3
Created: October 1 1995 12:00:00
System CPU test: PASSED
System memory test (4M): PASSED
Timer test: PASSED
Console port test:..PASSED
CMB Config RAM test (32K): PASSED
NVRAM test (64K): PASSED
Real-time clock test: PASSED
Watchdog timer test: PASSED
ABC test: PASSED
BANSHEE test: PASSED
EPIC test: PASSED
MOCA test: PASSED
DMA test: PASSED
Loopback test: PASSED
End of Diagnostics, entering load stage
```

Displaying the Main Menu

The Main Menu provides access to switch system information, various switch system configuration menus, and a reset system menu.

To display the Main Menu, press [Enter] from the startup messages screen after all startup messages are displayed. A Main Menu similar to that in Figure 6-3 is displayed. From this menu, you can display a System Information menu, a Configuration Parameters menu, or a Reset System menu.

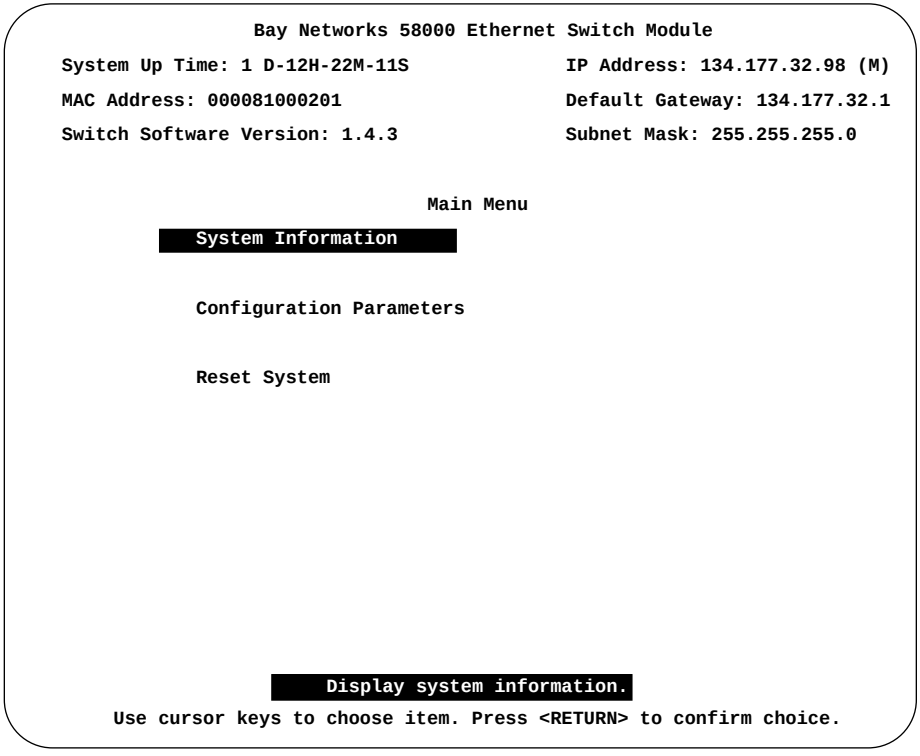


Figure 6-3. Main Menu

Displaying System Information

The System Information menu provides the following information:

- The current switch configuration
- Configurations for 10 Mb/s and 100 Mb/s ports
- Which ports are operating as trunk ports

To display the System Information menu, choose System Information from the main menu. A System Information menu similar to that in Figure 6-4 is displayed.

```
                Bay Networks 58000 Ethernet Switch Module
System Up Time: 1 D-12H-22M-11S            IP Address: 134.177.32.98(M)
MAC Address: 000081000201                  Default Gateway: 134.177.32.1
Switch Software Version: 1.4.3             Subnet Mask: 255.255.255.0

                          System Information
          Switch Firmware Version [None]
          Switch Mode [Basic]
          Memory (Boot/Flash/NVRAM/DRAM) [128K/2048K/256K/4096K]
          Master Switch Priority [8000]
          Master Switch MAC Address [000081000201]
          Master Switch IP Address [134.177.32.98]
          100 Mb/s Full Duplex (Port#) [MDA P1]
          100 Mb/s Half Duplex (Port#) [MDA P2]
          10 Mb/s Full Duplex (Port#) [None]
          10 Mb/s Half Duplex (Port#) [1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16]
          Trunk Ports [MDA P1]


                    The current firmware version.
  <CTRL><P>:Main Menu <CTRL><U>:Previous Menu <CTRL><L>:Refresh Screen
```

Figure 6-4. System Information menu

The System Information screen only *displays* information: you must use the Configuration Parameters menu to modify the Model 58000 switch parameters. Table 6-3 describes the fields on the System Information screen.

Table 6-3. System information fields

Field	Description
Switch Firmware Version	Displays the current switch firmware version.
Switch Mode	Displays the switch mode for the Model 58000 switch. Basic mode is the default mode. The Model 58000 switch uses the virtual mode only if a VLAN is set up and ports are assigned to that VLAN.
Memory (Boot/Flash/NVRAM/DRAM)	Displays the Model 58000 switch memory configuration. Boot stores network boot code, power-up diagnostics, and fault-isolation code. Flash memory stores main agent and switch software programs. NVRAM stores configuration data and some statistics. DRAM is used by the CPU as an expansion of main memory space.
Master Switch Priority	Displays the master switch priority configured for the local hub. The priority range is from Hex number 0, the highest, to FFFF, the lowest (default priority=8000). (If two or more Model 58000 switches have the same switch priority, the master switch is selected by the lowest MAC address.)
Master Switch MAC Address	Specifies the MAC address of the master switch. This parameter is read-only and determined at run-time.
Master Switch IP Address	Specifies the IPaddress of the master switch. This parameter is read-only and determined at run-time.
100 Mb/s Full Duplex (Port #)	Lists the MDA ports that are operating at 100 Mb/s full-duplex. MDA P1 means port 1 on the MDA.
100 Mb/s Half Duplex (Port #)	Lists the MDA ports that are operating at 100 Mb/s half-duplex. MDA P2 means port 2 on the MDA.
10 Mb/s Full Duplex (Port #)	Lists 10 Mb/s ports that are operating at full-duplex.
10 Mb/s Half Duplex (Port #)	Lists 10 Mb/s ports that are operating at half-duplex.
Trunk Ports	Lists ports that are directly connected to another switch.

Displaying Local Virtual LAN Information

If virtual LANs are defined as part of the Model 58000 switch, the switch mode is automatically displayed as virtual mode.

To display the virtual LAN information for the Model 58000 switch, choose Switch Mode from the System Information screen. A Local VLAN Information screen similar to that in Figure 6-5 is displayed.

```
                Bay Networks 58000 Ethernet Switch Module
System Up Time: 1 D-12H-22M-11S          IP Address: 134.177.32.98(M)
MAC Address: 000081000201                Default Gateway: 134.177.32.1
Switch Software Version: 1.4.3           Subnet Mask: 255.255.255.0

                        Local VLAN Information

  Port    VLAN ID/Name                    Port    VLAN ID/Name
  1   [2/Default]                         9        [2/Default]
  2   [2/Default]                         10       [2/Default]
  3   [2/Default]                         11       [2/Default]
  4   [2/Default]                         12       [2/Default]
  5   [2/Default]                         13       [2/Default]
  6   [2/Default]                         14       [2/Default]
  7   [2/Default]                         15       [2/Default]
  8   [2/Default]                         16       [2/Default]
  9   [2/Default]                         MDA P1   [Trunk]
  10  [2/Default]                         MDA P2   [Trunk]
  11  [2/Default]

                  VLAN ID and name associated with port 1.
     Use cursor keys to choose item. Press <RETURN> to confirm choice.
<CTRL><P>: Main Menu  <CTRL><U>: Previous Menu  <CTRL><L>: Refresh Screen
```

Figure 6-5. Local VLAN Information

NOTE: *Use Optivity network management software to configure virtual LANs. For more information, refer to the user documentation that shipped with your Optivity software.*

Configuring the Minimum System Parameters

Use the Configuration Parameters menu and appropriate submenus to configure the following basic system parameters for the Model 58000 switch:

- IP address
- Default gateway address
- Subnet mask
- SNMP community strings

Displaying the Configuration Parameters Menu

To display the Configuration Parameters menu, choose Configuration Parameters menu from the Main Menu. A Configuration Parameters menu similar to that shown in Figure 6-6 is displayed.

```
                Bay Networks 58000 Ethernet Switch Module
System Up Time: 1 D-12H-22M-11S              IP Address: 134.177.32.98(M)
MAC Address: 000081000201                    Default Gateway: 134.177.32.1
Switch Software Version: 1.4.3               Subnet Mask: 255.255.255.0

                        Configuration Parameters

          Switch Parameters

             Boot Parameters

             SNMP Parameters

                    Modify switch related parameters.
     Use cursor keys to choose item. Press <RETURN> to confirm choice.
  <CTRL><P>: Main Menu <CTRL><U>: Previous Menu <CTRL><L>: Refresh Screen
```

Figure 6-6. Configuration Parameters menu

Modifying the IP Address, Default Gateway Address, and Subnet Mask

You can display and modify the switch IP address, default gateway address, and subnet mask using the Switch Parameters menu.

Table 6-4 lists and describes the parameter options available from the Switch Parameters menu.

Table 6-4. Switch parameter options

Menu option	Description	Change effective
Modify IP Address	Modifies the IP address of the Model 58000 switch.	After reset
Modify Default Gateway Address	Modifies the IP address of the default gateway for the subnet to which the Model 58000 switch belongs.	After reset
Modify Subnet Mask	Modifies the IP subnet to which the Model 58000 switch belongs.	After reset
Modify Switch Priority	Modifies the local switch priority to select the master Model 58000 switch. The priority range is from Hex number 0, the highest, to FFFF, the lowest. (Default priority=8000.) The master switch must have either the highest priority or the smallest MAC address if two or more Model 58000 switchs have the same priority.	Immediately
Modify Switch Port Speed and Duplex Mode	Modifies the port speed (10 Mb/s or 100 Mb/s) and selects full- or half-duplex.	Immediately
Modify Switch Port Front/Back Connection	Modifies the switch port connection for ports 1–12 between front connection and backplane connection.	Immediately
Modify Switch Port Type	Modifies the switch port type between auto mode and feeder mode.	After reset
Modify Switch Port Flow Control	Modifies the switch port flow control for 100 Mb/s ports between enable and disable.	Immediately
Modify Expansion Module Port Configuration	Modifies the expansion module port configuration for port speed and duplex mode, port type between auto mode and feeder mode, and flow control between enable and disable.	Immediately for port speed, duplex mode and flow control After reset for port type

To modify the IP address, default gateway address, and subnet mask for a Model 58000 switch, follow these steps:

1. **Choose Switch Parameters from the Configuration Parameters menu.**

   A Switch Parameters menu similar to that in Figure 6-7 is displayed.

NOTE: *The Modify Expansion Module Port Configuration option is displayed on the Switch Parameters menu only when the expansion module is installed on the switch. The menu below shows this option.*

```
                Bay Networks 58000 Ethernet Switch Module
System Up Time: 1 D-12H-22M-11S            IP Address: 134.177.32.98(M)
MAC Address: 000081000201                  Default Gateway: 134.177.32.1
Switch Software Version: 1.4.3             Subnet Mask: 255.255.255.0

                            Switch Parameters

              Modify IP Address [134.177.32.98]
              Modify Default Gateway Address [134.177.32.1]
              Modify Subnet Mask [255.255.255.0]
              Modify Switch Priority [8000]
              Modify Switch Port Speed and Duplex Mode
              Modify Switch Port Front/Back Connection
              Modify Switch Port Type
              Modify Switch Port Flow Control
              Modify Expansion Module Port Configuration


                        Change the switch's IP address.
      Use cursor to choose item. Press <RETURN> to confirm choice.
```

Figure 6-7. Switch Parameters menu

2. **To modify the IP address, Choose Modify IP Address from the Switch Parameters menu.**

   The current IP address is displayed and the system prompts you to enter a new IP address in dotted-decimal notation (ddd.ddd.ddd.ddd).

3. **Enter the IP address for the Model 58000 switch, then enter Y to verify the new address.**

4. **To modify the default gateway and subnet mask for the Model 58000 switch, select those options and enter the new information in the same dotted-decimal format.**

5. **Reset the Model 58000 switch. For instructions on how to reset the switch, see Resetting the Model 58000 Switch later in this chapter.**

CAUTION: *Resetting a switch that is connected to other switches in a switch community affects all switches in the community. All other switches will transition to a configuring mode. During this time, the switches will not forward any frames.*

NOTE: *The new IP address, default gateway, and subnet mask information are not used until the Model 58000 switch is reset.*

Displaying and Modifying SNMP Parameters

Read and read-write community strings are used by the SNMP agent to control requests for information about and access to management information for the Model 58000 switch. The SNMP parameters can only be modified using the system configuration menus that appear on the VT100 terminal connected to the service port of the Model 500x chassis. They cannot be changed remotely from a network management station.

Use the SNMP Parameters menu to display and modify the current SNMP parameters. Table 6-5 describes the SNMP parameters in the SNMP Parameters menu.

Table 6-5. SNMP parameters

Item	Description	Change effective
Modify Read Community String	Changes the read community string, which the SNMP agent uses to check against get (read) commands from a network management station for security reasons. The default setting is public.	Immediately
Modify Read-Write Community String	Changes the read-write community string, which the SNMP agent uses to check against set (write) commands from a network management station for security reasons. The default setting is private.	Immediately

To display and modify the SNMP parameters, follow these steps:

1. **Choose Configuration Parameters from the Main Menu.**

   The Configuration Parameters menu is displayed.

2. **Choose SNMP Parameters from the Configuration Parameters menu.**

   An SNMP Parameters menu similar to that shown in Figure 6-8 is displayed.

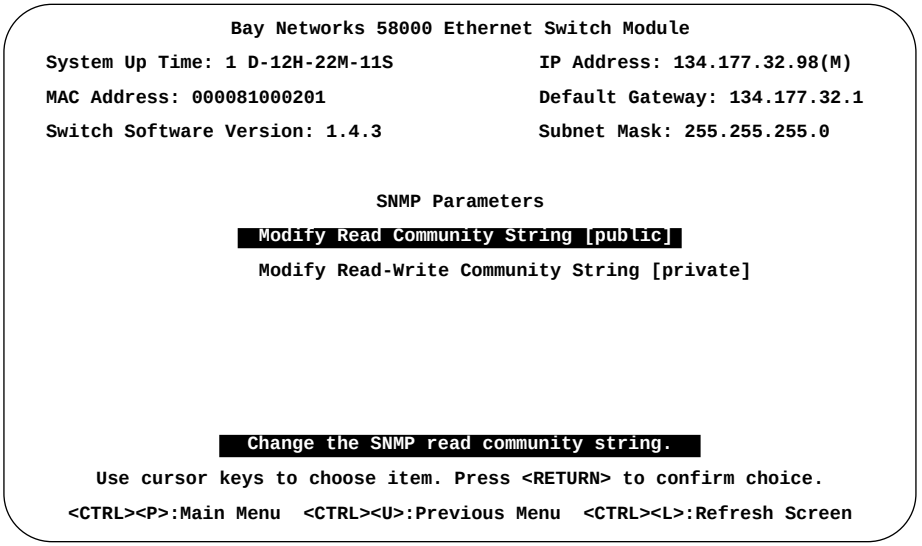


Figure 6-8. SNMP Parameters menu

3. **Choose the community string you want to modify.**

   The system prompts you to enter a new community string.

4. **Enter the new community string and press Y to confirm your entry.**

   The new information is effective immediately.

You can continue using the system configuration menus, or use your network management software, to configure the following additional system parameters:

- Master switch priority
- Port configurations
- Boot parameters

Modifying the Master Switch Priority

A master switch is assigned in a network that includes more than one switch. Only one master switch is allowed per Model 58000 switch community. The master switch gathers virtual LAN information from other Model 58000 switches in the community and communicates this information to the network management station that manages them. The master switch also receives configuration requests from the network management station and distributes this configuration information to other Model 58000 switches in the community.

The master switch is automatically determined by the LattisSpan protocol. This determination is based on switch priority and MAC address. In their default configuration, all Model 58000 switches have the same switch priority, in which case the master switch is selected according to the lowest MAC address of all connected Model 58000 switches in the community. The Model 58000 switch that reports the lowest MAC address is automatically assigned to be the master switch in the community. The master switch selection process is transparent and requires no preconfiguration from the user.

However, if you want to change the assigned master switch within a community, you can decrease the master switch priority value for a particular Model 58000 switch so that it is less than other Model 58000 switches within the same community. Because a lower value indicates a higher priority, this will cause the modified Model 58000 switch to become the master switch.

NOTE: *In communities with different LattisSpan switches that are managed by Optivity network management software, make sure the master switch is running switch software version 1.4.2 (or later). If a master switch is running an earlier version of switch software, Optivity will not manage the switches that are running software version 1.4.2 (or later). To prevent this problem, upgrade the master switch to 1.4.2 (or later) or change the switch priorities in your network so that the switch running version 1.4.2 (or later) is the master switch.*

The Model 28115 switch (a previous version of a BayStack 281xx Fast Ethernet Switch) does not support forced feeder links between switches. The BayStack 28115/ADV and BayStack 28104/ADV switches support forced feeder links between switches only if they are running switch software version 1.4.2 (or later).

The collection of Model 58000 switches that are managed by a particular master switch is defined by the community "boundary." All Model 58000 switches within a community are able to send and receive link-level community management frames. Most network-level routers do not forward link-level segment traffic; therefore, those routers generally define the community boundary between Model 58000 switches.

You can modify the master switch priority using the Switch Parameters menu. To modify the master switch priority, follow these steps:

1. **Choose Configuration Parameters from the Main Menu.**

   The Configuration Parameters menu is displayed.

2. **Choose Switch Parameters from the Configuration Parameters menu.**

   The Switch Parameters menu is displayed.

3. **Choose Modify Switch Priority from the Switch Parameters menu.**

   The system prompts you to enter the new switch priority (0-ffff).

4. **Enter the new switch priority value and press Y to confirm your entry.**

   The change takes place immediately without resetting the switch.

Modifying Port Configurations

You can configure the ports on the Model 58000 switch to operate in various modes. Table 6-6 lists and describes the port configuration options available for 10 Mb/s and 100 Mb/s ports. For detailed descriptions of port configurations, refer to Chapter 2 ,"Planning a Switched Network."

Table 6-6. Port configuration options

Port speed	Configuration options
10 Mb/s (Switch front panel ports)	Duplex mode—ports can operate in half-duplex mode or full-duplex mode. (First 12 ports can only operate in half-duplex mode when connected to the Model 500x backplane.)
	Front/back connection—first 12 ports can be configured for either front connection or backplane connection.
	Port type mode—ports can operate in automatic mode or forced feeder mode.
100 Mb/s (MDA ports)	Duplex mode—ports can operate in half-duplex mode or full-duplex mode.
	Port type mode—ports can operate in automatic mode or forced feeder mode.
	Flow control—Flow control can be enabled or disabled on ports operating at 100 Mb/s in the full-duplex mode.

Modifying Port Duplex Mode

To modify the duplex mode for a switch port, follow these steps:

1. **Choose Configuration Parameters from the Main Menu.**

   The Configuration Parameters menu is displayed.

2. **Choose Switch Parameters from the Configuration Parameters menu.**

   The Switch Parameters menu is displayed.

3. **Choose Modify Switch Port Speed and Duplex Mode from the Switch Parameters menu.**

   A Switch Port Speed and Duplex Mode menu similar to that shown in Figure 6-9 is displayed.

```
                Bay Networks 58000 Ethernet Switch Module
System Up Time: 1 D-12H-22M-11S            IP Address: 134.177.32.98(M)
MAC Address: 000081000201                  Default Gateway: 134.177.32.1
Switch Software Version: 1.4.3             Subnet Mask: 255.255.255.0

                    Switch Port Speed and Duplex Mode

Port    Speed(Mb/s) Duplex Mode        Port    Speed(Mb/s) Duplex Mode
 1      [10 Mb/s Half]                  10      [10 Mb/s Half]
 2      [10 Mb/s Half]                  11      [10 Mb/s Half]
 3      [10 Mb/s Half]                  12      [10 Mb/s Half]
 4      [10 Mb/s Half]                  13      [10 Mb/s Half]
 5      [10 Mb/s Half]                  14      [10 Mb/s Half]
 6      [10 Mb/s Half]                  15      [10 Mb/s Half]
 7      [10 Mb/s Half]                  16      [10 Mb/s Half]
 8      [10 Mb/s Half]                  MDA P1  [100 Mb/s Half]
 9      [10 Mb/s Half]                  MDA P2  [100 Mb/s Half]

                  Change port 1 speed and duplex mode.
    Use cursor keys to choose item. Press <RETURN> to confirm choice.
<CTRL><P>: Main Menu  <CTRL><U>: Previous Menu  <CTRL><L>: Refresh Screen
```

Figure 6-9. Switch Port Speed and Duplex Mode menu

4. Choose the port you want to change.

The system displays the current port speed and duplex mode of that port and prompts you to enter a new speed and duplex mode. The current port mode is highlighted, and the port mode options are displayed unhighlighted.

NOTE: *You cannot change the port speed at this time, however, you can change the port duplex mode.*

5. **Select the new port duplex mode.**

   The system prompts you for confirmation. The modified ports use the new duplex mode immediately.

6. **Repeat steps 4 and 5 for additional ports.**

NOTE: *The first 12 10BASE-T ports cannot be configured for full-duplex mode when they are connected to the Model 500x chassis backplane.*

Modifying Switch Port Front/Back Connection

To modify the switch port front/back connection, follow these steps:

1. **Choose Configuration Parameters from the Main Menu.**

   The Configuration Parameters menu is displayed.

2. **Choose Switch Parameters from the Configuration Parameters menu.**

   The Switch Parameters menu is displayed.

3. **Choose Modify Switch Port Front/Back Connection from the Switch Parameters menu.**

   A Switch Port Front/Back Connection menu similar to that shown in Figure 6-10 is displayed.

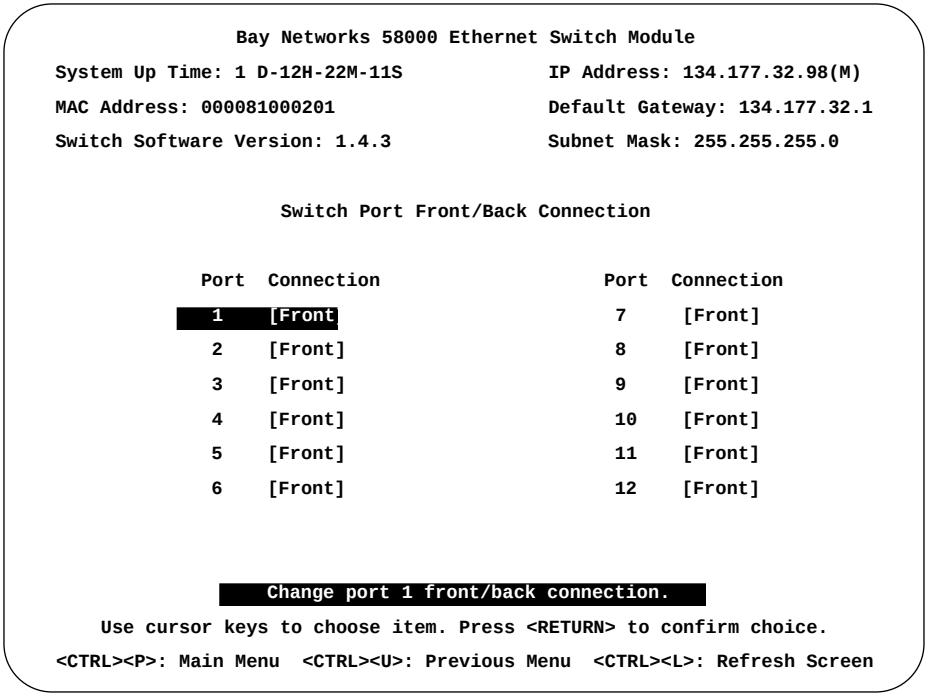


Figure 6-10. Switch Port Front/Back Connection menu

4. Choose the port you want to change.

The system displays the current connection for that port and prompts you to change the connection. The current port connection is highlighted, and the port connection options (either Front or Back) are displayed unhighlighted.

5. Select the new port connection (either Front or Back).

The system prompts you for confirmation. The modified ports use the new port connections immediately.

6. Repeat steps 4 and 5 for additional ports.

Modifying Switch Port Type

To modify the switch port type, follow these steps:

1. **Choose Configuration Parameters from the Main Menu.**

   The Configuration Parameters menu is displayed.

2. **Choose Switch Parameters from the Configuration Parameters menu.**

   The Switch Parameters menu is displayed.

3. **Choose Modify Switch Port Type from the Switch Parameters menu.**

   A Switch Port Type menu similar to that shown in Figure 6-11 is displayed.

```
                    Bay Networks 58000 Ethernet Switch Model
  System Up Time: 1 D-12H-22M-11S              IP Address: 134.177.32.98(M)
  MAC Address: 000081000201                    Default Gateway: 134.177.32.1
  Switch Software Version: 1.4.3               Subnet Mask: 255.255.255.0

                                Switch Port Type

 Port Operational Current Next Boot          Port  Operational Current Next Boot
  1    [Act Feeder] [Auto] [Auto]             10    [Act Feeder] [Auto] [Auto]
  2    [Act Feeder] [Auto] [Auto]             11    [Act Feeder] [Auto] [Auto]
  3    [Act Feeder] [Auto] [Auto]             12    [Act Feeder] [Auto] [Auto]
  4    [Act Feeder] [Auto] [Auto]             13    [Act Feeder] [Auto] [Auto]
  5    [Act Feeder] [Auto] [Auto]             14    [Act Feeder] [Auto] [Auto]
  6    [Act Feeder] [Auto] [Auto]             15    [Act Feeder] [Auto] [Auto]
  7    [Act Feeder] [Auto] [Auto]             16    [Act Feeder] [Auto] [Auto]
  8    [Act Feeder] [Auto] [Auto]           MDA P1 [Act Feeder] [Auto] [Auto]
  9    [Act Feeder] [Auto] [Auto]           MDA P2 [Act Feeder] [Auto] [Auto]

                        Change port type of port 1.
      Use cursor keys to choose item. Press <RETURN> to confirm choice.
   <CTRL><P>: Main Menu  <CTRL><U>: Previous Menu  <CTRL><L>: Refresh Screen
```

Figure 6-11. Switch Port Type menu

4. **Choose the port you want to change.**

   The system displays the current type (Auto or Feeder) for that port and prompts you to change the port type. The current port type is highlighted, and the port type options are displayed unhighlighted.

5. **Select the new port type, either auto or feeder.**

   The system prompts you for confirmation.

NOTE: *The new port type is not used until the Model 58000 is reset. See Resetting the Model 58000 Switch later in this chapter for information about resetting the switch.*

6. **Repeat steps 4 and 5 for additional ports.**

Modifying Switch Port Flow Control

NOTE: *Flow control can be enabled only on 100 Mb/s MDA ports operating in full-duplex mode.*

To modify the switch port flow control, follow these steps:

1. **Choose Configuration Parameters from the Main Menu.**

   The Configuration Parameters menu is displayed.

2. **Choose Switch Parameters from the Configuration Parameters menu.**

   The Switch Parameters menu is displayed.

3. **Choose Modify Switch Port Flow Control from the Switch Parameters menu.**

   A Switch Port Flow Control menu similar to that shown in Figure 6-12 is displayed.

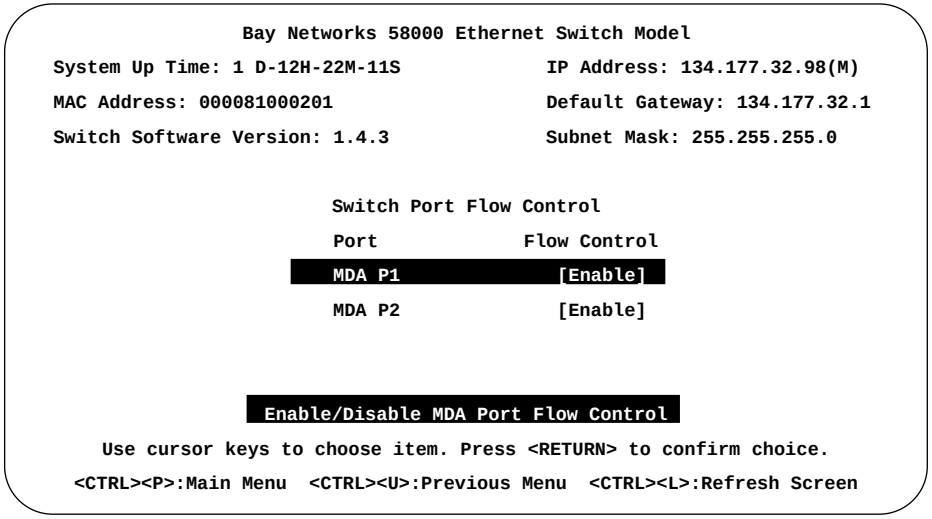


Figure 6-12. Switch Port Flow Control menu

4. Choose the port you want to change.

The system displays the current flow control setting for that port and prompts you to change the setting. The current flow control setting is highlighted, and the other flow control option is displayed unhighlighted.

5. Select the new flow control option, either enable or disable.

The system prompts you for confirmation. The modified ports use the new port flow control settings immediately.

6. Repeat steps 4 and 5 for additional ports.

Displaying and Modifying the Expansion Module Port Configuration

The Modifying Expansion Module Port Configuration menu option is provided only when an expansion module is installed in the Model 58000 switch.You can modify expansion module port duplex mode, port type, and port flow control from this menu.

To display the Modify Expansion Port Configuration menu, follow these steps:

1. **Choose Configuration Parameters from the Main Menu.**

   The Configuration Parameters menu is displayed.

2. **Choose Switch Parameters from the Configuration Parameters menu.**

   The Switch Parameters menu is displayed.

3. **Choose Modify Expansion Module Port Configuration from the Switch Parameters menu.**

   A Modify Expansion Module Port Configuration menu similar to that shown in Figure 6-13 is displayed.

```
                Bay Networks 58000 Ethernet Switch Module
System Up Time: 1 D-12H-22M-11S          IP Address: 134.177.32.98(M)
MAC Address: 000081000201                Default Gateway: 134.177.32.1
Switch Software Version: 1.4.3           Subnet Mask: 255.255.255.0

                  Expansion Module Port Configuration

                  Expansion Card Port Speed and Duplex Mode
                  Expansion Card Port Type
                  Expansion Card Port Flow Control


          Change Expansion Card port speed and duplex mode.
    Use cursor keys to choose item. Press <RETURN> to confirm choice.
<CTRL><P>: Main Menu  <CTRL><U>: Previous Menu  <CTRL><L>: Refresh Screen
```

Figure 6-13. Modify Expansion Module Port Configuration menu

Modifying Expansion Card Port Duplex Mode

To modify the expansion card port duplex mode, follow these steps:

1. **Choose Expansion Card Port Speed and Duplex Mode from the Expansion Module Port Configuration menu.**

   An Expansion Module Switch Port Speed and Duplex Mode menu similar to that shown in Figure 6-14 is displayed.

```
                Bay Networks 58000 Ethernet Switch Module
System Up Time: 1 D-12H-22M-11S              IP Address: 134.177.32.98(M)
MAC Address: 000081000201                    Default Gateway: 134.177.32.1
Switch Software Version: 1.4.3               Subnet Mask: 255.255.255.0

          Expansion Module-Switch Port Speed and Duplex Mode

                          Port Speed(Mb/s) Duplex Mode
                         MDA1 P1    [100 Mb/s Half]
                         MDA1 P2    [100 Mb/s Half]
                         MDA2 P1    [100 Mb/s Half]
                         MDA2 P2    [100 Mb/s Half]
                         MDA3 P1    [100 Mb/s Half]
                         MDA3 P2    [100 Mb/s Half]
                         MDA4 P1    [100 Mb/s Half]
                         MDA4 P2    [100 Mb/s Half]

                    Change Port 1 speed and duplex mode.
   Use cursor keys to choose item. Press <RETURN> to confirm choice.
<CTRL><P>: Main Menu  <CTRL><U>: Previous Menu  <CTRL><L>: Refresh Screen
```

Figure 6-14. Expansion Module-Switch Port Speed and Duplex Mode menu

2. **Choose the port you want to change.**

   The system displays the current duplex mode of that port and prompts you to enter a new speed and duplex mode. The current port mode is highlighted, and the port mode options are displayed unhighlighted.

3. **Select the new port duplex mode.**

   The system prompts you for confirmation. The modified ports use the new duplex mode immediately.

4. **Repeat steps 2 and 3 for additional ports.**

Modifying Expansion Card Port Type

To modify the expansion card port type, follow these steps:

1. **Choose Expansion Card Port Type from the Expansion Module Port Configuration menu.**

   An Expansion Module Port Type menu similar to that shown in Figure 6-15 is displayed.

```
                Bay Networks 58000 Ethernet Switch Module
System Up Time: 1 D-12H-22M-11S              IP Address: 134.177.32.98(M)
MAC Address: 000081000201                    Default Gateway: 134.177.32.1
Switch Software Version: 1.4.3               Subnet Mask: 255.255.255.0

                      Expansion Module Port Type

                  Port        Operational Current Next Boot
                 MDA1 P1      [Act Feeder] [Auto] [Auto]
                 MDA1 P2      [Act Feeder] [Auto] [Auto]
                 MDA2 P1      [Act Feeder] [Auto] [Auto]
                 MDA2 P1      [Act Feeder] [Auto] [Auto]
                 MDA3 P1      [Act Feeder] [Auto] [Auto]
                 MDA3 P2      [Act Feeder] [Auto] [Auto]
                 MDA4 P1      [Act Feeder] [Auto] [Auto]
                 MDA4 P2      [Act Feeder] [Auto] [Auto]

                   Change port type of MDA1 port1.
   Use cursor keys to choose item. Press <RETURN> to confirm choice.
 <CTRL><P>:Main Menu  <CTRL><U>:Previous Menu  <CTRL><L>:Refresh Screen
```

Figure 6-15. Expansion Module Port Type menu

2. **Choose the port you want to change.**

   The system displays the current type for that port and prompts you to change the port type. The current port type is highlighted, and the port type options are displayed unhighlighted.

3. **Select the new port type, either auto or feeder.**

   The system prompts you for confirmation.

NOTE: *The new port type is not used until the Model 58000 switch is reset. See Resetting the Model 58000 Switch later in this chapter for information about resetting the switch.*

4. **Repeat steps 2 and 3 for additional ports.**

Modifying Expansion Card Port Flow Control

Flow control for expansion card ports can be enabled only if the 100 Mb/s MDA ports are configured for full-duplex mode.

To modify the expansion card port flow control, follow these steps:

1. **Choose Expansion Card Port Flow Control from the Expansion Module Port Configuration menu.**

   An Expansion Module-Switch Port Flow Control menu similar to that shown in Figure 6-16 is displayed.

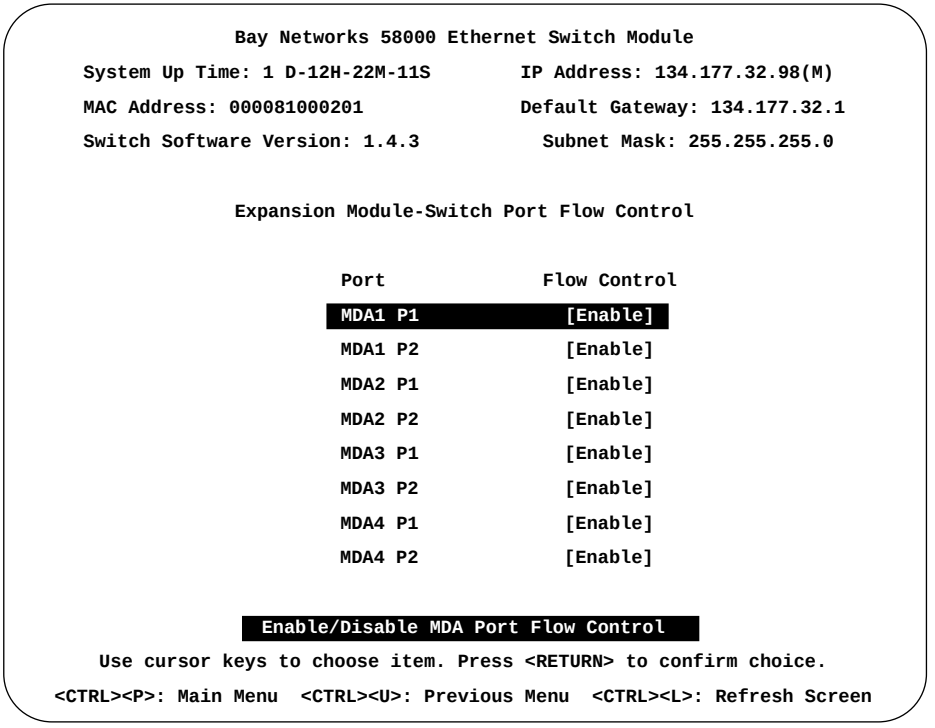


Figure 6-16. Expansion Module-Switch Port Flow Control menu

2. Choose the port you want to change.

The system displays the current flow control setting for that port and prompts you to change the setting. The current flow control setting is highlighted and the other flow control option is displayed unhighlighted.

3. Select the new flow control option, either enable or disable.

The system prompts you for confirmation. The modified ports use the new port flow control settings immediately.

4. Repeat steps 2 and 3 for additional ports.

Displaying and Modifying Boot Parameters

Initially, the Model 58000 switch boots using the information stored in its nonvolatile RAM (NVRAM). The configuration information contained in the local NVRAM specifies the location and name of the image file necessary to boot the Model 58000 switch.

If you want to load a new software image file, you need to specify the image file name and where the image file is stored. You can display and modify the current boot parameters using the Boot Parameters menu.

The Boot Parameters menu provides a list of the current boot parameters and a list of commands for modifying the boot parameters. Table 6-7 lists and describes the boot parameters available in the Boot Parameters menu.

Table 6-7. Boot parameters

Menu option	Description	Change effective
Modify Boot Mode	Specifies the source of the switch boot parameters, either Local or Network (using the BootP protocol) to be used at the next system reset.	Immediately
Modify Image Load Mode	Specifies the source of the switch image file (either Local or Network) to be used at the next system reset.	Immediately
Modify Boot Router IP Address	Allows you to change the boot router IP address.	After reset
Modify TFTP Load Server IP Address	Modifies the IP address of the TFTP load server.	Immediately
Modify TFTP Retry Count	Changes the number of TFTP service request retries before giving up.	Immediately
Modify Image File Name	Modifies the Model 58000 switch image file name to be downloaded.	Immediately

NOTE: *The Boot Parameters menu allows you to specify where the new image is located (local or remote) and the name of the image file. However, you will use the "Download Image" option from the Reset System menu to actually download the image file.*

To modify the boot parameters, follow these steps:

1. **In the Main Menu, choose Configuration Parameters.**
2. **In the Configuration Parameters menu, choose Boot Parameters.**

   A Boot Parameters menu similar to that in Figure 6-17 is displayed.

```
                Bay Networks 58000 Ethernet Switch Module
 System Up Time: 1 D-12H-22M-11S            IP Address: 134.177.32.98(M)
 MAC Address: 000081000201                  Default Gateway: 134.177.32.1
 Switch Software Version: 1.4.3             Subnet Mask: 255.255.255.0

                            Boot Parameters
 Modify Boot Mode [Local]
 Modify Image Load Mode [Local]
 Modify Boot Router IP Address [123.123.11.1]
 Modify TFTP Load Server IP Address [123.123.11.5]
 Modify TFTP Retry Count [5]
 Modify Image File Name [c:\comm\58k11e.img]

                  Change the boot mode to Local or Network.
     Use cursor keys to choose item. Press <RETURN> to confirm choice.
  <CTRL><P>: Main Menu <CTRL><U>: Previous Menu <CTRL><L>: Refresh Screen
```

Figure 6-17. Boot Parameters menu

3. **Choose Modify Boot Mode.**

   The system displays the current boot mode (either network or local) and prompts you change the setting.The current boot mode is highlighted, and the other boot mode option is displayed unhighlighted.

4. **Choose the new boot mode option.**

   The system prompts you for confirmation.

5. **Repeat steps 3 and 4 to modify other boot parameter options.**

   Changes to the boot router IP address are effective only after resetting the Model 58000 switch. All other Boot Mode parameter changes are effective immediately.

NOTE: *To download an image file, set the Modify Image Load Mode to network; then download the image from the Reset System menu.*

Resetting the Model 58000 Switch

Use the Reset System menu to reset the Model 58000 switch. The switch must be reset before the changes to the following parameters can take effect:

- IP address
- Gateway address
- Subnet mask
- Boot router IP address

CAUTION: *Resetting a switch that is connected to other switches in a switch community affects all of the switches in the community. All switches will transition to a configuring mode. During this time, the switches will not forward any frames.*

In addition to resetting the system, the Reset System menu allows you to perform these functions:

- Reset the system to default.
- Download a new boot image file.
- Select a boot image version.
- Schedule the image reboot.
- Cancel a scheduled reset.

To reset the Model 58000 switch without downloading a new boot image file, follow these steps:

1. **In the Main Menu, choose Reset System.**

   A Reset System menu similar to that shown in Figure 6-18 is displayed.

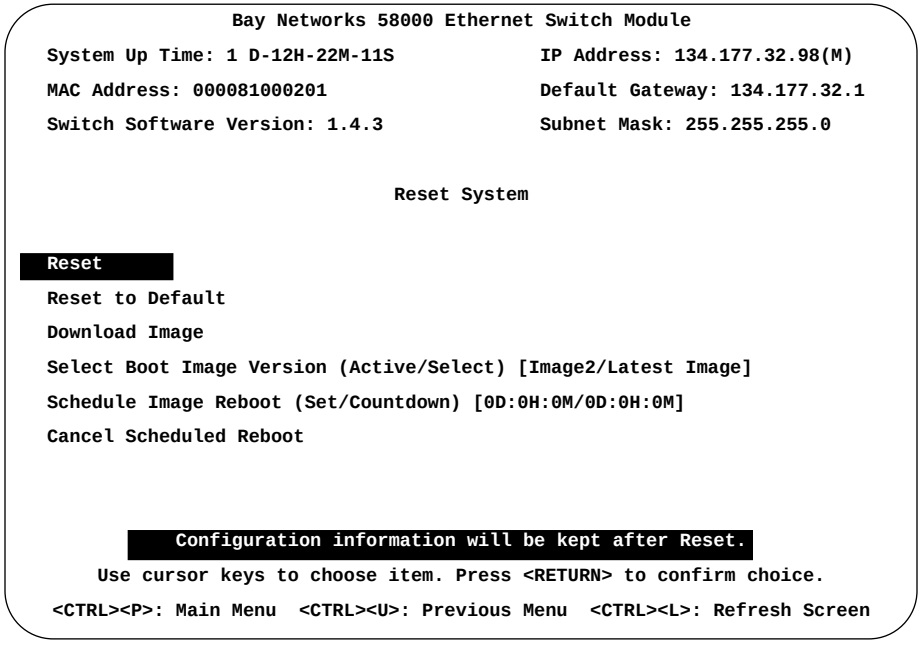


Figure 6-18. Reset System menu

2. **Choose Reset.**

   The Reset System menu displays a line showing Soft Reset and Hard Reset.

NOTE: *A soft reset resets the system quickly without performing internal system diagnostics tests, whereas the hard reset resets the system and performs the internal system diagnostics tests.*

3. **Select either Soft Reset or Hard Reset.**

   The system prompts you to confirm your entry. The Model 58000 switch immediately suspends the transmission of network traffic upon issuance of this command. Network operation is resumed upon completion of the reset.

4. **To reset the system to default, choose Reset to Default from the Reset System menu and press Y to confirm your entry.**

   The Model 58000 switch immediately suspends the transmission of traffic upon issuance of this command and resets the system to the default parameters. Network operation is resumed upon completion of the reset.

Downloading an Image File

You can download a new image file without having to reset the switch by selecting the appropriate option in the Reset System menu.

To download a new image file, follow these steps:

1. **Make sure the load parameters are set correctly, such as the TFTP Load Server IP Address and Image File Name.**

   Refer to Displaying and Modifying Boot Parameters earlier in this chapter for instructions on how to display and modify the image load parameter.

2. **Download Image from the Reset System menu.**

   The system prompts you to confirm your entry. The image file is immediately downloaded.

Selecting Boot Image Version

You can use the Reset System menu to select one of two switch software images to load and execute the next time a switch software image is downloaded. Table 6-8 lists and describes the different images you can select.

Table 6-8. Image option settings

Image options	Description
Image 1	Selects switch software image 1.
Image 2	Selects switch software image 2.
Latest Image	Selects the latest image that is stored in FLASH. The latest image is the image with the latest version number and creation date.

To select the boot image version, follow these steps:

1. **In the Main Menu, choose Reset System.**

   The Reset System menu is displayed.

2. **Choose Select Boot Image Version from the Reset System menu.**

   The Reset System menu displays a line showing Image 1, Image 2, and Latest Image.

3. **Select the image that you want to boot (either Image 1, Image 2, or Latest Image).**

   If the image is valid, the system is booted with that image. If you choose the latest image, the system automatically boots the last image that was built.

Scheduling Image Reboot

To schedule a time to reboot the switch, follow these steps:

1. **Choose Schedule Image Reboot from the Reset System menu.**

   The Reset System menu prompt you to enter the scheduled reboot time.

2. **Enter how much later in days, hours, and minutes the switch will be rebooted (D:H:M). The maximum time for scheduling a reboot is seven days, 23 hours, and 59 minutes.**

   The system reboots when the counter reaches zero.

Canceling Scheduled Reboot

To cancel a scheduled reboot of the system, choose Cancel Schedule Reboot from the Reset System menu. The schedule image reboot time is reset to zero.

The system prompts you to confirm your entry.

Appendix A Technical Specifications

This appendix lists technical specifications and includes a declaration of conformity for the Model 58000 switch.

General Specifications

Network Protocol and Standards Compatibility

IEEE 802.3i 10BASE-T

IEEE 802.3u 100BASE-T

Data Rate and Encoding

Built-in ports:	10 Mb/s Manchester Encoding for 10BASE-T
MDA ports:	100 Mb/s with 4B5B encoding and MLT-3 physical interface for 100BASE-TX
	100 Mb/s with 4B5B encoding and NRZI physical interface for 100BASE-FX

Interfaces

Built-in ports:	RJ-45 connectors for 10BASE-T ports
MDA ports:	RJ-45 connectors for 100BASE-TX MDA ports
	SC fiber optic connectors for 100BASE-FX MDA ports

Electrical Specifications

Power consumption:

Without MDA:	60W @ -48VDC
With MDA:	78W @ -48VDC

Thermal rating:

Without MDA:	205 BTU/Hr.
With MDA:	266 BTU/Hr.

Physical Specifications

Dimensions:	19in x 11in x 2.44in 48.26 cm x 27.94 cm x 6.20 cm
Weight:	5.1 lb 2.3 kg

Environmental Specifications

Operating temperature:	41° to 104° F (5° to 40° C)
Operating humidity:	85% maximum relative humidity, noncondensing
Operating altitude:	Up to 10,000 ft (3,050 m) maximum
Storage temperature:	–13° to 158° F (–25° to 70° C)
Storage humidity:	95% maximum relative humidity

Electromagnetic Emissions

Meets requirements of:

FCC Part 15, Subpart B, Class A

EN55022 (CISPR 22), Class B (shielded cables required)

VCCI Class 1 ITE (shielded AC power cables required)

Electromagnetic Susceptibility

Electrostatic discharge (ESD):	IEC 801-2, Level 3
Electrical fast transient/burst:	IEC 801-4, Level 2
Electrical surge:	IEC 801-5, Level 2/1

Safety Agency Approvals

UL 1950 with D-3 deviations

CSA 22.2 #950 with D-3 deviations

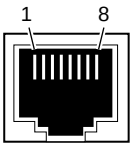
IEC 950 / EN 60 950 (TUV)

Designed to meet UL94-V1 flammability requirements

10BASE-T RJ-45 Pin Assignments (MDI-X)

Table A-1 describes RJ-45 UTP connector assignments (MDI-X).

Table A-1. RJ-45 UTP connector assignments (MDI-X)

Pin assignment	Pin no.	Signal name
 3165.1	1	Receive data +
	2	Receive data -
	3	Transmit data +
	4	Not assigned
	5	Not assigned
	6	Transmit data -
	7	Not assigned
	8	Not assigned

Declaration of Conformity

The following Declaration of Conformity for the Model 58000 10/100 Ethernet Switch complies with ISO/IEC Guide 22 and EN 45014. The declaration identifies the product, the Bay Networks name and address, and the applicable specifications that are recognized in the European community.

Declaration of Conformity to Type

Application of Council Directive(s): EMC Directive 89/336/EEC, Low Voltage Directive 73/23/EEC

Manufacturer's Name: Bay Networks, Inc.

Manufacturer's Address: 4401 Great America Parkway
Santa Clara, CA 95052-8185 USA

declares, that the product,

Product Name: 58000 Frame Switching Sub-System for the System 5000

S/N Range: all

Model Number: 58000

Product Options:

conforms to the following Standards:

Safety: EN60950

EMC: EN50081-1 EN55022 (CISPR 22, Class B)
EN50082-1 IEC 801-2:1984 IEC 801-3:1984 IEC 801-4:1988

The type as described in EC Type-Examination Certificate Number _____, and (or BABT Approval Number, as applicable)

The following Common Technical Regulations and/or normative documents: (or the relevant Standards where National Approvals apply)

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Place: Santa Clara, California, USA

Date: 15 January, 1996

(Signature)

Eddie Pavlu
(Full name)

EMC Group Manager
(Position)

Bay Networks

CE

QAF-132-C

Appendix B LED Functionality

This appendix provides reference information for interpreting the LEDs on the Model 58000 switch.

The Model 58000 switch LED display (see Figure B-1) consists of two matrices of LEDs. The right matrix includes a single bicolor LED (displaying in either green or amber), called the “annunciator,” and a group of bicolor (green and amber) LEDs showing module status and port status.

The left matrix includes bicolor (green and amber) LEDs showing port activity that indicate specific operating conditions for the 10BASE-T ports on the switch.

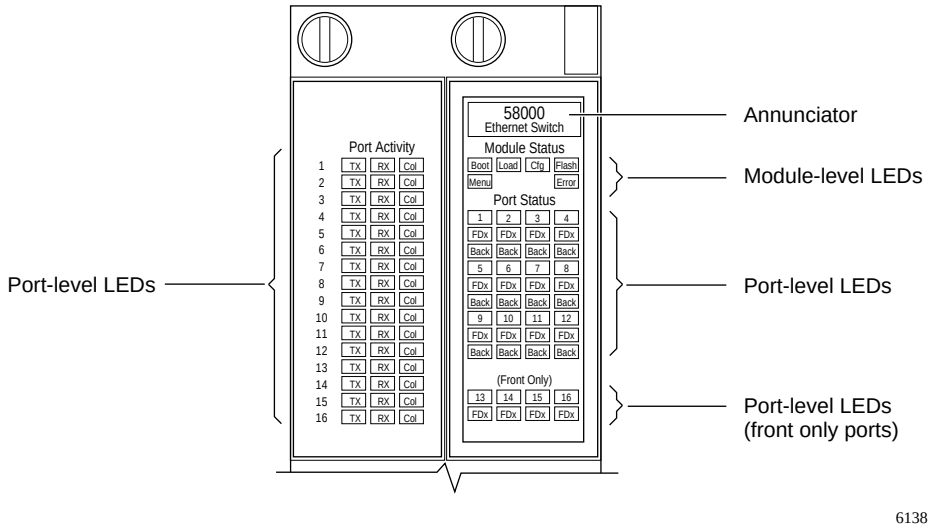


Figure B-1. LED matrices

The right side LED matrix is organized as follows:

- Annunciator, displaying the name of the switch
- Module-level status indicated by the Boot, Load, Cfg, Flash, Menu, and Error LEDs
- Port-level status indicated by the port number, FDx, and Back (for ports 1 to 12) LEDs

The left side LED matrix contains port activity status LEDs indicated by the port number, the TX, RX, and Col LEDs.

Table B-1 summarizes all the Model 58000 switch LEDs.

Table B-1. Model 58000 LEDs

Type	Label	Color	Meaning
Annunciator	58000 Ethernet Switch	Green	Shows status of entire module. Green indicates that the module is functioning properly.
		Amber	Briefly lights amber at system power-up, system reset, and during system self-test. Solid amber indicates that the module configuration could not be verified or some portion of the Model 58000 switch diagnostics failed.
Module Status	Boot	Green	Module is performing self-diagnostics.
		Off	Self-diagnostics is complete.
	Load	Green	Module is performing software image download.
		Off	Software image download is complete.
	Cfg	Green	Module is in configuring mode.
		Off	Module is in operational run mode.
	Flash	Green	Flash erasing is in progress.
		Blinking	Flash erasing is complete and/or module is performing TFTP download.
		Off	TFTP downloading is complete.
	Menu	Amber	Module does not have the proper IP address. User intervention is required.
		Off	No user intervention is required.
	Error	Amber	Module is in a fault/failure state.

Table B-1. Model 58000 LEDs (continued)

Type	Label	Color	Meaning
Port Status	Ports 1 to 12	Green	Port is connected to the Ethernet backplane segment and is operating.
		Amber	The segment is partitioned from the switch through network management or other means.
		Off	Link status of the port is off.
	Ports 13 to 16	Green	Link status of the port is on.
		Amber	The port is partitioned.
		Off	Link status is off.
	FDx	Green	The port is operating in full-duplex mode.
		Off	The port is operating in half-duplex mode.
	Back (Ports 1 to 12)	Green	The port is connected to the backplane.
		Off	The port is connected through the front panel.
Port Activity	TX	Green	Indicates the presence of data in the transmit direction.
		Off	Indicates no data present in the transmit direction.
	RX	Green	Indicates the presence of data in the receive direction.
		Off	Indicates no data present in the receive direction.
	Col	Amber	Indicates collision or congestion.
		Off	Indicates no collision or no congestion.

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