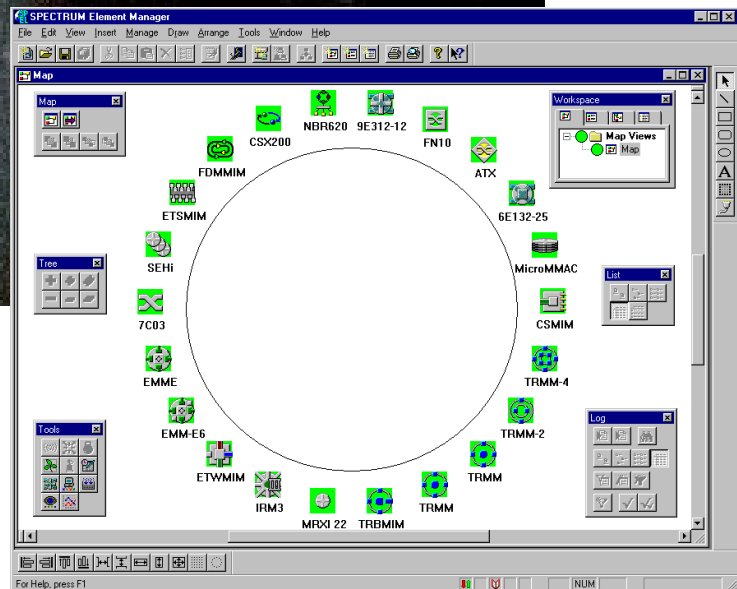
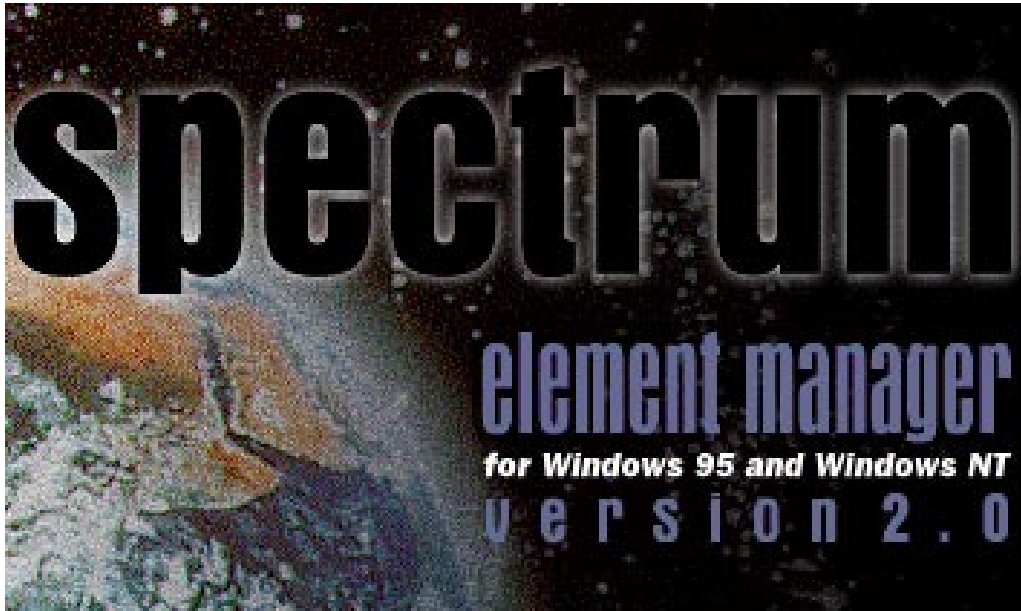


Cabletron Systems



9A128-01™ Management Module Guide for Microsoft® Windows™

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Introduction

How to use this guide; getting help; software conventions; related reading; firmware versions

Welcome to the Cabletron Systems *MMAC-Plus™ Remote Management for the 9A128-01™ User's Guide*. We have designed this document to serve as a simple reference guide for using MMAC-Plus Remote Management for the 9A128-01 FDDI/ATM bridge module. You should read through this guide to fully understand SPECTRUM Element Manager remote management for the 9A128-01.

The **9A128-01 ATM Access Module** provides two bridging interfaces which allow you to connect an external ATM network to either one of the two FDDI networks resident on the MMAC-Plus hub's FNB backplane. External front panel connections are made via a SONET, OC3 ATM interface. The 9A128-01 can be used to aggregate FNB traffic to an ATM backbone, or provide connectivity between ATM workstations and traditional LAN users. The 9A128-01 is an 802.3 LAN Emulation Client (LEC) device and will operate in an 802.3 emulated LAN; see Chapter 6, **LEC Administrator**, in your *SPECTRUM Element Manager Tools Guide* for more information.

IETF RFC 1483 — Multi-Protocol Encapsulation over ATM Adaptation Layer 5 — specifies a number of methods for encapsulating LAN traffic for transmission over ATM networks. Current versions of the 9A128-01 firmware use 802.3 VC-based multiplexing for bridging protocols; the most recent version of firmware (2.10.13) supports ATM Forum LAN Emulation and UNI 3.0/3.1 SVC signaling; future version will add support for Cabletron's SecureFast Switching.

Using This Guide

Each chapter in this guide describes one major functionality or a collection of several smaller functionalities supported by the 9A128-01 module. This guide contains information about software functions which are accessed directly from the Module View; for information about functions which are accessed via the MMAC-Plus Chassis View and/or the console window menu bar, consult the

Installing and Using SPECTRUM Element Manager Guide, Using MMAC+ Remote Management, User's Guide and SPECTRUM Element Manager Tools Guide.

Chapter 1, **Introduction**, provides a list of related documentation, describes certain software conventions, and shows you how to contact Cabletron Systems' Global Call Center. A brief description of the 9A128-01 module is also provided.

Chapter 2, **The 9A128-01 Module View**, describes the visual display of the 9A128-01 and explains how to use the mouse within the Module View; the operation of several device-level management functions — such as changing the port display, enabling and disabling ports, and setting device date and time— is also described here.

Chapter 4, **ATM Configuration**, describes how to configure Permanent Virtual Circuits (PVCs) for the ATM interface(s) available on each device's front panel.

Chapter 5, **FDDI Management**, describes the Configuration, Connection Policy, Station List, and Performance selections available from the FDDI menu. These windows provide information about each module's FDDI FNB connections.

Chapter 6, **Bridging**, provides a comprehensive look at all management options associated with the bridge portion of the 9A128-01, including Bridge Performance Graphs, Spanning Tree, and the Filtering Database.

We assume that you have a general working knowledge of Ethernet, IEEE 802.3, FDDI, ANSI X3T9.5, and ATM Forum type data communications networks and their physical layer components, and that you are familiar with basic bridging and switching concepts.

Related Reading

The 9A128-01 user's guide is only part of a complete document set designed to provide comprehensive information about the features available to you through SPECTRUM Element Manager. Other guides which supply important information related to managing these modules include:

Cabletron Systems' *Installing and Using SPECTRUM Element Manager*

Cabletron Systems' *Using MMAC-Plus Remote Management User's Guide*

Cabletron Systems' *SPECTRUM Element Manager Tools Guide*

Cabletron Systems' *SPECTRUM Element Manager Remote Administration Tools User's Guide*

Cabletron Systems' *Network Troubleshooting Guide*

Microsoft Corporation's *Microsoft Windows User's Guide*

For more information about the capabilities of the 9A128-01, consult the appropriate hardware documentation.

Software Conventions

The SPECTRUM Element Manager user interface contains a number of elements which are common to most windows and which operate the same regardless of which window they appear in. A brief description of some of the most common elements appears below; note that the information provided here is not repeated in the descriptions of specific windows and/or functions.

Common Window Fields

Similar descriptive information is displayed in boxes at the top of most windows in SPECTRUM Element Manager, as illustrated in [Figure 1-1](#), below.

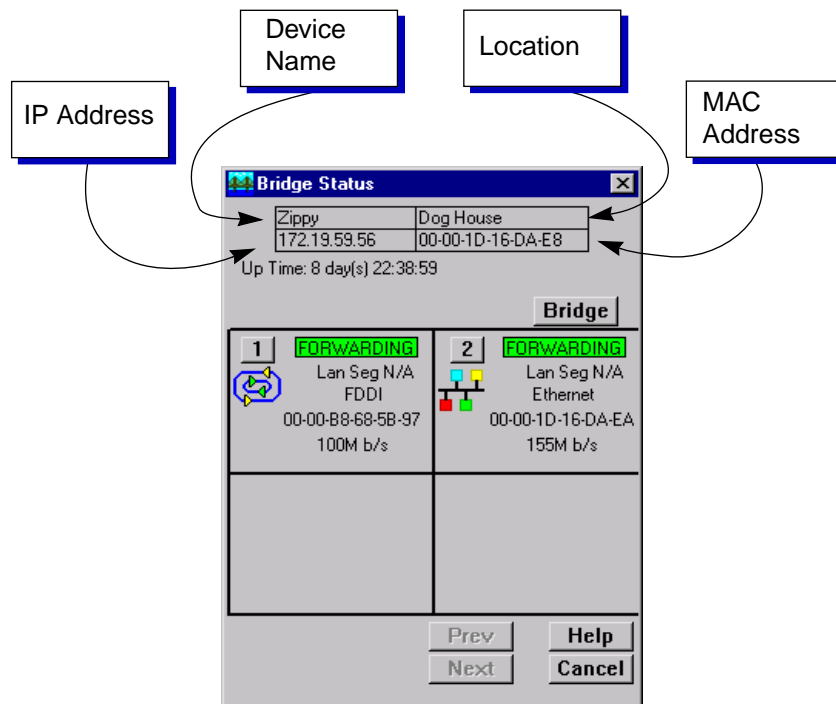


Figure 1-1. Sample Window Showing Group Boxes

Device Name

Displays the user-defined name of the device. The device name can be changed via the System Group window; see the *Generic SNMP User's Guide* for details.

IP Address

Displays the device's IP (Internet Protocol) Address; this will be the IP address used to define the device icon. IP addresses are assigned via Local Management; they cannot be changed via SPECTRUM Element Manager.

Location

Displays the user-defined location of the device. The location is entered through the System Group window; see the *Generic SNMP User's Guide* for details.

MAC Address

Displays the manufacturer-set MAC address of the channel through which SPECTRUM Element Manager is communicating with the device. MAC addresses are factory-set and cannot be altered.

Using Buttons

The **Cancel** button that appears at the bottom of most windows allows you to exit a window and terminate any unsaved changes you have made. You may also have to use this button to close a window after you have made any necessary changes and set them by clicking on an **OK**, **Set**, or **Apply** button.

An **OK**, **Set**, or **Apply** button appears in windows that have configurable values; it allows you to confirm and SET changes you have made to those values. In some windows, you may have to use this button to confirm each individual set; in other windows, you can set several values at once and confirm the sets with one click on the button.

The **Help** button brings up a Help text box with information specific to the current window. For more information concerning Help buttons, see **Getting Help**, below.

The command buttons, for example **Bridge**, call up a menu listing the windows, screens, or commands available for that topic.

Any menu topic followed by ... (three dots) — for example **Statistics...** — calls up a window or screen associated with that topic.

Getting Help

This section describes two different methods of getting help for questions or concerns you may have while using SPECTRUM Element Manager.

Using On-line Help

You can use the **Help** buttons to obtain information specific to a particular window. When you click on a Help button, a window will appear which contains context-sensitive on-screen documentation that will assist you in the use of the windows and their associated command and menu options. Note that if a Help button is grayed out, on-line help has not yet been implemented for the associated window.

From the **Help** menu accessed from the Module View window menu bar, you can access on-line Help specific to the Module View window, as well as bring up the Chassis Manager window for reference. Refer to Chapter 2 for information on the Module View and Chassis Manager windows.



*All of the SPECTRUM Element Manager help windows use the standard Microsoft Windows help facility; if you are unfamiliar with this feature of Windows, you can select **Help** —>**How to Use Help** from the console window menu bar, or consult your Microsoft Windows **User's Guide**.*

Getting Help from the Cabletron Systems Global Call Center

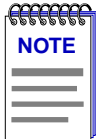
If you need technical support related to SPECTRUM Element Manager, or if you have any questions, comments, or suggestions related to this manual or any of our products, please feel free to contact the Cabletron Systems Global Call Center via one of the following methods:

By phone:	Monday through Friday between 8 AM and 8 PM Eastern Standard Time at (603) 332-9400.
By mail:	Cabletron Systems, Inc. PO Box 5005 Rochester, NH 03866-5005
By Internet mail:	support@ctron.com
FTP:	ftp.ctron.com (134.141.197.25)
Login	anonymous
Password	your email address
By BBS:	(603) 335-3358
Modem Setting	8N1: 8 data bits, 1 stop bit, No parity

For additional information about Cabletron Systems products, visit our World Wide Web site: <http://www.cabletron.com/>. For technical support, select **Service and Support**.

Firmware Versions Supported

SPECTRUM Element Manager support for the 9A128-01 module has been tested against firmware versions up to 2.10.13. If you have an earlier version of firmware and experience problems, contact Cabletron Systems Global Call Center for upgrade information.



As a general rule, firmware versions for new products are liable to change rapidly; contact Cabletron Systems Global Call Center for upgrade information for the latest customer release of firmware.

The 9A128-01 Module View

Information displayed in the Module View window; the Chassis Manager window; hub management functions


The 9A128-01 Module View window is the main screen that immediately informs you of the current configuration of your 9A128-01 via a graphical display of the two bridge ports and the FDDI A and B ports which provide connectivity to the FNB backplane. (The Module View does not currently provide a display which reflects the status of the front panel ATM ports.) The Module View window serves as a single point of access to all other 9A128-01 windows and screens, which are discussed at length in the following chapters.

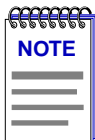
To access the 9A128-01 Module View window, you can either double-click on the appropriate device icon (as illustrated in [Figure 2-1](#), below), or use the following menu or toolbar options:



9A128-01

Figure 2-1. 9A128-01 Icon

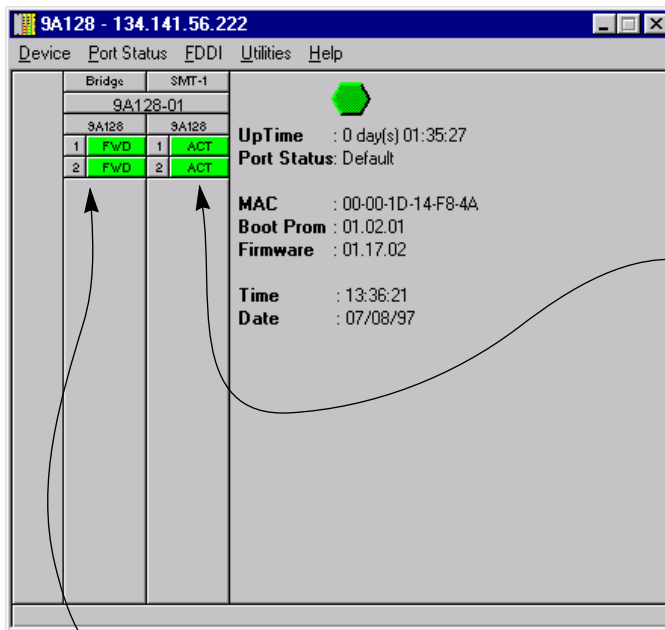
1. Using the mouse, click on the **9A128-01** icon to be monitored. The icon will be highlighted. (Note that all MMAC-Plus devices share an icon.)
2. Select **Manage** → **Node** from the primary window menu bar, or select  from the toolbar; the Module View window will appear.



*To model your 9A128-01 ATM Access Module as an individual device, you must select Chassis Manager mode from the window that appears when you launch the icon. Refer to your **Using MMAC-Plus Remote Management Guide** for information on how to access the module view from the MMAC-Plus Chassis View.*

Viewing Module Information

The 9A128-01 Module View window (Figure 2-2) provides a graphic representation of the 9A128-01, including a color-coded port display which immediately informs you of the current configuration and status of each port.

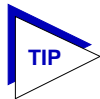



FDDI Port Status:
Ports 1 and 2 are the A and B port connections to the FNB FDDI backplane.

Bridge Port Status:
Port 1 = FDDI Backplane interface
Port 2 = Front Panel ATM interface

Figure 2-2. 9A128-01 Module View Window

By clicking in designated areas of the device graphical display (as detailed later in this chapter), or by using the menu bar at the top of the Module View window, you can access all of the menus that lead to more detailed device and port information.



When you move the mouse cursor over a management "hot spot," the cursor icon will change into a hand symbol  to indicate that clicking in the current location will bring up a management option.

Front Panel Information

In addition to the main interface display, the Module View window provides the following device information:

IP

The Module View window title displays the device's IP (Internet Protocol) Address; this will be the IP address you have used to create the 9A128-01 module in the Chassis Setup window, or the IP address used to create the device icon. IP addresses are assigned via Local Management, and cannot be changed via SPECTRUM Element Manager. Note that although each interface on the 9A128-01 module has its own MAC, or physical, address, only a single IP address is assigned.

Connection Status

This color-coded area indicates the current state of communication between SPECTRUM Element Manager and the 9A128-01.

- **Green** indicates the 9A128-01 is responding to device polls (valid connection).
- **Magenta** indicates that the 9A128-01 is in a temporary stand-by mode while it responds to a physical change in the hub (a board is inserted or removed or a board's FNB connection has been reconfigured); note that board and port menus are inactive during this stand-by state.
- **Blue** indicates an unknown contact status – polling has not yet been established with the 9A128-01.
- **Red** indicates the 9A128-01 is not responding to device polls (device is off line, or device polling has failed across the network for some other reason).

UpTime

The amount of time, in a days hh:mm:ss format, that the 9A128-01 has been running since the last start-up.

Port Status

Indicates the Port Status display selection currently in effect for the FDDI port display. The default port status view is connection status; if you have not changed the port status selection since launching the Module View window, this field will display **Default**. For more information about changing the port status display, see [Selecting a Port Status View](#) on page 2-9.

MAC

The physical layer address assigned to the interface through which SPECTRUM Element Manager is communicating with the device. Note that each interface on the 9A128-01 module has its own MAC address; these addresses are hard-coded in the device, and are not configurable.

Boot Prom

The revision of BOOT PROM installed in the 9A128-01.

Firmware

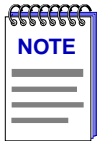
The revision of device firmware stored in the 9A128-01's FLASH PROMs.

Time

The current time, in a 24-hour hh:mm:ss format, set in the 9A128-01's internal clock.

Date

The current date, in an mm/dd/yy format, set in the 9A128-01's internal clock.



You can set the date and time by using the *Edit Device Date* and *Edit Device Time* options on the Device menu; see *Setting Device Date and Time*, page 2-20, for details.

Menu Structure

By clicking on various areas of the 9A128-01 Module View display, you can access menus which provide access to FDDI, ATM, MMAC-Plus chassis and bridging configuration and performance information, as well as utility applications and general device management functions. The following illustration displays the menu structure and indicates how to use the mouse to access the various menus:

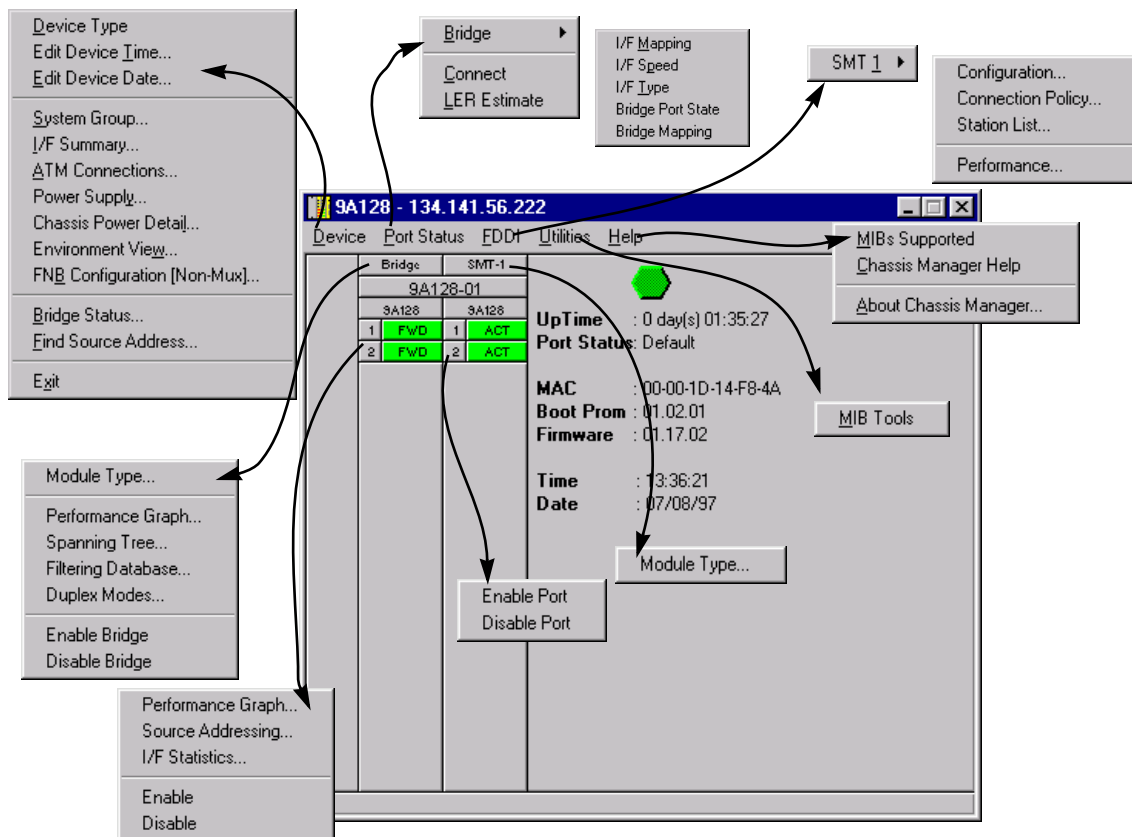


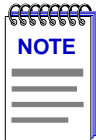
Figure 2-3. 9A128-01 Module View Menu Structure

The Device Menu

From the Device Menu at the Module View window menu bar, you can access the following selections:

- **Device Type...**, which displays a window containing a description of the device being modeled: 9A128-01, ATM/FDDI Bridge, with 1 ATM and 1 FNB connection
- **Edit Device Time** and **Edit Device Date**, which allow you to set the 9A128-01's internal clock.
- **System Group...**, which allows you to manage the 9A128-01 via SNMP MIB II. Refer to the *Generic SNMP User's Guide* for further information.
- **I/F Summary**, which lets you view statistics (displayed both graphically and numerically) for the traffic processed by each network interface on your device, and provides access to some SNMP MIB-II windows. See **Viewing I/F Summary Information**, page 2-14, for details.

- **ATM Connections**, which launches the window that allows you to view and configure Permanent Virtual Circuits (PVCs) for the 9A128-01's front panel ATM interfaces. For more information about configuring PVCs, see Chapter 3, **ATM Configuration**.



The next four menu options will appear depending on the configuration and services available in the MMAC-Plus chassis that this module is inserted within; for more information on management operations directly related to the monitoring and control of the MMAC-Plus Chassis, see the *Cabletron Systems Using MMAC-Plus Remote Management Guide*.

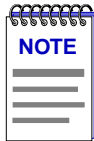
- **Power Supply...** which launches the Power Supply window that displays information about each power supply and its associated cooling fan in your MMAC-Plus chassis. You can also control the operation of the cooling fan from this window; see the *Cabletron Systems Using MMAC-Plus Remote Management Guide* for more information.
- **Chassis Power Detail...** which launches the Chassis Power Detail window that displays information about the power subsystem of the MMAC-Plus chassis; see the *Cabletron Systems Using MMAC-Plus Remote Management Guide* for more information.
- **Environment View...** which launches the Environment View window which provides information of the environmental conditions associated with the modules in the MMAC-Plus chassis; see the *Cabletron Systems Using MMAC-Plus Remote Management Guide* for more information.
- **FNB Configuration (Non-Mux)...** which launches the FNB Configuration window that displays and allows you to configure your FNB's current configuration; see the *Cabletron Systems Using MMAC-Plus Remote Management Guide* for more information.
- **Bridge Status...**, which opens a window that provides an overview of bridging information for each port, and allows you to access all other bridge-related options. Refer to Chapter 5, **Bridging**, for more information.
- **Find Source Address...**, which opens a window that allows you to search the 9A128-01's 802.1d Filtering Database to determine which bridging interface a specified source MAC address is communicating through. If the MAC address is detected as communicating through the bridge, the port display will flash to indicate the bridge interface of interest.
- **Exit**, which closes the 9A128-01 Module View window.

The Port Status Menu

The Port Status menu allows you to select the status information that will be displayed in the Bridge and FDDI port text boxes in the Module View window:

- **Bridge** allows you to select one of five status type displays for the bridge ports: I/F Mapping, I/F Speed, I/F Type, Bridge Port State, or Bridge Mapping.

- **C**onnect will display the each FDDI port's connection status.
- **L**ER Estimate will display the cumulative long term average of the bit error rate for each FDDI port, which represents the quality of the physical link.



When you select the LER Estimate port status display, this port status display will be reflected in both the bridge and FDDI ports. The FDDI ports will display the LER Estimate while the bridge ports will display the Percent Errors.

For more information on the bridge and FDDI port display options available via this menu, see **Selecting a Port Status View**, [page 2-9](#).

The FDDI Menu

The FDDI menu provides the following options, which allow you to monitor and manage the 9A128-01's connection to the FNB FDDI backplane:

- **C**onfiguration
- **C**onnection Policy
- **S**tation List
- **P**erformance

Refer to Chapter 4, **FDDI Management**, for details on these options.

The Utilities Menu

The Utilities menu provides access to the MIBTools utility, which provides direct access to the 9A128-01's MIB information. The MIB Tools selection is also available from the **Tools** menu at the top of the SPECTRUM Element Manager primary window; refer to your *Tools Guide*, included in this package, for a thorough explanation of the MIB Tools utility.

The Help Menu

The Help Menu has three selections:

- **MIBs Supported**, which brings up the Chassis Manager window, described on [page 2-12](#).
- **Chassis Manager Help**, which brings up a help window with information specifically related to using the Chassis Manager and Module View windows.
- **About Chassis Manager...**, which brings up a version window for the Chassis Manager application in use.

The Board Menus

The Board menu labeled **Bridge** provides access to most of the available bridging-related selections, which are also available from the Bridge Status window:

- **Module Type...**, which brings up a window containing a description of the 9A128-01 board; see **Viewing Hardware Types**, [page 2-13](#).
- **Performance Graph...**, which visually displays performance between all bridging ports on the 9A128-01; see Chapter 5, **Bridging**.
- **Spanning Tree...**, which allows you to set bridge parameters when it is operating using the Spanning Tree Algorithm (STA) – the method that bridges use to decide the controlling (root) bridge when two or more bridges are installed in parallel; see Chapter 5, **Bridging**, for more information.
- **Filtering Database...**, which allows you to monitor and manage bridge forwarding and filtering across each port of the 9A128-01; see **Chapter 5** for details.
- **Duplex Modes...**, which allows you to set Duplex Mode operation for standard Ethernet interfaces on your 2E42; see Chapter 5, **Bridging**.
- **Enable/Disable Bridge**, which enables or disables bridging across the entire 9A128-01.

The menu accessed from the FNB label provides only the **Module Type** option.

The Port Menus

The port menu selections vary according to the port's functionality. The menu for the two bridging ports offers the following selections:

- **Performance Graph...**, which brings up windows that visually display bridging performance at the selected port; see Chapter 5, **Bridging**, for details.
- **Source Addressing...**, which launches a window displaying the MAC addresses of all devices communicating through the selected bridging interface; see Chapter 5, **Bridging**, for details.
- **I/F Statistics...**, which launches a Statistics window, which displays interface statistics for the port; see Chapter 5, **Bridging** for details.
- **Enable/Disable**, which administratively turns the selected bridging port on or off; see **Enabling and Disabling Ports**, [page 2-21](#), for more information.

The FDDI port menus offer only two selections: **Enable Port**, and **Disable Port**. Note that you can enable and disable the A and B ports separately, if you wish; disabling only one of the pair, however, will cause a wrap condition.

Port Status Displays

When you open the Module View, each bridge port on the 9A128-01 will by default display the bridge port state (defined below); to change the bridge port status display, select the Bridge option on the Port Status menu, and drag right to select one of the available bridge port status display options; as described below.

Initially, each FDDI port on the 9A128-01 will by default display its current connection status (defined below); to change this status display, select the Connect or LER Estimate option on the Port Status menu, as described in the following section. Note that the status display of the bridge ports will remain the same when you change the port status display of the FDDI Ports to Connect; however, when you change the port status display of the FDDI Ports to LER Estimate, the bridge ports will display Percent Errors.

Selecting a Port Status View

To change the status view of your ports:

1. Click on **Port Status** on the menu bar at the top of the Module View window; a menu will appear.
2. Drag down to **Bridge**, and to the right to select the bridge port status information you want to display. The bridge port text boxes will display the appropriate status information.

and/or

Drag down to select the FDDI port status information you want to display. The FDDI port text boxes will display the appropriate status information.

Bridge Port Status Displays

You can choose from 5 different bridge port display options:

I/F Mapping

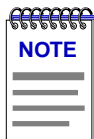
If you choose the **I/F Mapping** mode, the interface boxes will display the interface number (ifIndex) associated with each bridge port on the 9A128-01 module.

I/F Speed

If you choose the **I/F Speed** mode, the interface boxes will display the bandwidth of each individual bridge port on the 9A128-01 module; e.g., 100 Mbits/sec.

I/F Type

If you choose the **I/F Type** mode, the interface boxes will display the interface type of each bridge port on the 9A128-01 module; e.g., Eth (Ethernet).



The Bridge Port State and Bridge Mapping status modes will not be supported for devices which have been configured for SecureFast switching.

Firmware versions 2.10.13 and earlier do not support the ability to select SecureFast switching; if you have a later version of firmware, check your hardware manual to see if your version of firmware supports this feature. The toggle from traditional bridging to SecureFast switching is performed via Local Management; see your Local Management documentation for details.

Bridge Port State

If you choose the **Bridge Port State** mode, a bridge port is considered:

- FWD (Forwarding) if the port is on-line and forwarding packets across the 9A128-01 from one network segment to another.
- DIS (Disabled) if bridging at the port has been disabled by management; no traffic can be received or forwarded on this port, including configuration information for the bridged topology.
- LRN (Learning) if the Forwarding database is being created, or the Spanning Tree Algorithm is being executed because of a network topology change. The port is monitoring network traffic, and learning network addresses.
- LIS (Listening) if the port is not adding information to the filtering database. It is monitoring Bridge Protocol Data Unit (BPDU) traffic while preparing to move to the forwarding state.
- BLK (Blocking) if the port is on-line, but filtering traffic from going across the 9A128-01 from one network segment to another. Bridge topology information will be forwarded by the port.
- BRK (Broken) if the physical interface has malfunctioned.

Bridge Mapping

If you have selected the Bridge Mapping status mode, the port display will alter to show the physical interface index (ifIndex) associated with each front panel bridge port.

Bridge Port Status Color Codes

The Bridge Port Status Display options will use the following color code, regardless of which bridge port status option is selected: green = forwarding, blue = disabled, magenta = learning and listening, orange = blocking, and red = broken.

The FDDI Port Status Displays

When you open the Module View, each FDDI port on the 9A128-01 will by default display its current connection status (defined below); to change this status display, select one of the options on the Port Status menu, as described in the previous section.

FDDI port status view options are:

Connection State

The Connection State port display form indicates the port's connection status:

- **CON** (connecting): the port is trying to establish a link, but has not yet been successful. Ports which are not connected and which have not been disabled by management will display this status.
- **ACT** (active): the port has been enabled by management and has successfully established a link.
- **SBY** (standby): the port has a physical link, but the SMT Connection Policy is prohibiting a logical connection to the ring because the attempted connection is illegal. FDDI protocol always forbids connecting two master ports; all other connections are theoretically legal, although some are not desirable. You can view the SMT Connection Policy by selecting the **SMT Connection Policy** option from the **FDDI** menu; for more information, see Chapter 4, **FDDI Management**.
- **DIS** (disabled): the port has been disabled by management; note that this status does not indicate whether or not there is a physical link connected to the port.

LER Estimate

The Link Error Rate (LER) Estimate port display form displays a cumulative long term average of the bit error rate, which represents the quality of the physical link. It is computed when the port is connected and every 10 seconds thereafter. The value of the LER Estimate can range from 10^{-4} to 10^{-15} , but it is always displayed as the absolute value of the exponent; for example, if the port's LER Estimate is computed to be 10^{-5} , the value displayed in the Port Status box will be 5.0, which represents an actual rate of 1,250 bit errors per second. The lower LER Estimate numbers represent the highest bit error rates, as summarized in the figure below.

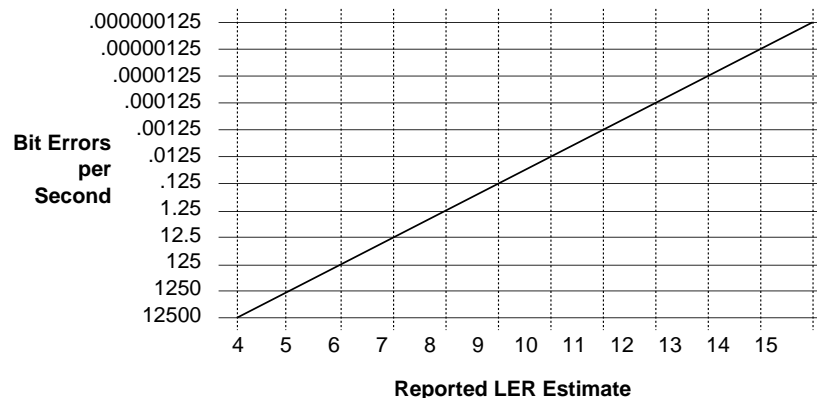
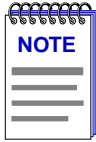


Figure 2-4. LER Estimate Values



The bridge ports will display **Percent Errors** when the LER Estimate port status display is selected. Percent Errors are calculated by the following formula: $(ErrorPkts / (ErrorPkts + ValidPkts)) * 100$, where **Error Pkts** = *IfInErrors* + *IfOutErrors* + *ifInDiscards* + *ifOutDiscards* + *ifInUnknownProtos* and **ValidPkts** = *ifInUcastPkts* + *ifOutUcastPkts* + *ifInNUcastPkts* + *ifOutNUcastPkts*.

FDDI Port Status Color Codes

FDDI port status color codes always reflect the port's connection status, even when the LER Estimate port display form has been selected. Under that color coding scheme:

- CON (Connecting) = yellow
- ACT (Active) = green
- SBY (Standby) = red
- DIS (Disabled) = red

The Chassis Manager Window

Like most networking devices, Cabletron's devices draw their functionality from a collection of proprietary MIBs and IETF RFCs. In addition, Cabletron's newer intelligent devices – like the 9A128-01 – organize their MIB data into a series of “components.” A MIB component is a logical grouping of MIB data, and each group controls a defined set of objects. For example, 9A128-01 bridging information is organized into its own component; FDDI and ATM information resides in two separate components, one for each of the 9A128-01's interfaces. Note, too, that there is no one-to-one correspondence between MIBs and MIB components; a single MIB component might contain objects from several different proprietary MIBs and RFCs.

The Chassis Manager window, [Figure 2-5](#), is a read-only window that displays the MIBs and the MIB components — and, therefore, the functionality — supported by the currently monitored device.

To view the Chassis Manager window:

1. Click on **Help** on the far right of the menu bar at the top of the chassis manager window.
2. Drag down to **MIBs Supported**, and release.

The MIBs which provide the 9A128-01's functionality — both proprietary MIBs and IETF RFCs — are listed here

MIB Components are listed here; remember, there's no one-to-one correspondence between MIBs and MIB Components

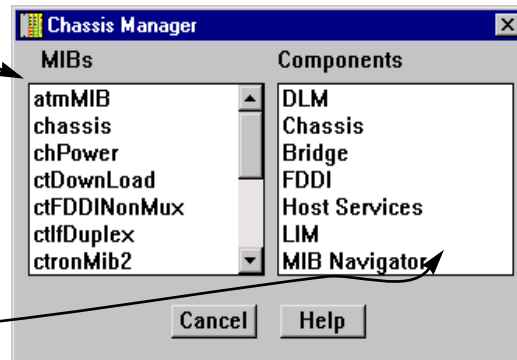


Figure 2-5. Chassis Manager Window

Viewing Hardware Types

In addition to the graphical displays described above, menu options provide specific information about the physical characteristics of ports in the 9A128-01, as well as information about the 9A128-01 module itself.

Device Type

Choosing the **Device Type** option on the Device menu brings up a window that describes the management device being modeled:



Figure 2-6. Device Type Window

Module Type

From the Board menus labeled Bridge and FNB on the 9A128-01 Module View window, you can view a description of the Module type: for the 9A128-01, the same information provided in the Device Type window.

To view the Module type:

1. Click on the **Bridge** or **FNB Board label**. The Board menu will appear.
2. Drag down to **Module Type....** The Module Type text box, [Figure 2-7](#), will appear.



Figure 2-7. Module Type Window

Viewing I/F Summary Information

The **I/F Summary** option available from the Device menu lets you view statistics (displayed both graphically and numerically) for the traffic processed by each network interface on your device. The window also provides access to a detailed statistics window that breaks down Transmit and Receive traffic for each interface.

To access the I/F Summary window:

1. From the Module View, click on the **Device** option from the menu bar.
2. Drag down to **I/F Summary** and release. The I/F Summary window, [Figure 2-8](#), will appear.

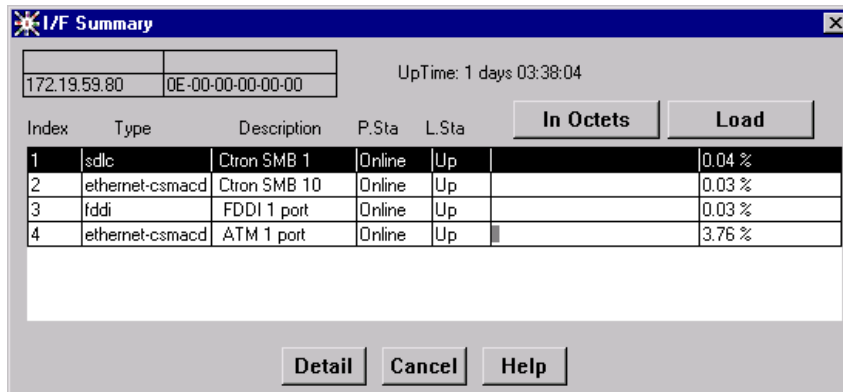


Figure 2-8. I/F Summary Window

The I/F Summary window provides a variety of descriptive information about each interface on your device, as well as a bar graph and statistics which display each interface's performance.

The following descriptive information is provided for each interface.

UpTime

The **UpTime** field lists the amount of time, in a days, hh:mm:ss format, that the device has been running since the last start-up.

Index

The index value assigned to each interface on the device.

Type

The type of the interface, distinguished by the physical/link protocol(s) running immediately below the network layer. Possible values are **sd1c** (for the MMAC-Plus SMB 1 proprietary management backplane), **ethernet-csmacd** (for the MMAC-Plus SMB 10 ethernet management backplane), **fddi** (for the FDDI FNB interface), and **atm** (for the front panel ATM connection).

Description

A text description of the interface: **Ctron SMB** (for the MMAC-Plus SMB 1 and SMB 10 management backplane interfaces); **FDDI** (for the FDDI FNB interface), or **ATM**.

P. Sta

Displays the current physical status — or operational state — of the interface: **Online** or **Offline**.

L. Sta

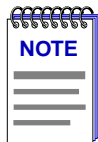
Displays the current logical status — or administrative state — of the interface: **Up** or **Down**.

Interface Performance Statistics/Bar Graphs

The statistical values and accompanying bar graphs to the right of the interface description fields provide a quick summary of interface performance. You can select the statistical value you want to display and the units in which you want those values displayed by using the two menu buttons directly above the graphs, as follows:

1. Click on the right menu button to select the unit in which you wish to display the selected statistic: , , Or .
2. Once you have selected the base units, click on the left menu button to specify the statistic you'd like to display. (The options from this menu will vary depending on the base units you have selected.)

After you select a new display mode, the statistics and graphs will refresh to reflect the current choice, as described below.



*Bar graphs are only available when **Load** is the selected base unit.*

Raw Counts

The total count of network traffic received or transmitted on the indicated interface since device counters were last reset. Raw counts are provided for the following parameters.

In Octets	Octets received on the interface, including framing characters.
In Packets	Packets (both unicast and non-unicast) received by the device interface and delivered to a higher-layer protocol.
In Discards	Packets received by the device interface that were discarded even though no errors prevented them from being delivered to a higher layer protocol (e.g., to free up buffer space in the device).
In Errors	Packets received by the device interface that contained errors that prevented them from being delivered to a higher-layer protocol.
In Unknown	Packets received by the device interface that were discarded because of an unknown or unsupported protocol.
Out Octets	Octets transmitted by the interface, including framing characters.
Out Packets	Packets transmitted, at the request of a higher level protocol, by the device interface to a subnetwork address (both unicast and non-unicast).
Out Discards	Outbound packets that were discarded by the device interface even though no errors were detected that would prevent them from being transmitted. A possible reason for discard would be to free up buffer space in the device.
Out Errors	Outbound packets that could not be transmitted by the device interface because they contained errors.

Load

The number of bytes processed by the indicated interface during the last poll interval in comparison to the theoretical maximum load for that interface type (1 Mbps for the SMB 1 management backplane; 10 Mbps for the SMB 10 ethernet

management backplane; 100 Mbps for FDDI; or 155 Mbps for ATM). Load is further defined by the following parameters.

In Octets	The number of bytes received by this interface, expressed as a percentage of the theoretical maximum load.
Out Octets	The number of bytes transmitted by this interface, expressed as a percentage of the theoretical maximum load.

Rate

The count for the selected statistic during the last poll interval. The available parameters are the same as those provided for Raw Counts. Refer to the Raw Counts section, above, for a complete description of each parameter.

Interface Statistics Window

The Interface Statistics window ([Figure 2-9](#)) provides MIB-II interface statistical information — including counts for both transmit and receive packets, and error and buffering information — for each available port interface. Color-coded pie charts also let you graphically view statistics for both received and transmitted Unicast, Non-Unicast, Discarded, and Error packets.

To open the Interface Statistics window:

1. In the I/F Summary window, click to select the interface for which you'd like to view more detailed statistics.
2. Click on **Detail**. The appropriate Interface Statistics window, [Figure 2-9](#), will appear.

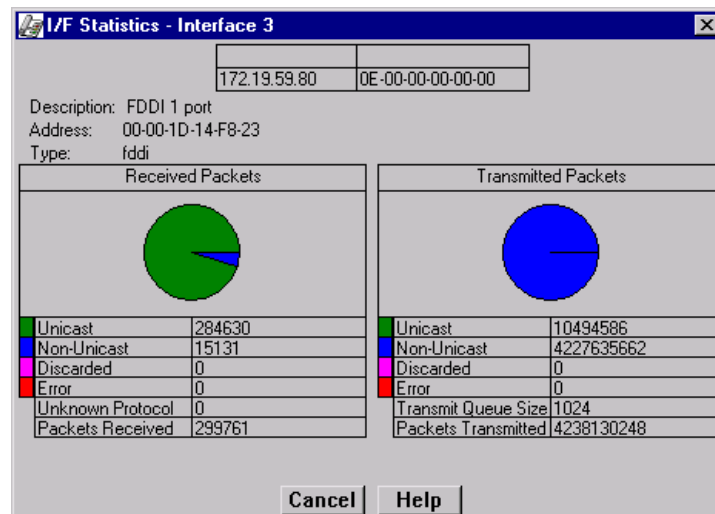


Figure 2-9. Interface Statistics Window

Three informational fields appear in the upper portion of the window:

Description

Displays the interface description for the currently selected port: Ctron SMB 1, Ctron SMB 10, FDDI, or ATM.

Address

Displays the MAC (physical) address of the selected port.

Type

Displays the interface type of the selected port: sdlc (for SMB 1), ethernet-csmacd (for SMB 2), fddi, or atm.

The lower portion of the window provides the following transmit and receive statistics; note that the first four statistics are also graphically displayed in the pie charts.

Unicast

Displays the number of packets transmitted to or received from this interface that had a single, unique destination address. These statistics are displayed in the pie chart, color-coded green.

Non-Unicast

Displays the number of packets transmitted to or received from this interface that had a destination address that is recognized by more than one device on the network segment. The non-unicast field includes a count of broadcast packets — those that are recognized by *all* devices on a segment. These statistics are displayed in the pie chart, color-coded dark blue.

Discarded

Displays the number of packets which were discarded even though they contained no errors that would prevent transmission. Good packets are typically discarded to free up buffer space when the network becomes very busy; if this is occurring routinely, it usually means that network traffic is overwhelming the device. To solve this problem, you may need to re-configure your bridging parameters, or perhaps re-configure you network to add additional bridges or switches. Consult the Cabletron Systems *Network Troubleshooting Guide* for more information.

These statistics are displayed in the pie chart, color-coded magenta.

Error

Displays the number of packets received or transmitted that contained errors. These statistics are displayed in the pie chart, color-coded red.

Unknown Protocol (Received only)

Displays the number of packets received which were discarded because they were created under an unknown or unsupported protocol.

Packets Received (Received only)

Displays the number of packets received by the selected interface.

Transmit Queue Size (Transmit only)

Displays the number of packets currently queued for transmission from this interface. The amount of device memory devoted to buffer space, and the traffic level on the target network, determine how large the output packet queue can grow before the 9A128-01 will begin to discard packets.

Packets Transmitted (Transmit only)

Displays the number of packets transmitted by this interface.

Making Sense of Interface Statistics

The statistics available in this window can give you an idea of how an interface is performing; by using the statistics in a few simple calculations, it's also possible to get a sense of an interface's activity level:

To calculate the percentage of input errors:

Received Errors /Packets Received

To calculate the percentage of output errors:

Transmitted Errors /Packets Transmitted

To calculate the total number of inbound and outbound discards:

Received Discards + Transmitted Discards

To calculate the percentage of inbound packets that were discarded:

Received Discards /Packets Received

To calculate the percentage of outbound packets that were discarded:

Transmit Discards /Packets Transmitted

Using the Find Source Address Feature

You can select the Find Source Address option to discover which bridging interface a specified source MAC address is communicating through. When you select the Find Source Address option, a search is made of the 802.1d Bridge Filtering Database to discover the bridge interface associated with the address that you specify. If the search is successful, the corresponding interface will flash in the Module View window. For more information on the Filtering Database and bridging in general, refer to Chapter 5, **Bridging**.

Use the Find Source Address option as follows:

1. Click to display the **Device** menu.

2. Drag to **Find Source Address....** The following window will appear.

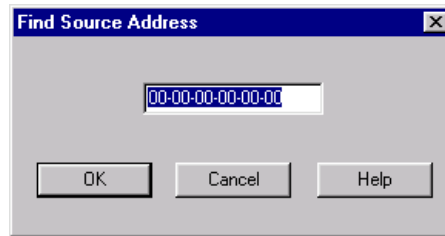


Figure 2-10. Find Source Address Window

3. In the text field in the middle of the window, enter a valid MAC address in Hex format and then click .

If the address is found in the 802.1d Bridge Filtering Database, the port through which the address is communicating will flash in the front panel Module View port display.

If the address is not found in the Filtering Database, a separate window will appear with a “Can’t Find Source Address” message.

Managing the Hub

In addition to the performance and configuration information described in the preceding sections, the Module View also provides you with the tools you need to configure your hub and keep it operating properly. Hub management functions include setting device date and time and enabling and disabling ports.

Setting the Device Date and Time

From the **Device** menu you can select the **Edit Device Time** and **Edit Device Date** options to change the date and time stored in the device’s internal clock.

To edit the device time:

1. Click on **Device** on the Module View window menu bar to access the Device menu; drag down to **Edit Device Time**, and release.
2. The Device Time change window, [Figure 2-11](#), will appear.

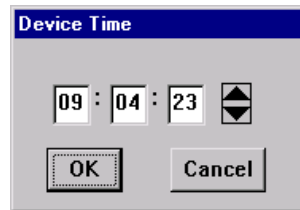


Figure 2-11. New Time Window

3. Enter the new time in a 24-hour hh:mm:ss format, either by highlighting the field you wish to change and using the up and down arrow buttons, or by simply entering the new value in the appropriate field.
4. Click on to save your changes, or on to cancel.

To edit the device date:

1. Click on **Device** on the Module View window menu bar to access the Device menu; drag down to **Edit Device Date**, and release.
2. The Device Date change window, [Figure 2-12](#), will appear.

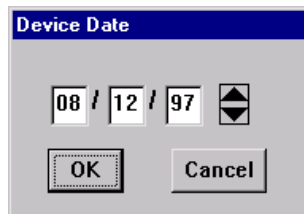


Figure 2-12. New Date Window

3. Enter the new date in a mm/dd/yy format, either by highlighting the field you wish to change and using the up and down arrow buttons, or by simply entering the new value in the appropriate field.
4. Click on to save your changes, or on to cancel.

Enabling and Disabling Ports

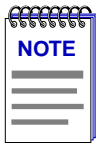
Bridge Ports

When you disable a bridge port, you disconnect that port's network from the bridge entirely. The port does not forward any packets, nor does it participate in Spanning Tree operations. Nodes connected to the network can still communicate with each other, but they can't communicate with the bridge or with other

networks connected to the bridge. When you enable a port, the port moves from the Disabled state through the Learning and Listening states to the Forwarding state; bridge port state color codes will change accordingly.

To enable or disable a bridge port:

1. Click on the appropriate Bridge Port to display the bridge port menu.
2. Drag down to **Enable** to enable the selected port, or to **Disable** to disable the port.



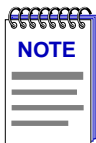
*For more information about bridging functions and how to determine the current state of each bridge port, see Chapter 5, **Bridging**.*

Module Ports

From the port menus on the two FDDI ports in the 9A128-01 Module View window, you can enable and disable either port.

To enable or disable a port:

1. Click on the desired **Port** button. The Port menu will appear.
2. Click on **Enable Port** to enable the port, or **Disable Port** to disable the port. Your port will now be enabled or disabled as desired.



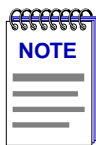
You can separately enable and disable the A and B ports which provide the backplane FNB connection; however, disabling only one of this port pair will cause a wrap condition on the backplane ring.

ATM Configuration

Viewing connection data; configuring Permanent Virtual Circuits (PVCs); adding and deleting connection entries

The ATM interfaces provided by the 9A128-01 module provides the connectivity that allows you to merge ATM network segments with traditional LAN technologies via the FDDI FNB backplane. Current versions of 9A128-01 firmware use 802.3 VC-based multiplexing for bridging protocols to move PVC traffic between the ATM front panel connection and the switching backplane, and support ATM Forum LAN Emulation; future versions will add support for Cabletron's SecureFast Switching.

An ATM network uses two types of virtual channels, or circuits: Switched Virtual Circuits, or SVCs, and Permanent Virtual Circuits, or PVCs. SVCs are created and dismantled dynamically on an as-needed basis, and require no management definition; PVCs, however, must be manually configured. The Current ATM Connections window provides the means for accomplishing these configurations.



*For current firmware versions available for the 9A128-01, you can **only** view current connections; you will not be allowed to add new connections or modify existing connections.*

Accessing the ATM Connections Window

To access the ATM Connections window from the Module View:

1. Click on **Device** on the Module View menu bar to access the Device menu.
2. Drag down to **ATM Connections...**, and release. The Current ATM Connections window, [Figure 3-1](#), will appear.

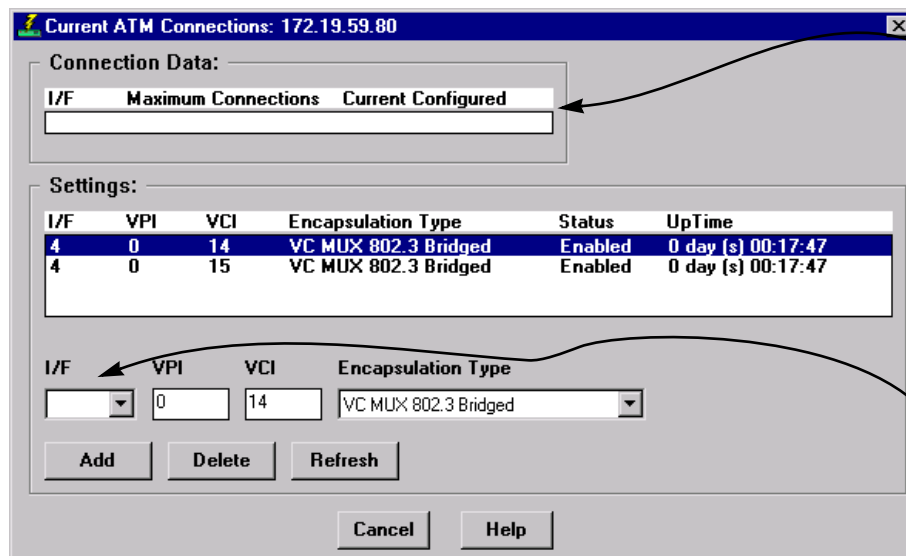


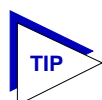
Figure 3-1. The Current ATM Connections Window

The Current ATM Connections window provides the following information about the device’s ATM connections:

Connection Data

The Connection Data fields provide the following information about each ATM interface available on the device:

I/F Displays the index number assigned to each ATM interface present on the selected module. The 9A128-01 has a single ATM interface, indexed 4.



*The 9A128-01 supports a total of four interfaces. For more detailed information about the interfaces present on each module and their index number assignment, see **Viewing I/F Summary Information** in Chapter 2.*

Maximum Connections Displays the maximum number of connections allowed by current device firmware.

Current Configured Displays the number of Permanent Virtual Circuits, or PVCs, currently configured.

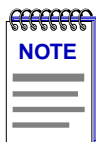


Connection Data will not be available for the 9A128-01’s ATM interface.

Settings

The Settings portion of the window contains a list box which displays information about each of the currently configured PVCs, as well as the fields used to configure new connections:

I/F	The device interface on which the PVC was configured.
VPI	Displays the Virtual Path Identifier assigned to the connection; current versions of 9A128-01 firmware allow values from 0 - 3. Virtual Path Identifiers are used to group virtual connections, allowing for channel trunking between ATM switches. Each VPI can be configured to carry many different channels (designated by VCIs) between two points.
VCI	Displays the Virtual Channel Identifier assigned to the connection; allowable values are 0 - 1023 <i>for each VPI</i> . Each assigned VCI must be unique within its defined VPI: for example, you can assign a VCI of 14 as many as four times: once with a VPI of 0, once with a VPI of 1, and so on. Remember, it is the combined VPI and VCI designations assigned to a channel that creates the grouping of virtual connections.
Encapsulation Type	Displays the method used to encapsulate LAN packets on the selected circuit. Current versions of 9A128-01 firmware use 802.3 VC-based multiplexing for bridging protocols (designated VC MUX 802.3 Bridged); future versions will add support for ATM Forum LAN Emulation and Cabletron's SecureFast Switching. You may also see some connections assigned a type of "other"; these are default connections that cannot be modified or deleted.
Status	Displays the current administrative status of the connection: enabled or disabled. In current versions of firmware, all connections are enabled by default, and cannot be disabled.
UpTime	The length of time the selected connection has been enabled.



*You can **only** view current connections; you will not be allowed to add new connections, delete existing connections, or modify existing connections, on 9A128-01's with the firmware currently supported.*

Add

Selecting the **Add** button either adds a new connection or modifies an existing one, using the parameters entered in the fields below the list box. A confirmation window will appear for both additions and modifications.

Delete

Selecting the **Delete** button deletes the selected connection; a confirmation window requires that you confirm the deletion.

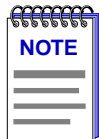
Refresh

Selecting **Refresh** refreshes the connection information displayed in the window.

Configuring Connections

Adding a New Connection

To configure new Permanent Virtual Circuits (PVCs), enter the following information in the text fields which appear just below the settings list box:



Current versions of 9A128-01 firmware do not support the ability to add new connections, delete existing connections, or modify existing connections.

1. In the **I/F** text box, click on the down-arrow to the right of the text field, and drag down to select the interface for which you wish to configure a connection. All available ATM interfaces will be listed in this menu: index 4 for the 9A128-01.
2. In the **VPI** text box, enter the Virtual Path Identifier you wish to assign to this connection. Allowable values are 0 to 3; remember, the VPI you assign will be used to group virtual connections, allowing for channel trunking between ATM switches.
3. In the **VCI** text box, enter the Virtual Channel Identifier you wish to assign to this connection. Allowable values are 0 to 1023 for each VPI. For example, you could assign the same channel identifier — say, 25 — as many as four times: once with a VPI of 0, once with a VPI of 1, and so on. Again, remember that it is the combination of VPI and VCI that will be used to direct cells through the intermediate switches between the source and destination.

4. In the **Encapsulation Type** field, click on the down arrow located to the right of the field, and drag down to select the desired encapsulation type. Current versions of 9A128-01 firmware use 802.3 VC-based multiplexing for bridging protocols (designated VC MUX 802.3 Bridged); future versions will add support for additional encapsulation methods.



Selecting any of the other encapsulation types listed in the field's menu will cause a "Set Failed" error when you attempt to add the new connection.

5. Click **Add** to add the new permanent circuit to the ATM interface. The circuit is automatically enabled, and will remain in place until it is manually removed.

Deleting a Connection

To delete an existing PVC:

1. In the connections list box, click to select the connection you wish to delete.
2. Click on **Delete**. A confirmation window will appear, listing the parameters assigned to the connection and asking you to verify that you wish to delete it. Click on **OK** to proceed with the deletion, or on **Cancel** to cancel.

FDDI Management

Configuration; connection policy; station list; and performance

The FDDI menu lets you access windows to view FDDI configuration, connection policy, station list, and performance with respect to the single Station Management (SMT) entity which provides each device's connectivity to the FDDI FNB backplane.

SMT provides the system management services for the FDDI protocols, including connection management, node configuration, error recovery, statistics collection, and management frame encoding. SMT is comprised of various subcomponent functions, including Connection Management (CMT) and Ring Management (RMT).

The 9A128-01 is also encoded with MAC (Media Access Control) protocol layer information — which you can assign to either FNB 1 or FNB 2. The primary function of the MAC layer is to deliver frames for stations attached to the ring; this involves transmitting frames onto the ring, removing frames from the ring, and repeating frames. Other services provided by the MAC component include providing attached stations with access to the ring in a fair and structured manner, providing address recognition for incoming frames, and generating and verifying frame check sequences. Each ring must have at least one MAC associated with it for correct operation.

The windows that provide information about the FDDI component of the 9A128-01 module are:

- **Configuration** — This window displays the current configuration of the selected module with respect to its SMT entity, and shows the status of the backplane ring to which it is connected.
- **Connection Policy** — This window shows the types of connections between the four FDDI PHY (port) types — A, B, M, and S — that will be allowed by the SMT entity.

- **Station List** — With this window you can see the configuration of the ring on which the SMT entity resides, including number of nodes, node addresses (both Canonical and MAC), node class, and current ring topology.
- **Performance** — This window lets you view the number of frames transmitted and received on the ring as detected by the selected SMT entity, along with error and lost frames, and the number of ring initializations.

To use the FDDI menu:

1. Click on **FDDI** in the Module View; drag down to select **SMT 1**, and to the right to reveal the following FDDI menu (Figure 4-1).

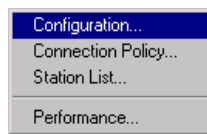


Figure 4-1. The FDDI Menu

2. Drag to select the desired option.

Configuration

The Configuration window, Figure 4-2, informs you about the configuration of the selected module's FDDI backplane connection and the operating state of the FDDI ring to which it is connected, and displays parameters relating to ring initialization.

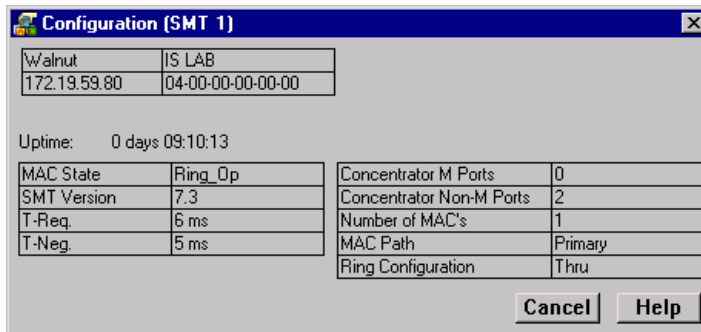


Figure 4-2. The Configuration Window

MAC State

This field indicates the current state of the selected module's MAC component. (The RMT component of SMT monitors MAC operation and takes actions necessary to aid in achieving an operational ring.) Possible states are:

Not Available	There is no MAC on the FDDI ring associated with the SMT entity, or the selected SMT entity is not attached to the main ring through the backplane FNB A and B ports.
Ring-Op	The ring is functioning normally. While in this state, the MAC being managed is part of an operational FDDI ring.
Isolated	SMT has just initialized RMT or RMT has entered this state during a path test (trace) after ring beaconing; RMT is not aware of the ring path or state.
Non-Op	The MAC being managed by the selected SMT is participating in ring recovery; the ring is not operational.
Detect	The claim (beacon) process of the FDDI ring protocol has exceeded one second. There may be a problem on the ring; any duplicate address conditions are being detected. In this state, the ring is still alive, but no data is being transmitted.
Non-Op-Dup	The ring is not operational; the address of the MAC under control of the SMT entity has been found to duplicate that of another MAC on the ring. The duplicate address condition prevented ring recovery and initialization after a claim and beacon process. This state will not occur unless you are using locally-administered addresses, as factory-set MAC addresses are guaranteed to be unique.
Ring-Op-Dup	The ring is operational; however, the address of the MAC under control of the SMT entity has been found to duplicate that of another MAC on the ring. Corrective actions will be attempted before the duplicate address condition causes ring initialization to fail after the claim and beacon recovery process. Like Non-Op-Dup, this state will not occur unless you are using locally-administered addresses.
Directed	The beacon process did not complete within 7 seconds. The selected SMT has directed the controlled MAC to send beacon frames to notify the other stations that a serious problem exists on the ring, and a Trace state is soon to follow.
Trace	A problem exists on the ring which could not be corrected during the beaconing process, and a Trace has been initiated. During a Trace (or Path Test), the SMT sends a signal that forces its nearest upstream neighbor

to remove from the ring and conduct a self-test. If the ring does not recover, each subsequent upstream station will be forced to remove from the ring and conduct self-tests until the problem has been corrected. While the test is being conducted, ring management re-enters the isolated state.

SMT Version

Displays the version number of the Station Management (SMT) entity. SMT provides the system management services for the FDDI protocols, including connection management, node configuration, error recovery, and management frame encoding. SMT frames have a version ID field that identifies the structure of the SMT frame Info field. The version number is included in the SMT frame so that a receiving station can determine whether or not its SMT version is able to communicate with the SMT version of another station. Knowing the version number allows the stations to handle version mismatches. Each FDDI station supports a range of SMT versions. The supported version range is identified within the ietf-fddi MIB by two smtTable attributes: snmpFddiSMTLowVersionId and snmpFddiSMTHiVersionId. If a received frame is not within the supported version range, the frame is discarded.

T-Req. (Requested Target Token Rotation Time)

The token rotation time bid made by the selected SMT entity during ring initialization. Each station detecting that the ring must be initialized begins a claim token process and issues a stream of Claim Frames, which negotiate the value assigned to the Target Token Rotation Time (TTRT). The information field of these frames contains the issuing station's bid for the value of TTRT. Each claiming station inspects incoming Claim frames (from other issuing stations) and either continues its own bid (and removes the competing Claim Frame from the ring) or defers (halts transmission of its own bid and repeats the competing bid) according to the following hierarchy of arbitration:

- A Claim Frame with the lowest TTRT bid has precedence.
- If the values of TTRT are equal, the frame with the longest source address (48 vs. 16 bits) has precedence.
- If both TTRT value and source address length are equal, the frame with the highest address has precedence.

The 9A128-01 is shipped with a T-Req = 83 msec (earlier versions of firmware) or 6 msec (later firmware versions). T-Req is stored within the MIB in units of nanoseconds (one billionth of a second) rather than milliseconds (one thousandth of a second); SPECTRUM Element Manager converts nanoseconds to milliseconds for display purposes. You can use any SNMP Set Request tool to edit the T-Req value; just remember that you must enter your value in nanoseconds, rather than milliseconds.

T-Neg. (Negotiated)

The winning time negotiated in the ring initialization sequence.

Concentrator M Ports

This field displays the number of Master (M) ports on the device that are associated with the selected SMT entity. A Master port is a port that provides a connection for Single Attachment Station (SAS) devices to the FDDI network. The 9A128-01 does not support M ports, so this field will always display 0.

Concentrator Non-M Ports

This field display the number of non-Master ports (A, B, or S ports) on the device that are associated with the selected SMT entity. The 9A128-01 supports only two FDDI ports: the backplane A and B ports that supply each device's connection to the FDDI FNB backplane.

Number of MACs

The number of Media Access Control entities present on the device associated with the selected SMT entity. For the 9A128-01, this number will be 1.

MAC Path

Indicates the configuration of the MAC in respect to the logical ring, as determined by the Connection Management (CMT) portion of SMT. CMT controls the establishment of a media attachment to the FDDI network, the connections with other nodes in the ring, and the internal configuration of the various entities within a node. CMT provides the link confidence test, and specifies a Link Error Monitor (LEM) which monitors active links on a per-link basis to ensure that failing links are detected and, if required, removed from the network. Possible values are:

- **Primary** indicates that the MAC is inserted into the primary path of the currently used FNB ring.
- **Secondary** indicates that the MAC is inserted into the secondary path of the currently used FNB ring.
- **Local** means that the MAC is not inserted into a primary or secondary path of a dual ring, but may be connected to one or more other nodes. This is not a valid value for the 9A128-01.
- **Isolated** means that the MAC has no connection to the ring or other concentrator ports.
- **Not Available** means that there is no MAC on the FDDI ring associated with the selected SMT entity. Again, this state will not occur for the 9A128-01.
- **Unknown** means that device firmware cannot determine the MAC path.
- **?** indicates that SPECTRUM Element Manager cannot determine the MAC path.

Ring Configuration

The current configuration of the MAC and physical layers of the A and B ports.

Connection Policy

The SMT Connection Policy determines which types of connections are allowed among the four FDDI port types: A, B, M (Master), and S (Slave). FDDI protocol forbids Master→Master connections; all other connection types are legal, although some are considered to be undesirable.

The Connection Policy window, [Figure 4-3](#), lists potential connection types in a “Reject X-Y” format, where X represents the FDDI port on the selected module, and Y represents the attaching node. An X in the checkbox next to a Connection Policy indicates that the connection has been disallowed.

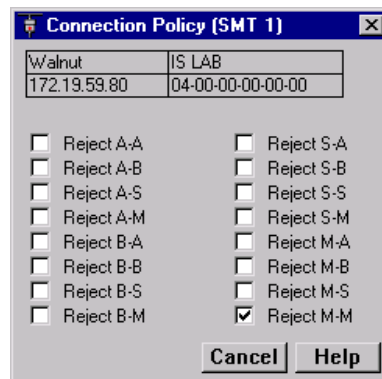


Figure 4-3. The Connection Policy Window

The following table summarizes the FDDI connection rules:

Table 4-1. FDDI Connection Rules

	A	B	S	M
A	V, U	V	V, U	V, P
B	V	V, U	V, U	V, P
S	V, U	V, U	V	V
M	V	V	V	X

V —valid connection

X —illegal connection

U —undesirable (but legal) connection; this requires that SMT is notified.

P —valid, but when both A and B are connected to M ports (a dual-homing configuration), only the B connection is used.



Though technically legal under FDDI connection rules, undesirable connections will cause a twisted or wrapped ring.

Each device has its own connection policy; however, when two devices attempt to connect, their combined established connection policies dictate the connections that will be allowed. In an attempted connection between two nodes, the most lenient policy will determine whether the connection (as long as it is legal) can be made. For example, if two FDDI nodes attempt an A→A connection, and this connection is not allowed at one FDDI node but allowed at the other, the connection would be accepted. If the connection policy at both nodes disallows the connection, the connection will be rejected.

This is a read-only window; you currently cannot edit the connection policy via SPECTRUM Element Manager.



You can use any SNMP Set Request or MIB tool to edit the Connection Policy for your device by setting the `fddimibSMTConnectionPolicy` MIB OID (part of the MIB-II FDDI Transmission MIB (RFC1512)). `fddimibSMTConnectionPolicy` is simply a 16-bit integer value (ranging from 32768 to 65535) that corresponds to the connection policy (in the "Reject X-Y" format, where X represents a port on the FDDI Switch Module, and Y represents the attaching node).

To set the connection policy for the device, total the bit values corresponding to the desired connection policy according to the table below, and then use your SNMP Set Request or Mib tool to set the value for the appropriate SMT index. For example, to set a connection policy that disallowed the undesirable A-A or B-B connections you would set the `fddimibSMTConnectionPolicy` MIB OID to 32,801: 32,768 (reject M-M, required) + 32 (reject B-B) + 1 (reject A-A).

Policy	Power
reject A-A	2^0 (1)
reject A-B	2^1 (2)
reject A-S	2^2 (4)
reject A-M	2^3 (8)
reject B-A	2^4 (16)
reject B-B	2^5 (32)
reject B-S	2^6 (64)
reject B-M	2^7 (128)
reject S-A	2^8 (256)
reject S-B	2^9 (512)
reject S-S	2^{10} (1,024)
reject S-M	2^{11} (2,048)
reject M-A	2^{12} (4,096)
reject M-B	2^{13} (8,192)
reject M-S	2^{14} (16,384)
reject M-M	2^{15} (32,768 — a permanently set value for this bit)

Station List

The Station List illustrates the configuration of the ring associated with the currently selected SMT entity, including number of nodes on the ring, node addresses (both Canonical and MAC), node class, and ring topology.

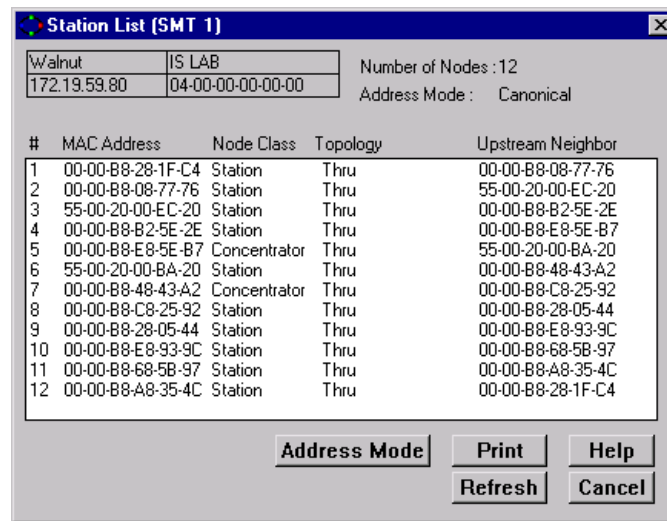


Figure 4-4. The Station List Window

The Station List provides the following information about the ring with which the SMT is currently associated:

Number of Nodes

The number of stations inserted into the FDDI ring with which the SMT entity is currently associated.

Address Mode

Displays the current mode being used to display the addresses of the devices in the Station List. The two possible modes are Canonical (FDDI) or MAC (Ethernet).

To change the current Address Mode, click on the **Address Mode** button at the bottom of the window. The current address mode will change in the Address Mode field and the Stations panel.

Stations Panel

The Stations Panel displays a list of the stations on the ring to which the selected SMT is connected, in ring sequence from the MAC, along with each station's node class and current topology.

Note that the information displayed in the Station List is static once the window is opened; for updated information, click on the **Refresh** button.

If the number of nodes exceeds the panel size, scroll bars will appear in the list box that will allow you to scroll through the station list to view the node of interest.

Information provided in the Stations Panel includes:

#

An index number assigned to each station that indicates its position on the ring in relation to the monitored SMT's MAC address. The monitored SMT's MAC is always the first entry (1) in the station list.

MAC Address

Displays the 48-bit hardware address — used for universal address assignment — of the node inserted into the ring. These addresses are hardcoded into the device, and are not configurable. The address will appear in Canonical or MAC format, as currently selected.

Node Class

Displays the type of ring device. Possible values are:

Station	Indicates an FDDI node capable of transmitting, receiving, and repeating data.
Concentrator	Indicates an FDDI node that provides attachment points to the ring for stations that are not directly connected to the dual ring.

Topology

Indicates the node's MAC configuration topology.

Upstream Neighbor

Displays hardware address (in Canonical or MAC format, as currently selected) of each node's upstream neighbor.

Performance

The Performance window, [Figure 4-5](#), provides graphical and numeric performance statistics for the selected SMT entity, including:

- Transmit Frames
- Receive Frames
- Frame Errors
- Lost Frames
- Ring Ops

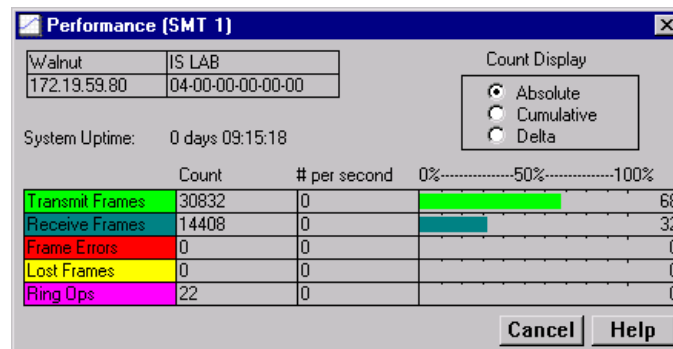


Figure 4-5. Performance Window

Statistics are displayed in three ways:

- By count (i.e., the number detected of each for the selected interval).
- By rate (i.e., the number of each per second, as averaged over the selected interval).
- Graphically, as a percentage of each with respect to total network load processed by the selected interface during the last interval (e.g., a transmit frames rate of 75% during a delta interval indicates that of all frames *processed* by the selected interface, 75% were *transmitted* by that interface).

You can view performance for three different intervals:

- **Absolute** — Counts recorded since the selected module was last started.
- **Cumulative** — Counts recorded since the Performance window was opened.
- **Delta** — Counts recorded during a single polling interval that is set for SPECTRUM Element Manager (refer to the *Installing and Using...* guide for information on setting polling intervals).

To change the interval, click to select the desired radio button in the Count Display panel in the top right hand corner of the window.

Available statistics are:

Transmit Frames

The number of frames transmitted by the MAC associated with the SMT during the chosen interval.

Receive Frames

The number of frames received by the MAC associated with the SMT during the chosen interval.

Frame Errors

The number of error frames detected by the MAC associated with the SMT during the chosen interval that had not been detected previously by other stations. Error frames may include frames with an invalid Frame Check Sequence (FCS), with data length errors, or with internal errors that prevent the MAC from transferring the frame to the Logical Link Control (LLC) layer.

Lost Frames

The number of frames detected by the MAC associated with the SMT during the chosen interval that have an unknown error, so their validity is in doubt. When the MAC encounters a frame of this type, it increments the Lost Frame counter and strips the remainder of the frame from the ring, replacing it with idle symbols.

Ring Ops

The number of times the ring has entered the "Ring Operational" state from the "Ring Not Operational" state during the selected interval. This counter updates when the MAC informs Station Management (SMT) of a change in Ring Operation status.

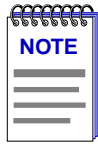
Bridging

Bridge management overview; the Bridge Status window; enabling and disabling bridging; Bridge Performance Graphs; bridge detail breakdown; the Bridge Spanning Tree window; changing bridge Spanning Tree parameters; the Filtering Database window; configuring the filtering database

With SPECTRUM Element Manager's Bridge Status window, you can view and manage each bridging interface supported by the 9A128-01. You manage your bridge by using the following windows:

- The **Bridge Status** window provides you with basic information about the current status of each available bridging interface, and allows you to enable or disable bridging at each interface. The Bridge Status window also provides access to additional windows which allow you to configure bridging parameters.
- The bridge-level **Duplex Modes** option allows you to set Duplex Mode operation for the FDDI interface; although the window is available, duplex mode operation is not currently supported for the 9A128-01.
- The **Performance Graph** and **Interface Statistics** windows graphically display the traffic passing between your bridged networks, and let you compare and contrast traffic processed by each interface; the **Source Addressing** window lists the MAC addresses of devices communicating through each interface.
- The **Spanning Tree** window shows bridge port information and protocol parameters relating to the Spanning Tree Algorithm (the method of determining the controlling bridge when a series of bridges are placed in parallel).
- With the **Filtering Database** window, you can see the contents of the Static and Learned databases – the two address databases which construct the IEEE 802.1 Source Address Table. The bridge uses the contents of these databases to make its packet filtering and forwarding decisions. You can configure entries in these databases to increase bridging efficiency across your network.

The following sections detail how to use each of the bridge management windows.



By default, the 9A128-01 perform traditional switching (or bridging). Firmware version 2.10.13 and earlier do not support the ability to select SecureFast switching; if you have a later version of firmware, check your hardware manuals to see if your version of firmware supports this feature. The toggle from traditional bridging to SecureFast switching is performed via Local Management; see your Local Management documentation for details.

Bridging-related windows will not be available for devices which have been configured for SecureFast switching.

The Bridge Status Window

The Bridge Status window provides you with basic information about the current status of bridging across your 9A128-01. Color-coding of each port display allows you to quickly ascertain the status of each interface. The Bridge Status window also lets you access further windows to control bridging parameters. To access the Bridge Status window from the Module View window:

1. In the Module View window, click on **Device** to display the Device menu.
2. Drag down to **Bridge Status...**, and release. The appropriate Bridge Status window, [Figure 5-1](#), will appear.



Figure 5-1. The Bridge Status Window

The following information is provided by the Bridge Status window for each available bridging interface:

Up Time

At the top of the Bridge Status window, you can see the time period (in a days, hh:mm:ss format) that has elapsed since the selected module was last reset or initialized.

Bridge State on Interface

Indicates the state of bridging over the port interface. Note that this state (and its corresponding color-code) will also be reflected on the bridge port display in the Module View window. Possible bridge states and their corresponding colors are:

- **Forwarding** (green) – the port is on line, and is configured by Spanning Tree Algorithm to forward frames to and from its attached network.
- **Disabled** (blue) – bridging at the port has been disabled by management; no traffic can be received or forwarded, including configuration information for the bridged topology.
- **Listening** (magenta) – this bridge port is not adding information to the Filtering Database. The port is monitoring Bridge Protocol Data Unit (BPDU) traffic while preparing to move to the Forwarding state.
- **Learning** (magenta) – the Forwarding database is being created or the Spanning Tree Algorithm is being executed due to a network topology change; the port is monitoring network traffic, learning network addresses.
- **Blocking** (orange) – Spanning Tree Algorithm has configured this port to block (filter) frames to prevent redundant data loops in the bridged network; the port can't receive or forward traffic, but bridge topology information will be forwarded.
- **Broken** (red) – the physical interface has malfunctioned.

Interface Type

Indicates the interface type which applies to each bridge port interface (fddi, atm, or other for the INB). The interface type (ifType) is a mandatory object type from the SNMP MIB-II Interface (IF) Group.

Bridge Address

Indicates the physical (MAC) address of the bridge port.

Speed

Indicates the theoretical maximum speed of the selected interface in kilobytes per second: 2500 Mbits for the INB interface; 100 Mbits for FDDI; and 155 Mbits for ATM.

Accessing Other Management Options from the Bridge Status Window

At the top of the Bridge Status window, you can click on **Bridge** to access a menu that provides other bridge management options:

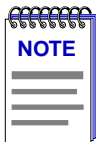
- A Module Type window that contains a description of the 9A128-01 module, see **Viewing Hardware Types** in Chapter 2 for more information.
- A Bridge Performance Graph that displays statistics for traffic across the entire bridge (see **Bridge Statistics**, page 5-6).

A Performance Graph window is also available for each individual interface, by clicking on a port index button to display the port level management options (see **Bridge Statistics**, page 5-6).

- The Spanning Tree window, which allows you to set the Spanning Tree Algorithm parameters (see **Bridge Spanning Tree**, page 5-14).
- The Filtering Database window, which lets you configure the bridge's acquired and permanent filtering databases to filter or forward traffic across the selected module (see **Filtering Database**, page 5-21).
- The Duplex Modes window, which allows you to configure duplex mode (on or off) for standard Ethernet and FDDI interfaces; see **Configuring Duplex Modes**, below, for details.

Configuring Duplex Modes

Enabling Full Duplex mode on an interface allows the interface to receive and transmit packets at the same time, effectively doubling the available bandwidth (and, therefore, the wire speed) on the selected interface. Interfaces which are not set to Full Duplex mode must receive and transmit separately, waiting for one activity to be completed before the other is begun.



Although this option appears on the menu accessed from the Bridge Status window, the Duplex Mode functionality is not supported by the 9A128-01 module. Attempting to set options in these windows will generate Set Failed errors, but will not affect the device's bridging functions.

To access the Duplex Modes window:

1. Click on **Bridge** to display the main Bridge menu;
2. Drag down to **Duplex Mode(s)...**, and release. The Duplex Modes Window, **Figure 5-2**, will appear.

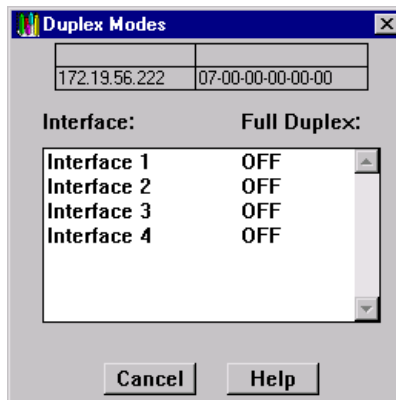


Figure 5-2. The Duplex Modes Window

The main portion of the Duplex Modes window consists of a list of the interfaces available on the 9A128-01 module and their current Full Duplex state: ON indicates that Full Duplex mode has been enabled for the selected interface; OFF indicates that it has not; N/A indicates that Full Duplex is not available.

To configure the Duplex Mode for any standard Ethernet or FDDI interface:

1. In the Duplex Modes window, highlight the interface whose Duplex Mode you wish to change. Note that only one interface can be selected at a time.
2. Double-click the selected interface to toggle the Full Duplex setting from **ON** to **OFF**, or vice versa. The set will take place immediately.

Enabling and Disabling Bridging

When you disable a bridge port, you disconnect that port's network from the bridge entirely. The port does not forward any packets, nor does it participate in Spanning Tree operations. Nodes connected to the network can still communicate with each other, but they can't communicate with the bridge and other networks connected to the bridge. When you enable a port, the port moves from the Disabled state through the Learning and Listening states to the Forwarding or Blocking state (as determined by Spanning Tree).

To enable or disable bridging at the port interface level from the Bridge Status window:

1. Click on the desired **Port** button (**1**) to display the port menu.
2. Drag down to **Enable** to restart bridging on the selected interface, or **Disable** to halt bridging across the selected interface.

To enable or disable bridging at all ports from the Bridge Status window:

1. Click on **Bridge** to display the bridge menu.
2. Drag down to **Enable Bridge** to restart bridging across all interfaces, or **Disable Bridge** to halt bridging across all interfaces.

You can also disable bridging across all ports or for an individual bridge port on from the Module View window; see **Enabling and Disabling Ports** in Chapter 2 for details.

Bridge Statistics

The following sections describe the Statistics windows available for the selected bridge, both at the device and port levels.

Performance Graphs

You use the Bridge Performance Graphs to view a color-coded strip chart that shows you the traffic being bridged through all networks or an individual network supported by your device. You can configure the display to show frames filtered, forwarded, and/or transmitted, as well as the number of errors. The graph has an x axis that indicates the 60 second interval over which charting occurs continuously, while its y axis measures the number of packets or errors that are processed by the selected module as a whole or by one of its bridging interfaces.

For the 9A128-01, selecting the **Detail** button on the device-level performance graph window allows you to compare the packets forwarded, filtered, or transmitted across all networks supported by the 9A128-01, as well as errors on all networks; for a selected bridged network, the **Detail** button allows you to view the number of packets forward to, or received from, each other network supported by the 9A128-01.

You can select the statistics you wish to monitor by using the menu buttons provided; when you change Performance Graph parameters, the graph will refresh and generate a strip chart based on the newly defined parameters.

To access the collective Bridge Performance Graph window:

1. From the Bridge Status window, click on **Bridge** to display the bridge menu.

or

From the Module View window, click on the **Bridge** label in the module display; the bridge menu will appear.

2. Drag down to **Performance Graph...**, and release. The Bridge Performance Graph window, [Figure 5-3](#), will appear. (The individual port Bridge Performance Graph windows are similar, except that they display a graph applicable to the selected interface.)

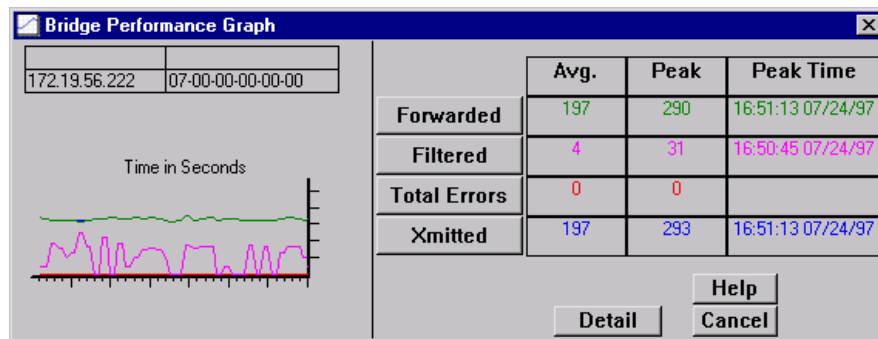


Figure 5-3. Bridge Performance Graph

To access the port-level Bridge Performance Graph windows:

1. From the Bridge Status window, click on the appropriate **port** button (**1**) to display the port menu.

or

From the Module View window, click on the appropriate **Port Index** on the bridge port display; the Port menu will appear.

2. Drag down to **Performance Graph...**, and release. The port-level Bridge Performance Graph window will appear.

For each chosen statistic, Performance Graphs display both average and peak activity, as well as the date and time the peak values were recorded; average values are also displayed graphically.

The Average statistics are updated every two seconds, as averaged over the previous four two-second intervals; the graphical display also updates at two-second intervals. For the first 60 seconds of graphing, you will note the graph lines extending as each interval's data is added to the graph. Once the first 60 seconds has passed, the newest data is added at the right edge of the graph, and the oldest data is scrolled off to the left.

Available performance statistics are:

Forwarded (Green)

Forwarded The number of frames forwarded by the bridge, at the device or port level.

Nothing The Frames Forwarded function is currently not measuring any statistics.

Filtered (Magenta)

- Filtered The total number of frames filtered by the bridge, at the device or port level.
- Nothing The Filtered scale is not currently measuring the number of packets filtered by the bridge.

Total Errors (Red)

- Total Errors The total number of errors experienced by all bridging interfaces on the selected module, or by an individual bridge interface.
- Nothing The Errors scale is currently not measuring error packets coming through the device as a whole or a single port.

Xmitted (Blue)

- Xmitted The total number of frames transmitted by the selected bridge interface, or by all bridge interfaces.
- Nothing The Xmitted scale is not currently measuring the number of packets filtered by the bridge or the selected individual interface.

Configuring the Bridge Performance Graphs

To configure the Bridge Performance Graph:

1. Using the mouse, click on **Forwarded** (with green statistics to the right). The Forwarded menu will appear. Click on the desired mode.
2. Click on **Filtered** (with magenta statistics to the right). The Filtered menu will appear. Click on the desired mode.
3. Click on **Total Errors** (with red statistics to the right). The Errors menu will appear. Click on the desired mode.
4. Click on **Xmitted** (with blue statistics to the right). The Xmitted menu will appear. Click on the desired mode.

Once you have selected a new mode, it will appear in its respective button, and after the next poll the Performance Graph will refresh and begin to measure using the new mode.

The Bridge Detail Breakdown Window

The Bridge Detail Breakdown window allows you to compare the number of frames forwarded, filtered, and transmitted on the network segments connected to each bridging interface on your 9A128-01, as well as the number of errors experienced on each interface.

To access this window from the Bridge performance graph, click on **Detail**. The Bridge Detail Breakdown window, [Figure 5-4](#), will appear.

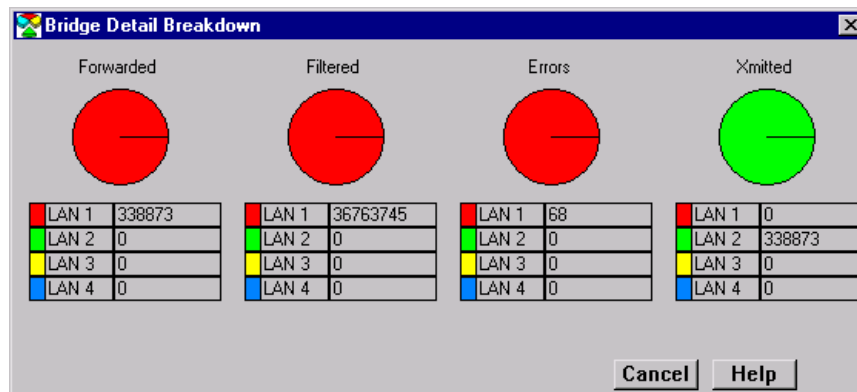


Figure 5-4. The Bridge Detail Breakdown Window

The following information is available for the network segments connected to each of the bridge ports on the 9A128-01. The information is expressed both numerically and in pie charts. Each port's network segment has a corresponding color for its statistics or pie chart segments (LAN 1 = red, LAN 2 = light green, LAN 3 = yellow, LAN 4 = blue).

The values given in these fields are cumulative totals read from the 9A128-01.

Forwarded

The total number of frames forwarded on each port's network segment.

Filtered

The total number of frames filtered on each port's network segment.

Errors

The total number of frames (either inbound or outbound) containing errors which prevented them from being processed.

Xmitted

The total number of frames transmitted over each port's network segment.

The Bridge Port Detail Breakdown Window

For the selected bridge interface, the Bridge Port Detail Breakdown window allows you to view the number of packets forwarded to or received from each of the other interfaces on your 9A128-01.

To access the Bridge Port Detail Breakdown window from the port Bridge performance graph, click on **Detail**. The Bridge Port Detail Breakdown window, [Figure 5-5](#), will appear.

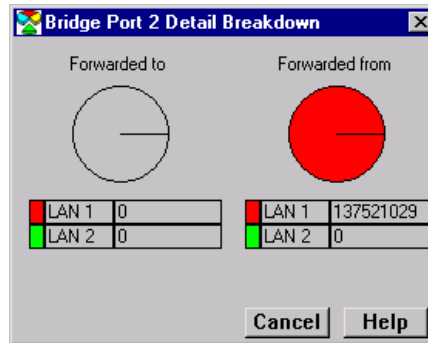


Figure 5-5. The Bridge Port Detail Breakdown Window

The following information is available for each bridge interface on the 9A128-01; the information is expressed both numerically and in pie charts:

Forwarded to

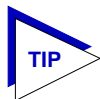
The number of frames forwarded by the selected bridge interface to each other interface on the bridge.

Forwarded from

The total number of frames received by the selected bridge interface from each of the other bridge interfaces.

The Interface Statistics Window

The Interface (IF) Statistics window ([Figure 5-6](#)) provides MIB-II interface statistical information — including counts for both transmit and receive packets, and error and buffering information — for each of the interfaces available on the 9A128-01. A color-coded pie chart in the middle of the window lets you graphically view statistics for Unicast, Non-Unicast, Discarded, and Error packets.



This window is also available for all port interfaces via the I/F Summary window available from the Module View Device menu. See [Viewing I/F Summary Information](#) in Chapter 2 for more information.

To access the IF Statistics window:

1. Click on the appropriate bridge port index (**1**) to reveal the Port menu.
2. Drag down to **IF Statistics...**, and release.

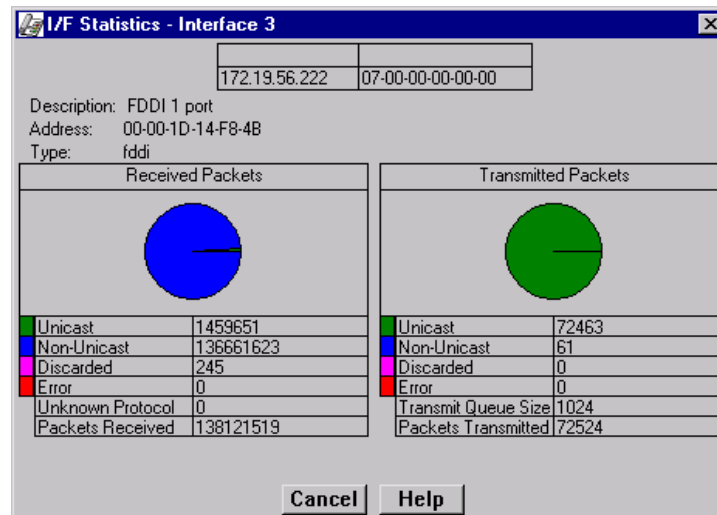


Figure 5-6. Interface Statistics Window

Three informational fields appear in the upper portion of the window:

Description

Displays the interface description for the currently selected port.

Address

Displays the MAC (physical) address of the selected port.

Type

Displays the interface type of the selected port.

The lower portion of the window provides the following transmit and receive statistics; note that the first four statistics are also graphically displayed in the pie charts.

Unicast

Displays the number of packets transmitted to or received from this interface that had a single, unique destination address. These statistics are displayed in the pie chart, color-coded green.

Non-Unicast

Displays the number of packets transmitted to or received from this interface that had a destination address that is recognized by more than one device on the network segment. The non-unicast field includes a count of broadcast packets — those that are recognized by *all* devices on a segment. These statistics are displayed in the pie chart, color-coded dark blue.

Discarded

Displays the number of packets which were discarded even though they contained no errors that would prevent transmission. Good packets are typically discarded to free up buffer space when the network becomes very busy; if this is occurring routinely, it usually means that network traffic is overwhelming the device. To solve this problem, you may need to re-configure your bridging parameters, or perhaps re-configure your network to add additional bridges. Consult the Cabletron Systems *Network Troubleshooting Guide* for more information.

These statistics are displayed in the pie chart, color-coded magenta.

Error

Displays the number of packets received or transmitted that contained errors. These statistics are displayed in the pie chart, color-coded red.

Unknown Protocol (Received only)

Displays the number of packets received which were discarded because they were created under an unknown or unsupported protocol.

Packets Received (Received only)

Displays the number of packets received by the selected interface.

Transmit Queue Size (Transmit only)

Displays the number of packets currently queued for transmission from this interface. The amount of device memory devoted to buffer space, and the traffic level on the target network, determine how large the output packet queue can grow before the 9A128-01 will begin to discard packets.

Packets Transmitted (Transmit only)

Displays the number of packets transmitted by this interface.

Using Source Addressing

You can use the Port Source Addresses window to view the MAC addresses that are communicating through a selected bridge interface.

To open the Source Addresses window from the Bridge Status window:

1. Click on the individual index (**1**) of the bridge interface of interest. The port menu will appear.
2. Select **Source Addressing...** The Source Addresses window, [Figure 5-7](#), will appear.

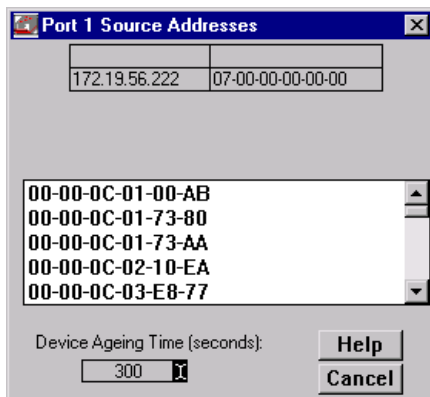
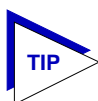


Figure 5-7. The Port Source Addresses Window



You can also open the Port Source Addresses window from the Module View by clicking on the bridge interface of interest and selecting the Source Addressing option.

The Port Source Addresses window displays the MAC addresses of all devices that have transmitted packets that have been forwarded through the selected bridging interface during the last cycle of the Filtering Database's defined ageing timer (learned addresses that have not transmitted a packet during one complete cycle of the ageing timer are purged from the Source Address Table). For more information on the Filtering Database, see **Filtering Database** on [page 5-21](#).

Setting the Ageing Time

To alter the Source Address Ageing Time:


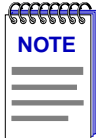
1. Click the I-bar cursor () next to the **Device Ageing Time** field. The Device Ageing Time window, [Figure 5-8](#), will appear.



Figure 5-8. Device Ageing Time Window

2. Type in the new Ageing Time (allowable range is 10 to 1,000,000 seconds; the default is 300 seconds).
3. Click **OK** to accept the new Ageing Time, or click **Cancel** to exit the window without making changes.



Note that the Source Addresses Ageing Time is the same as the Ageing Time displayed (and configured) via the Filtering Database window; setting the Ageing Time in the Source Addresses window also changes the time in the Filtering Database window, and vice versa.

Bridge Spanning Tree

The Bridge Spanning Tree window allows you to display and modify the selected module's bridge port information and protocol parameters relating to the Spanning Tree Algorithm.

In a network design with multiple bridges placed in parallel (i.e., attached to the same LAN), data loops must be prevented. The Spanning Tree Algorithm (STA) is the method that bridges use to communicate with each other to ensure that only a single data route exists between any two end stations. On a LAN interconnected by multiple bridges, Spanning Tree selects a controlling Root Bridge and Port for the entire bridged LAN, and a Designated Bridge and Port for each individual LAN segment. A Designated Port/Bridge for a LAN segment forwards frames from that LAN towards the Root Bridge, or from the Root Bridge onto the LAN. All other bridge ports attached to that LAN are configured to filter (block) frames. When data passes from one end station to another across a bridged LAN, it is forwarded through the Designated Bridge/Port for each LAN segment towards the Root Bridge, which in turn forwards frames towards Designated Bridges/Ports on its opposite side.

During the Root Bridge Selection process, all bridges on the network communicate STA information via Bridge Protocol Data Units (BPDUs). With BPDUs, all network bridges collectively determine the current network topology and communicate with each other to ensure that the topology information is kept current.

To access the Bridge Spanning Tree window:

1. From the Bridge Status window, click on **Bridge** to display the Bridge menu.

or

From the Module View window, click on the **Bridge** label in the module display; the bridge menu will appear.

2. Drag down to **Spanning Tree...**, and release. The Bridge Spanning Tree window, [Figure 5-9](#), will appear.

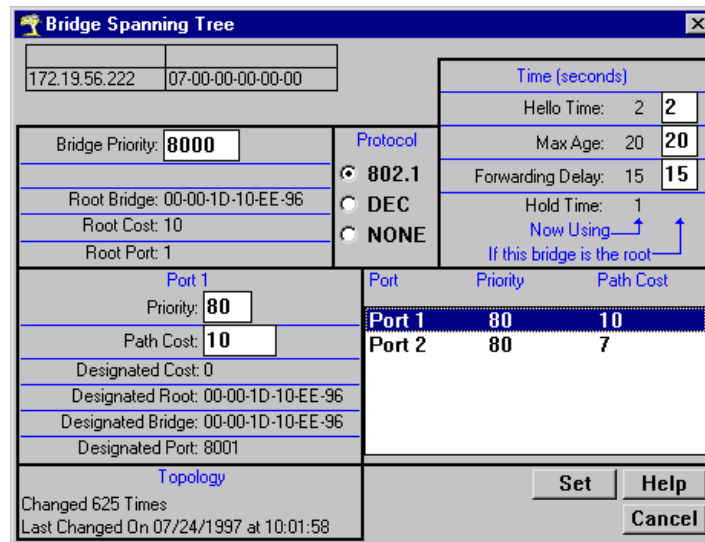


Figure 5-9. Bridge Spanning Tree Window

Configuring the Bridge Spanning Tree Window

The Bridge Spanning Tree window displays STA parameters and allows you to alter parameters for the selected bridge as a whole, and for each individual bridging interface.

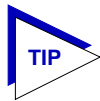
The currently selected bridging interface is highlighted in the lower right quadrant of the window. To alter the parameters of another interface, click on the appropriate **Port X** name listed in the quadrant.

The Bridge Spanning Tree window provides the following bridge-level information:

Bridge Priority

This field displays the “priority” component of the module’s unique bridge identifier. The Spanning Tree Algorithm assigns each bridge a unique identifier, which is derived from the bridge’s MAC address and the Priority. The bridge with the lowest value of bridge identifier is selected as the Root. A lower priority number indicates a higher priority; a higher priority enhances a bridge’s chance of being selected as the Root.

You can edit this text box to change network topology, if needed. The default value is 8000.



Part of a bridge's Identifier is based on its MAC address. In most network installations, the difference between bridge performance may be negligible. You may, however, find your data bottle-necked in installations where both a low-performance bridge and a high-performance bridge are attached to the same LAN segment and the two (or more) bridges have the same Priority component set (e.g., at the default 8000 Hex). In such a scenario you may want to alter the Priority component of the higher performance bridge to ensure that it becomes root for the segment (or overall root). Remember, if Priority components are equal the bridge on the segment with the lowest Hex value of MAC address would have a better chance of being selected as the root bridge — as it would have a lower Bridge Identifier. If your bridges come from multiple vendors, they will have different MAC address values (e.g., Cabletron devices have a lower MAC address than 3Com devices); if they come from the same vendor, the bridge with the earlier manufacture date will be likely to have the lower MAC address value.

Root Bridge

Displays the MAC address of the bridge that is currently functioning as the Root Bridge.

Root Cost

Indicates the cost of the data path from this bridge to the Root Bridge. Each port on each bridge adds a “cost” to a particular path that a frame must travel. For example, if each port in a particular path has a Path Cost of 1, the Root Cost would be a count of the number of bridges along the path. (You can edit the Path Cost of bridge ports as described later.) The Root Bridge's Root Cost is 0.

Root Port

This field displays the identifier (the physical index number) of the selected module's bridge port that has the lowest cost path to the Root Bridge on the network. If the selected module is currently the Root Bridge, this field will read 0.

Protocol

Displays the Spanning Tree Algorithm Protocol type the selected module is currently using. The choices are:

- 802.1
- DEC (DEC Lanbridge 100)
- None

The following four fields display values used for various Spanning Tree timers that are set at the Root Bridge and this bridge. In Spanning Tree operations, the value used for the tree is the one set at the Root Bridge (with the exception of Hold Time, which is a fixed value); but you can change the value for each bridge on your network in the event that it becomes Root.

Hello Time

This parameter indicates, in seconds, the length of time the Root Bridge (or bridge attempting to become the Root) waits before resending Configuration BPDUs. The range for this field is 1 to 10 seconds, with a default value of 2 seconds. The Root Bridge sets the Hello Time.

Max Age

This parameter displays the bridge's BPDU ageing timer. This controls the maximum time a BPDU can be retained by the bridge before it is discarded. During normal operation, each bridge in the network receives a new Configuration BPDU before the timer expires. If the timer expires before a Configuration BPDU is received, it indicates that the former Root is no longer active. The remaining bridges begin Spanning Tree operation to select a new Root. The current Root Bridge on the network sets the Max Age time. The range for this field is 6 to 40 seconds, with a default value of 20 seconds.

Forwarding Delay

This parameter displays the time period which elapses between states while the bridge is moving to the Forwarding state. For example, while moving from a Blocking to a Forwarding state, the port first moves from Blocking to Listening to BPDU activity on the network, remains there for the Forward Delay period, then moves to the Learning State (and remains in it for the Forward Delay period), and finally moves into a Forwarding state. This timer is set by the Root Bridge. During a topology change, the Forward Delay is also used as the Filtering Database Aging Time (refer to **Filtering Database**, [page 5-21](#)), which ensures that the Filtering Database maintains current topology information.

Hold Time

This parameter displays, in seconds, the minimum time that can elapse between the transmission of Configuration BPDUs through a bridge port. The Hold Time ensures that Configuration BPDUs are not transmitted too frequently through any bridge port. Receiving a BPDU starts the Hold Timer. After the Hold Timer expires, the port transmits its Configuration BPDU to send configuration information to the Root. The Hold Time is a fixed value, as specified by the IEEE 802.1d specification.

The following fields are applicable to each bridge port on the selected module:

Priority

If two or more ports on the same bridge are connected to the same LAN segment, they will receive the same Root ID/Root Cost/Bridge ID information in Configuration BPDUs received at each port. In this case, the BPDU's Port ID information – the transmitting port's identifier and its manageable Priority component – is used to determine which is the Designated Port for that segment.

A lower assigned value gives the port a higher Priority when BPDUs are compared. The allowable range is 0-FF hexadecimal (0-255 decimal); the default is 80 hexadecimal.

Path Cost

Displays the cost that this port will contribute to the calculation of the overall Root path cost in a Configuration BPDU transmitted by this bridge port. You can lower a port's Path Cost to make the port more competitive in the selection of the Designated Port – for example, you may want to assign a lower path cost to a port on a higher performance bridge. The allowable range is 1 to 65535.

Designated Cost

Displays the cost of the path to the Root Bridge of the Designated Port on the LAN to which this port is attached. This cost is added to the Path Cost to test the value of the Root Path Cost parameter received in Configuration BPDUs.

Designated Root

Displays the unique bridge identifier of the bridge that is assumed to be the Root Bridge.

Designated Bridge

Displays the network address portion of the Bridge ID (MAC address/priority component) for the bridge that is believed to be the Designated Bridge for the LAN associated with this port.

The Designated Bridge ID, along with the Designated Port and Port Identifier parameters for the port, is used to determine whether this port should be the Designated Port for the LAN to which it is attached. The Designated Bridge ID is also used to test the value of the Bridge Identifier parameter in received BPDUs.

Designated Port

Displays the network address portion of the Port ID (which includes a manageable Priority component) of the port believed to be the Designated Port for the LAN associated with this port.

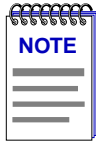
The Designated Port ID, along with the Designated Bridge and Port Identifier parameters for the port, is used to determine whether this port should be the Designated Port for the LAN to which it is attached. Management also uses it to determine the Bridged LAN topology.

Topology

This indicates how many times the bridge's Topology Change flag has been changed since the selected module was last powered up or initialized. The Topology Change flag increments each time a bridge enters or leaves the network, or when the Root Bridge ID changes.

Changing Bridge Spanning Tree Parameters

The Bridge Spanning Tree window allows you to update the following parameters for your bridge. When you have finished making changes to the following individual parameters, you must click on at the bottom of the Spanning Tree window to write the changes to the selected module.



Any values you set at the bridge will cause a Topology Change flag to be issued in the next Configuration BPDUs it transmits. This will cause the bridged network to immediately recalculate Spanning Tree and change topology accordingly.

Changing Bridge Priority

To change the part of the bridge address that contains the identifier used in the Spanning Tree Algorithm for priority comparisons:

1. Highlight the **Bridge Priority** field.
2. Enter the new identifier, in hexadecimal format; the allowed range is 0-FFFF hexadecimal.
3. Click on **Set**.

The selected Bridge Priority will be applied to the bridge (a lower number indicates a higher priority in the root selection process).

Changing the Spanning Tree Algorithm Protocol Type

To change the type of protocol used in Spanning Tree:

1. Click the mouse on the appropriate option button: **IEEE 802.1**, **DEC**, or **None**.
2. Click on **Set**.

The selected Spanning Tree Algorithm protocol type will be applied to the bridge. If you selected None, the Spanning Tree Algorithm will be disabled (if it already was enabled). If STA Protocol Type was changed from None to IEEE 802.1 or DEC, you must restart the bridge for the newly selected STA protocol to be applied.



All bridges in a network must use the same Spanning Tree version. Mixing Spanning Tree Algorithm protocols will cause an unstable network.

Changing Hello Time

If the bridge is the Root Bridge, or is attempting to become the Root, and you want to change the length of time the bridge waits between sending configuration BPDUs:

1. Highlight the **Hello Time** field, and type in a new value.
2. Click on **Set**.

The IEEE 802.1d specification recommends that Hello Time = 2 seconds; the allowable range is 1 to 10 seconds.

Changing Max Age Time

If the selected module is the Root Bridge or attempting to become the Root, and you want to change the maximum time that bridge protocol information will be kept before it is discarded:

1. Highlight the **Max Age** field, and type in a new value.
2. Click on **Set**.

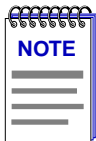
The IEEE 802.1d specification recommends that Max Age = 20 seconds; the allowable range is 6 to 40 seconds.

Changing Forwarding Delay Time

If the selected module is the Root Bridge or attempting to become the Root, and you want to change the time period the bridge will spend in the Listening state (e.g. either listening to BPDU activity on the network while moving from the Blocking to the Learning state or in the Learning state while the bridge is moving from the Listening to the Forwarding state):

1. Highlight the **Forwarding Delay** field, and type in a new value.
2. Click on **Set**.

The IEEE 802.1d specification recommends that Forward Delay = 15 seconds; the allowable range is 4 to 30 seconds.



To ensure proper operation of the Spanning Tree Algorithm, the IEEE 802.1d specification recommends that you always observe the following relationship between Forwarding Delay and Max Age:

$$2 \times (\text{Forwarding Delay} - 1.0) \geq \text{Max Age}$$

Changing Port Priority

To change the part of the Port Priority used in priority comparisons:

1. If necessary, select the desired port by clicking the mouse to highlight the port in the lower right quadrant of the window. The lower left quadrant of the window will now allow you to edit parameters for the selected port.
2. Highlight the port **Priority** field, and enter the new priority identifier. Only valid hexadecimal numbers (0 to FF) are allowed in this field. The default is 80 hexadecimal.
3. Click on **Set**. The new port priority will be saved.

Changing Path Cost

To change the Path Cost:

1. If necessary, select the desired port by clicking the mouse to highlight the port in the lower right quadrant of the window. The lower left quadrant of the window will now allow you to edit parameters for the selected port.
2. Highlight the **Path Cost** field, and type in a new value from 1 to 65535 decimal (default is 100 decimal).
3. Click on **Set**.

The new path cost will be applied to the port.

Filtering Database

The Filtering Database, which makes up the IEEE 802.1 Source Address Table, is used to determine which frames will be forwarded or filtered between the selected module's bridging ports.

Transparent bridges like the 9A128-01 use the **Filtering Database** to determine a packet's route through the bridge. During initialization, the bridge copies the contents of its Permanent Database to the Filtering Database. Next, the bridge learns network addresses by entering the source address and port association of each received packet into the Filtering Database. When in the Forwarding state, the bridge examines each received packet and checks it against the contents of the Filtering Database. If the destination address is located on the network from which the packet was received, the bridge filters (does not forward) the packet. If the destination address is located on a different network, the bridge forwards the packet to the appropriate network. If the destination address is not found in the Filtering Database, the bridge forwards the packet to all networks. To keep Filtering Database entries current, older entries are purged after a period of time, which is called the Dynamic Ageing Time.

The Filtering Database consists of two separate databases: the Static and the Learned Databases.

The **Static Database** contains addresses that are entered by a network administrator. You add these addresses directly to the database while the bridge is powered up, or to the selected module's battery-backed RAM so that they are stored on shutdown till the next power-up.

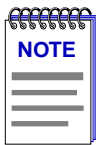
The **Learned Database** consists of addresses that accumulate as part of the bridge's learning process as it is up and running. These do not remain in the Source Address Table when the system is shut down. The Learned Database also contains the addresses that are in the Static Database upon start-up of the bridge.

Entries to the Source Address Table are one of four types: **Permanent**, **Static**, **Dynamic**, or **Learned**.

- **Permanent** entries are addresses that you add to the Static Database (via the Filtering Database window) that are stored in the selected module's battery-backed RAM. Since they remain in the module on shutdown or restart, they are considered "Permanent."
- **Static** entries are addresses that you add to the Static Database (via the Filtering Database window). These entries remain in the selected module's memory until it is shut down.
- **Dynamic** entries are addresses that you add to the Static Database (via the Filtering Database window). With the Ageing Time feature, you set the time period that these addresses are saved in the Source Address Table. Addresses that have not transmitted a packet during one complete cycle of the ageing timer are deleted from the database.
- **Learned** entries are addresses that are added to the Learned Database through the bridge's learning process. With the Ageing Time feature, you set the time period that these addresses are saved in the Source Address Table. Addresses which are inactive within a cycle of the ageing timer are dropped from the database.

Learned address entries are divided into two types, **Learned** and **Self**. Address entries classified as **Learned** have transmitted frames destined for a device attached to a segment connected to the selected module. Address entries classified as **Self** are those that have sent a frame with a destination address of one of the selected module's bridging port.

At the Filtering Database window (Figure 5-10), you can view the number of entries of each type: Permanent, Static, Dynamic, or Learned.



When you first initialize the Filtering Database window, a message will appear to inform you that data is being retrieved. The message will disappear when all information has been returned from the Filtering Database, and you will be able to view and configure database entries.

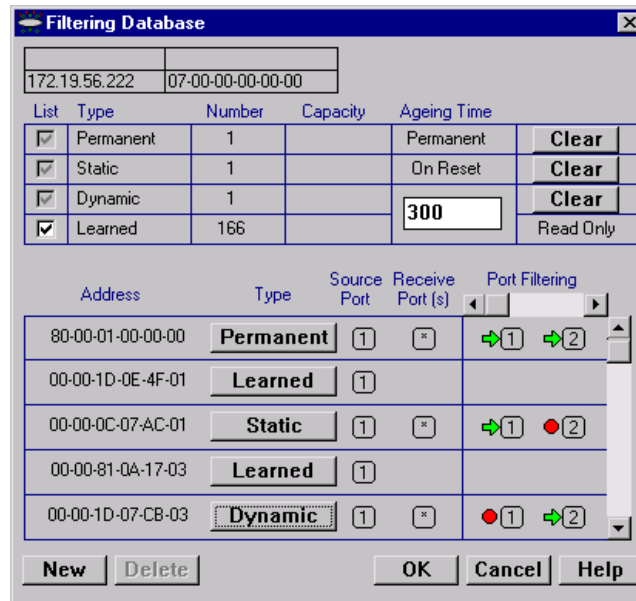


Figure 5-10. The Filtering Database Window

A scrollable Address Entry panel allows you to:

- View the address entries in the Filtering Database.
- Alter an entry's type (e.g., from Learned to Permanent, Dynamic, or Static).
- View and configure the bridging action taking place on the packets entering each of the bridging ports.

In addition, you can use buttons to add individual addresses to, or delete them from, these databases, or clear all Permanent, Static, or Dynamic entries in the database.

To access the Filtering Database window:

1. Click on **Bridge** to display the Bridge menu.

or

Click on the **Bridge label** in the module display; the bridge menu will appear.

2. Drag down to **Filtering Database...**, and release. The Filtering Database window will appear.

The following fields are listed in the top portion of the Filtering Database window:

List

The List checkboxes indicate whether the associated entry type (Permanent, Static, Dynamic, or Learned) will be displayed in the scrollable table of address entries. A check next to the entry type indicates that it will be displayed.

Type

Indicates the type of entry in the database.

Number

Displays the current number of Permanent, Static, Dynamic, and Learned Address entries.

Capacity

Indicates the total capacity of each entry type in the Static and Learned databases.

Ageing Time

Indicates the length of time, in seconds, that Dynamic and Learned Addresses in the Source Address Table are allowed to remain inactive before they are dropped from the database. The allowable time range for these entries is 10 to 1,000,000 seconds. Ageing time is not applicable to Static or Permanent entries. You can configure this field, as described in the next section.

The following fields are applicable to the scrollable Address Entry panel of Filtering Database entries.

Address

Lists the addresses for which the bridge's Filtering Database has forwarding and/or filtering information.

Type

Indicates the type of an entry in the database. The possible types are Static, Dynamic, Learned, Self, or Permanent. You can alter the entry type, as described in the next section.

Source Port

Indicates the port number on which the address entry was first detected. A question mark (?) indicates that the address entry was not a learned entry, but Port Filtering information applies to it (i.e., the entry is a created Permanent, Dynamic, or Static entry and has corresponding filtering information).

Receive Port

Indicates the number of the port on which a frame must be received in order for the entry's Port Filtering information to apply. An asterisk (*) indicates that the receive port is promiscuous, and applies to all ports of the bridge (assuming no conflicting entry applies). You can change the receive port, as described in the following section.

Port Filtering

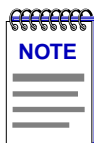
Indicates the action that will take place at each bridge port when it receives frames from the selected address entry. A green arrow indicates that the frames received from the address will be forwarded to the port's associated segment (➔**1**). A red circle indicates that frames will be filtered (blocked) from the port's associated segment (●**2**). You can change the Port Filtering action, as described in the next section. Use the scroll bars to view the filtering/forwarding status for all available ports; only two consecutive ports are displayed simultaneously.

Configuring the Filtering Database

You can configure the Filtering Database by:

- Altering the Ageing Time for Dynamic and Learned entries.
- Changing the type of entry with the Type buttons.
- Changing the Receive port for the filter.
- Changing the Port Filtering action at each bridge port.
- Adding or deleting individual Filtering Database entries.
- Clearing all Permanent, Static, or Dynamic entries from the Filtering Database.

Note that although configuration changes will appear in the window, no action actually takes place in the bridge's Filtering Database until you click on the **OK** button in the bottom right of the window. This saves the new configuration. If you change the window without clicking **OK**, then attempt to exit the window by clicking **Cancel**, a text box will appear stating "Changes have been made. Cancel them?". Click on **Yes** to exit the window without changing the Filtering Database, or **No** to return to the window.



*When you reconfigure the Filtering Database and click **OK**, the screen will clear temporarily and a message will appear to indicate that the information is being updated. When the changes have been successfully set and the Filtering Database has updated, the screen information will be refreshed.*

Altering the Ageing Time

To alter the Ageing Time for Dynamic and Learned entries:

1. Highlight the **Ageing Time** field with the cursor.
2. Type in the new Ageing Time (allowable range is 10 to 1,000,000 seconds).

Changing the Type of Entry

You can change any entry type from its current type (Learned, Self, Permanent, Static, or Dynamic) to either a Permanent, Static, or Dynamic entry. To do so:

1. Click on the shadowed **Type** button. A menu will appear with the three possible types to which the entry can be changed.
2. Highlight the desired type.

Changing the Receive Port

You can change the Receive port of an address entry in the scrollable panel, so that a frame must be received at the specified port for the filtering action to apply. To do so, click on the **Receive** port in the panel. With each click, the Receive port will cycle to the next port — from * (promiscuous), to 1, to 2, and back to *.

Changing the Port Filtering Action

You can change the Port Filtering action at each bridge port from its current action to the opposing action.

1. Maneuver the scroll bar until the desired port is in the Port Filtering panel.
2. Click on the port to alter its filtering action from forwarding frames from the associated address (➔**1**), to filtering frames (●**2**) (or vice versa).

Adding or Deleting Individual Entries

You can add or delete entries individually from the Filtering Database.

To add an address:

1. Click on the **New** button in the lower left of the window. A window (Figure 5-11) will appear.

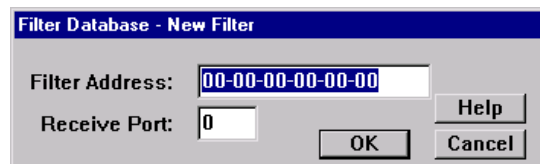



Figure 5-11. Filter Database – New Filter Window

2. In the **Filter Address** field, type in the address (Hex format) for which you desire bridging. Be sure to add "-" as a separator between each byte in the address.
3. In the **Receive Port** field, type in the port at which the address must be detected for bridging to take place. If you enter a value of 0 in this field, the Receive Port is considered promiscuous (i.e., any port), and will be designated by an * in the Address Entry panel.
4. Click on **OK**.
5. Specify the **Port Filtering** action on the address entry as described in the previous section.

To delete an address:

1. Click to highlight the address entry in the Address Entry panel that you wish to delete from the filtering database.
2. Click on **Delete**.

Clearing All Permanent, Static, or Dynamic Entries

To erase all Permanent, Static, or Dynamic entries from the Filtering Database, click on the associated  button in the upper portion of the window.

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