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Release 7.0

CopperView™ Element Manager:

Configuring a DSL Concentrator

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Table of Contents

About CopperView™

CopperView User Documentation

The *CopperView*™ Access Management System (AMS) and the *CopperView* Element Manager (EM) are described in five operating guides:

CopperView AMS Operating Guide: Provides the instructions required for using the *CopperView* AMS to control your network.

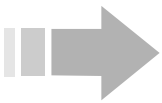
CopperView Installation Instructions: Provides the steps required to install the *CopperView* AMS and *CopperView* EM software. It also describes how to configure AMS and EM properties.

CopperView EM: Introduction: Describes the *CopperView* EM software and its features. It also provides samples of *CopperView* EM windows with an explanation of each window's fields.

CopperView EM: Configuring a DSL Concentrator: Describes DSL concentrator operation by means of the EM, including initial configuration, configuring WAN ports and configuring subscriber interfaces.

CopperView EM: Monitoring DSL Concentrator Operation: Provides diagnostic procedures and describes statistics that are maintained by the DSL concentrator and can be accessed, and graphed, using the EM.

These operating guides are provided in PDF format on the Copper Mountain Support FTP site and on the *CopperView* CD. *Adobe Acrobat*™ *Reader* is required for viewing the operating guides. A complimentary copy is included. If you require printed copies, contact *Copper Mountain Networks*' Customer Support at 1-888-611-4266.



N O T E

If you are reading a CopperView operating guide as an on-line document, various references throughout the document are provided in the form of hypertext links. If you click on one of these "hot links" (light blue text) the document will automatically go to the referenced page.

On-Line Help

The *CopperView* EM and *CopperView* AMS operating guides are also included as on-line help. Access the on-line help by clicking on *Help* in either the AMS or EM menu bar and selecting *Contents*.

Release Notes

For complete information about new features and late-breaking operational or other issues, consult the Release Notes document corresponding to the installed *CopperView* software version. Electronic copies of all release notes are available at the Copper Mountain support ftp site. From your browser, enter:

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ftp://userid@support.coppermountain.com
```

Enter your password when prompted to complete your login.

System Software and Applicability

This document applies to *CopperView*™ Element Manager (EM) software delivered under Release 7.0. Release 7.0 corresponds to and is intended to support and manage Hardware/Software Release 7.0 of the *CopperView* Access Management System (AMS), *CopperEdge*™ 150 Fast Packet DSL Concentrators, and *CopperEdge* 200 Fast Packet DSL Concentrators.

Document Conventions

Throughout this document, you will encounter examples of configuration commands in which link- or user-specific information such as IP addresses, subnet masks, or MAC addresses are shown. Unless otherwise specified, all such data is fictitious and provided for illustrative purposes only.

Document Applicability

This document covers the EM systems for Solaris, Linux, Windows NT and Windows 2000 platforms. These versions are virtually identical, but you may note minor variations in the appearance of the graphic interface. The Windows version serves as the basis for illustrations in this document.

If Features Described in this Document Do Not Appear

If features described in this document do not appear in the displayed windows, the software in the connected DSL concentrator may pre-date your *CopperView* EM software version (version 7.0). Double click in the Shelf View in the area above the modules, or on an empty module slot, to access the *System/Shelf* window suite with the *System* window displayed. The software version of the DSL concentrator will be displayed in the *Version* field. If the DSL concentrator's software is version 6.1 or earlier, refer to the feature descriptions in the *CopperView EM Installation and Operating Guide* for that version of the EM.

Reference Documents

CopperView Installation Instructions, Copper Mountain Networks part number 0081868-01.

CopperView Access Management System Operating Guide, Copper Mountain Networks part number 0081869-01.

CopperView Element Manager: Introduction, Copper Mountain Networks part number 0081870-01.

CopperView Element Manager: Configuring a DSL Concentrator, Copper Mountain Networks part number 0081871-01.

CopperView Element Manager: Monitoring DSL Concentrator Operation, Copper Mountain Networks part number 0081872-01.

CopperEdge 200 DSL Concentrator: Installation and Operating Guide, Copper Mountain Networks part number 0081873-01.

CopperEdge 200 DSL Concentrator: CopperCraft™ Reference and MIB Definitions, Copper Mountain Networks part number 0081874-01.

CopperEdge 150 DSL Concentrator: Installation and Operating Guide, Copper Mountain Networks part number 0081875-01.

CopperEdge 150 DSL Concentrator: CopperCraft Reference and MIB Definitions, Copper Mountain Networks part number 0081876-01.

CE200 SNMP Agent Profile, Release 7.0. This document is provided for advanced users of the *CopperView AMS*. It describes all MIBs and portions of MIBs that are supported by this release of the *CopperView AMS*.

Release Notes for Version 7.0 of *CopperEdge* products and *CopperView AMS/EM* software.

Chapter 1
Overview of DSL Concentrator Configuration with the EM

This operator's guide provides instructions for using the *CopperView*™ Element Manager (EM) to configure and maintain a DSL concentrator. The procedures included in this volume take you from initial configuration of a DSL concentrator for use with the EM, to configuring WAN ports, and finally to adding subscribers by configuring subscriber *NetModels*. Tools that the EM supports for simplifying network operation and DSL concentrator maintenance are also described.

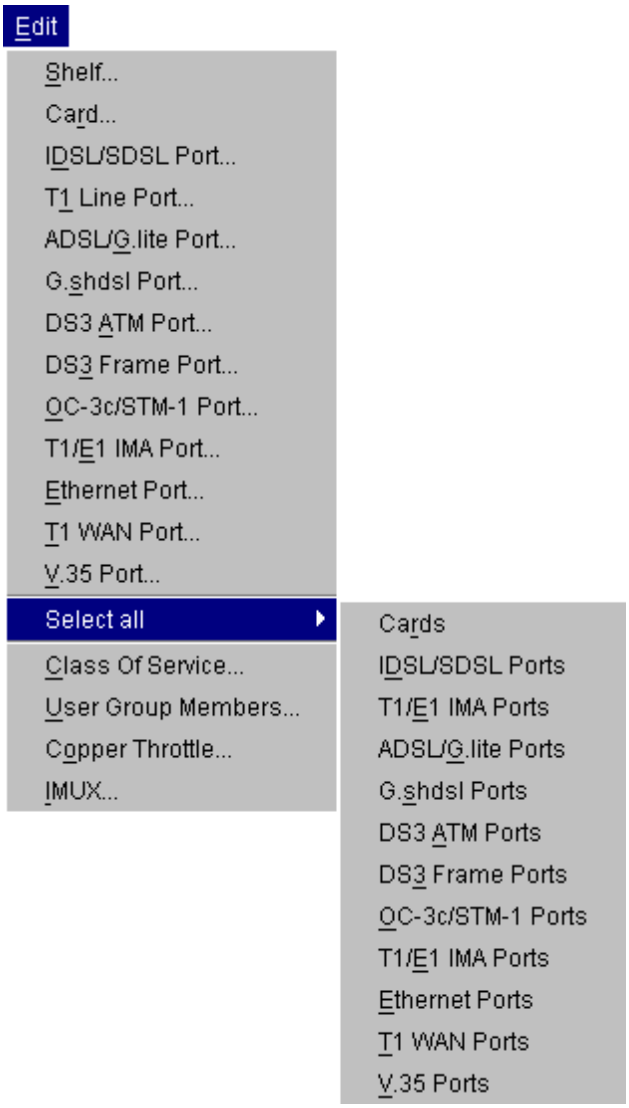
Locating Information in this Guide

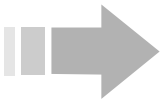
Information on using the EM to configure and maintain a DSL concentrator is located in the following chapters:

Chapter	Content
"EM Tools" on page 3	Using tools in the EM *Edit* menu; configuring class of service, user group members, data rates on subscriber ports, and IMUX bundles; using system redundancy with the DS3 protection switch.
"Initial Configuration" on page 21	Configuring a DSL concentrator for use with the EM; configuring WAN ports, adding virtual circuits and interfaces to WAN ports.
"Configuring Protocols" on page 57	Configuring protocol information pertaining to IP links, ATM circuits, frame relay circuits, *CopperVPN* groups, and IMA groups.
"Adding Subscribers" on page 111	Adding subscribers by linking subscriber ports to circuits on a WAN port using the appropriate *NetModel*.
"DSL Concentrator Maintenance" on page 169	Using EM tools to perform maintenance operations on DSL concentrators and CPE, including software upgrades.

Chapter 2
EM Tools

This chapter describes EM tools that are accessible through the EM *Edit* menu. The *Edit* menu allows you to configure a single DSL concentrator component, and to configure all components of a selected type. It also provides access to windows that allow you to configure a subscriber port's class of service, create user groups and add members to them, set subscriber port data rates, and increase subscriber port data rates by bundling multiple ports. Using system redundancy with the DS3 protection switch is also described in this chapter.





N O T E

Ensure that the CopperView AMS server is running before attempting to start the EM.

Selecting a Component Using the Edit Menu

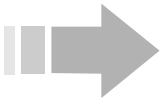
Click on a component in the Shelf View to select it, and then click on the *Edit* menu and select the component type in the upper *Edit* menu to display the *Edit* window suite for that component.

Selecting All Components Using the Edit Menu

Click on *Edit* in the EM menu bar, drag the cursor to *Select all*, then drag the cursor to a component type in the lower *Edit Select All* menu. Release the mouse button to select all installed components of that type. If you select *IDSL/SDSL Ports* from the lower menu, *all* IDSL and SDSL ports will be selected, even though you may have previously selected only one subscriber port by clicking on it. You can then click on the *Edit* or *Graph* icon in the EM tool bar to display an *Edit* or *Graph* menu for all of the subscriber ports.

Configuring Class of Service Values

Class of Service establishes preference levels that can be assigned to individual subscriber ports. Then, during periods of congestion in the DSL concentrator's System Control Module (SCM), subscriber ports with higher classes of service will be more likely to forward packets to a WAN interface. *Class of Service* does not guarantee that subscriber ports that have lower class of service will have packets discarded before ports with higher class of service. This feature only gives preference to higher service classes by forwarding more received packets from those classes than from lower service classes during periods of congestion.



N O T E

Preference accorded by Class of Service is measured in packets, not octets. As a result, a port sending large packets with a low Class of Service could have a higher throughput than a port sending small packets but with higher Class of Service.

The packet forwarding preference for a *Class of Service* is the percentage of packets in the composite data stream that will come from subscriber ports assigned this service class. It is determined by the ratio of the class weight to the sum of the class weights of all active classes. Default weights for classes A through D are:

- Class A = 4
- Class B = 3
- Class C = 2
- Class D = 1

Using the default class weights, if subscriber ports from Class A, Class B, Class C and Class D are sending data to the WAN port during a period of SCM congestion, forwarding preferences for Class A will be:

Class A / (Class A + Class B + Class C + Class D), or

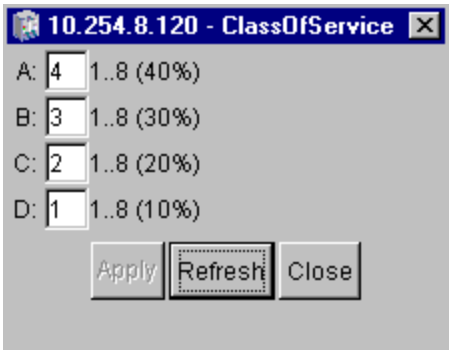
4 / (4 + 3 + 2 +1) = 4 / 10 = 0.4 or 40%

Note, however, that if only two service classes are actively passing data from subscriber ports to a WAN port, the forwarding preferences are calculated using only those classes. For example, if only Class A and Class D subscriber ports are sending data to the WAN port, forwarding preference for Class A will be:

Class A / (Class A + Class D), or

4 / (4 + 1) = 4 / 5 = 0.8 or 80%

Select *Class of Service* from the *Edit* menu to change the relative weight values applied to each class by the *Class of Service* feature. The *ClassOfService* window will display.



Enter the desired class weights and click on *Apply*. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

The following rules apply to selection of class weight values:

- Every class must have a whole number weight value from 1 to 8.
- Higher classes must have higher weight values than lower classes, i.e. A>=B>=C>=D.
- Two or more classes can be set to the same weight value, but any distinction between those classes is lost. Setting all classes to the same value eliminates all classes.

Configure the *Class of Service* level (A, B, C, or D) for an individual subscriber port in the *ServiceClass* field in the port's *Interface* window (described in "*CopperView EM: Introduction*"). Every configured (operational) subscriber port has a *Class of Service*; the default is Class D.

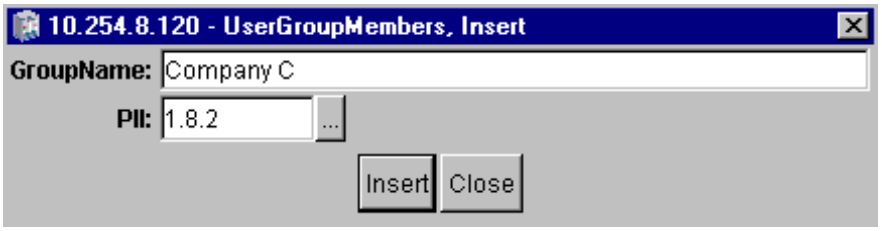
Configuring User Groups

The EM allows you to create user groups, and then assign subscriber ports, bundles and virtual circuits to them. User group information can then be used to help identify those ports, bundles and circuits in the Trap Log, and in Alarm and Event traps.

Select *User Group Members* from the *Edit* menu. The *UserGroupMembers* window appears with a display of all groups that have been assigned to the DSL concentrator. The PII of each group member is shown in the *PII* column, with the name of the group it belongs to in the *GrpName* column.

Creating a User Group

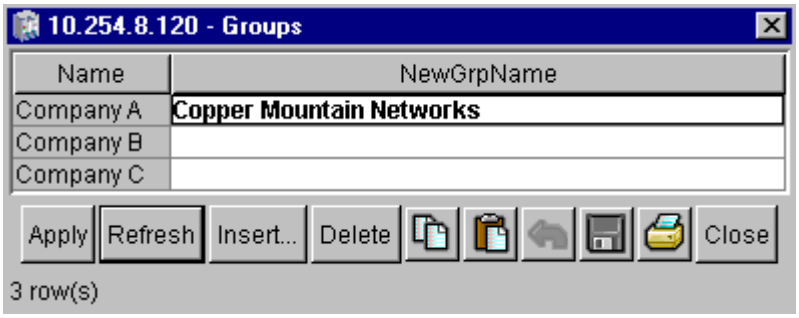
1. Click on *Insert* in the *UserGroupMembers* window. The *UserGroupMembers, Insert* window will display.



2. Enter the name of the new user group in the *GroupName* field. The group name must begin with an alphabetic character or an underscore, and cannot contain special characters. It can contain up to 31 characters.
3. Enter the PII of a group member in the *PII* field or click on the browse button to the right of this window to select the PII.
4. Click on *Insert* to add the group and its new member's PII to the *UserGroupMembers* window.
5. To add another member to an existing group, click on the group name in the *UserGroupMembers* window and then click on *Insert*. The EM will enter the selected group name in the *GroupName* field of the *UserGroupMembers, Insert* window. Repeat steps 3 and 4 to add the new member's PII to the group.
6. Click on *Refresh* to display the list of groups in the *UserGroupMembers* window in ascending alphanumeric order.
7. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Changing a User Group Name

1. Click on the *Groups* button in the *UserGroupMembers* window.
2. The *Groups* window will appear with user groups listed in the *Name* column. Enter a new group name in the *NewGrpName* field.
3. Click on *Apply* to assign the new name to that group; then click on *Refresh*.



4. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

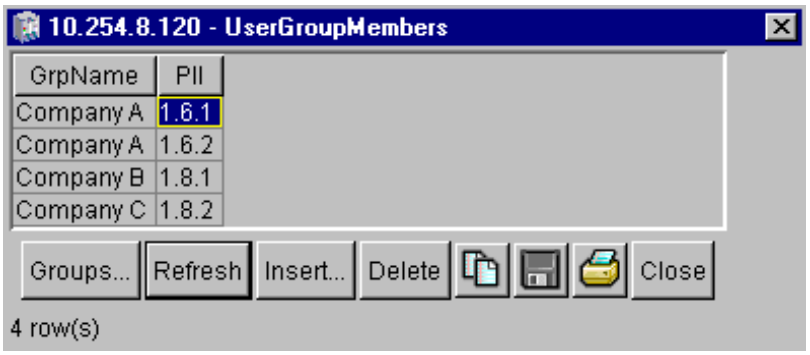
Adding a New User Group Name

1. To add a new group name without having to add a member to that group, click on *Insert* in the *Groups* window. The *Groups, Insert* window will appear.

2. Enter the name of a new user group and click on *Insert*.
3. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Removing a Member from a User Group

1. In the *UserGroupMembers* window, click on the member to be deleted.



2. Click on *Delete*.
3. Click on *Close* to exit the *UserGroupMembers* window.
4. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Controlling Subscriber Port Data Rates with Copper Throttle

The *Copper Throttle* feature provides a fast, easy-to-use tool for viewing and configuring data rates on multiple subscriber ports. You can apply *Copper Throttle* to ports on a single module or to ports on multiple modules.

To access a *Copper Throttle* display, first select one or more DSL modules, then click on the *Copper Throttle* icon in the EM tool bar. A separate *Copper Throttle* window will appear for each module selected.

Copper Throttle windows can be displayed for IDSL, SDSL, G.shdsl, ADSL and G.lite modules. For IDSL and SDSL modules, the *Copper Throttle* window shows the data rate of each port as an individual slider switch (throttle). For G.shdsl modules, the *Copper Throttle* window shows the configured minimum, configured maximum, and current data rates for each port. For the asymmetrical ADSL and G.lite modules, the *Copper Throttle* window shows the configured minimum, configured maximum, and current data rates in both the receive and transmit directions.

Reading the Copper Throttle Display

Copper Throttle indicates the data rate of each displayed port with a color code and a text readout. The text readout is located to the right of each *Copper Throttle* slider for IDSL and SDSL ports, and in the *Current Receive Rates* and *Current Transmit Rates* columns for G.shdsl, ADSL and G.lite ports. Colors used to show data rate in the *Copper Throttle* window are determined by the port being displayed.

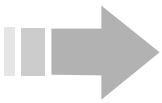
Displaying Port Data Rates for one DSL Module

Click on one DSL module to select; then click on the *Copper Throttle* icon to bring up a *Copper Throttle* window.

Displaying Port Data Rates for Multiple DSL Modules

To display *Copper Throttle* windows for multiple DSL modules, click on *Select all Cards* in the EM *Edit* menu to select all modules in the Shelf. (Selected modules will be highlighted in yellow.) Next, de-select any modules you do not need by holding down the <*Ctrl*> key and clicking on the module. De-select all WAN modules and the Buffer Control module, as well as any DSL modules for which you do not want to display a *Copper Throttle* window.

When the desired modules have been selected, click on the *Copper Throttle* icon in the EM tool bar. *Copper Throttle* windows will display the data rates of all ports on the selected modules.



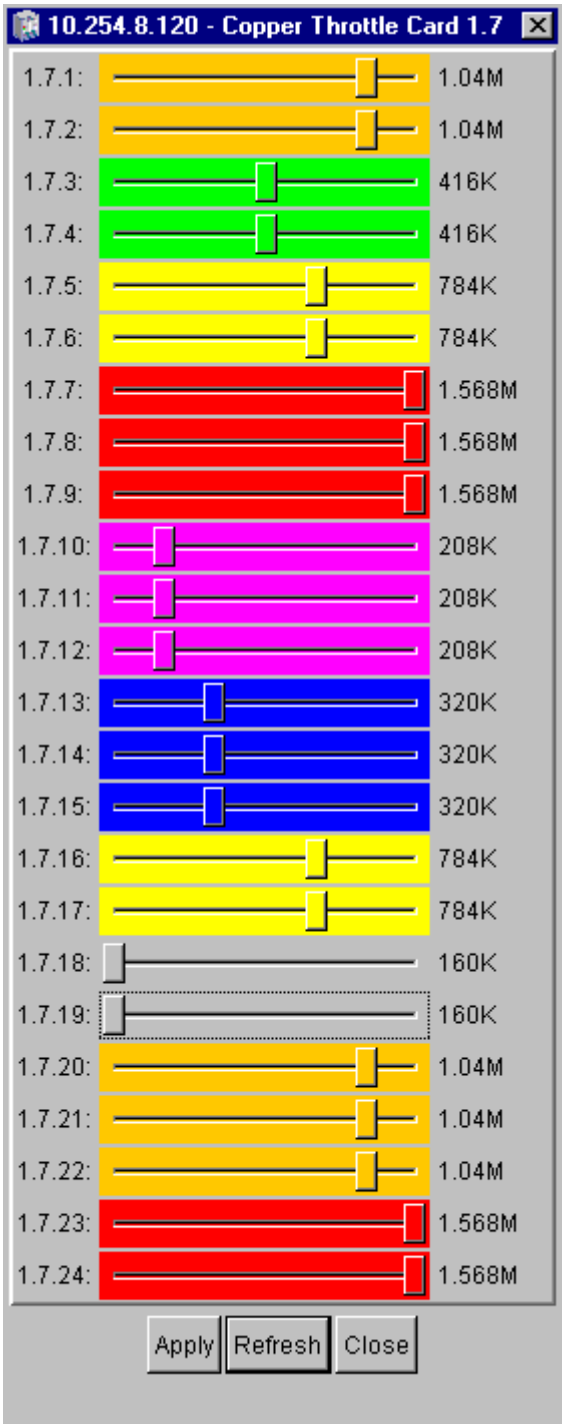
N O T E

When you select multiple DSL modules, Copper Throttle windows may overlap one another, and it may be necessary to click on the top windows and move them aside in order to view windows that have been covered.

Setting Data Rates for IDSL and SDSL Subscriber Ports

To change an IDSL or SDSL subscriber port's data rate:

1. Click to select an IDSL or SDSL module; then click on the *Copper Throttle* icon to display a *Copper Throttle* window.



Copper Throttle Window for a 24-Port SDSL Module

2. Click on the slider for a port in the *Copper Throttle* window and drag the slider to the right to increase the data rate, or to the

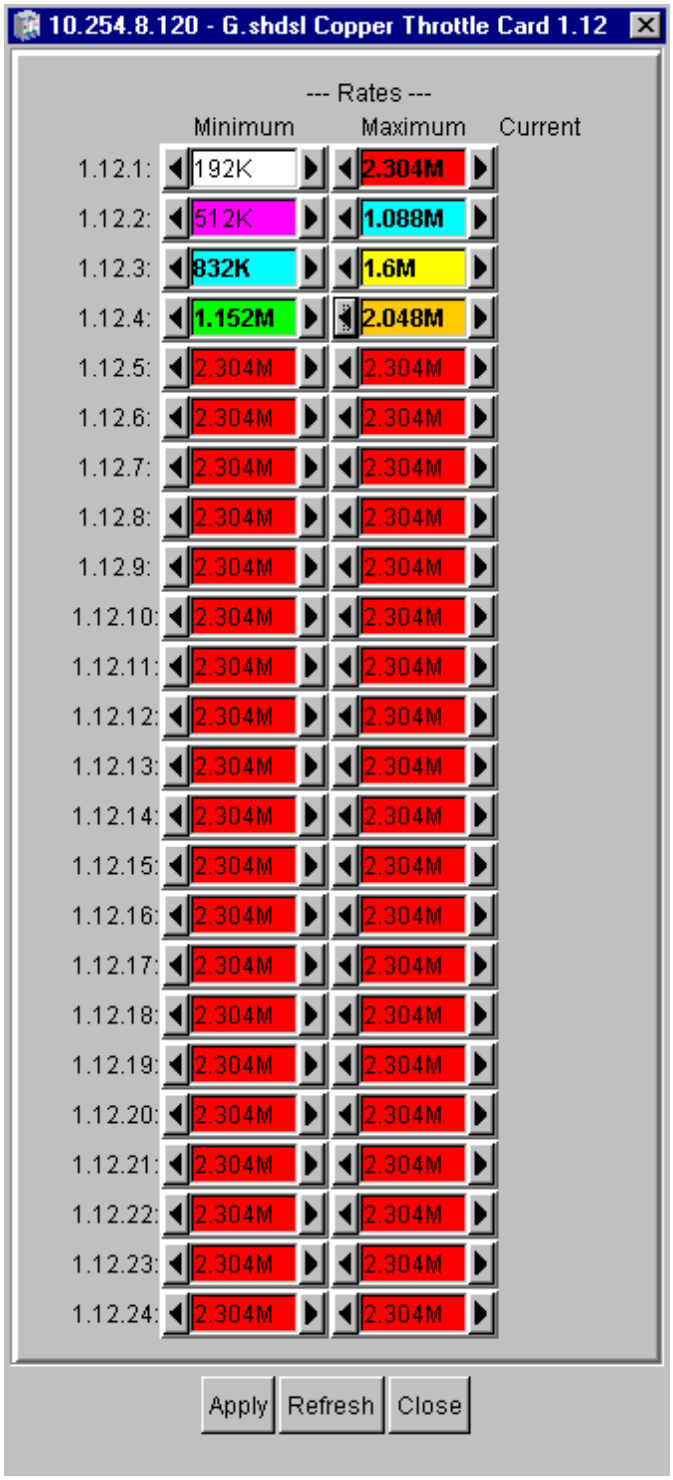
left to decrease the data rate. As you move the slider, the rate, as displayed by color code and text, will change.

3. When the desired rates have been configured, click on *Apply* to update the port rates and click on *Close* to exit *Copper Throttle*.
4. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Setting Data Rates for G.shdsl Subscriber Ports

To change a G.shdsl subscriber port's data rate:

1. Click to select a G.shdsl module; then click on the *Copper Throttle* icon to display a *Copper Throttle* window.



N O T E

If the training mode for a G.shdsl port is set to fixed-rate, you will not be able to adjust its minimum and maximum data rates. To change the port's training mode to rate-adaptive, double click on the G.shdsl port to display the subscriber port window suite, then click on the G.shdsl tab to display the G.shdsl window. Click to select rate-adaptive in the ConfTrainMode field; then click on Apply.

2. Each port displays colored text boxes indicating data speed control. The text field can only be changed with the arrows. Click on the left-arrow button to decrease the speed by one decrement. Click on the right-arrow button to increase the speed by one increment. The increment and decrement are based on the port's current displayed speed.

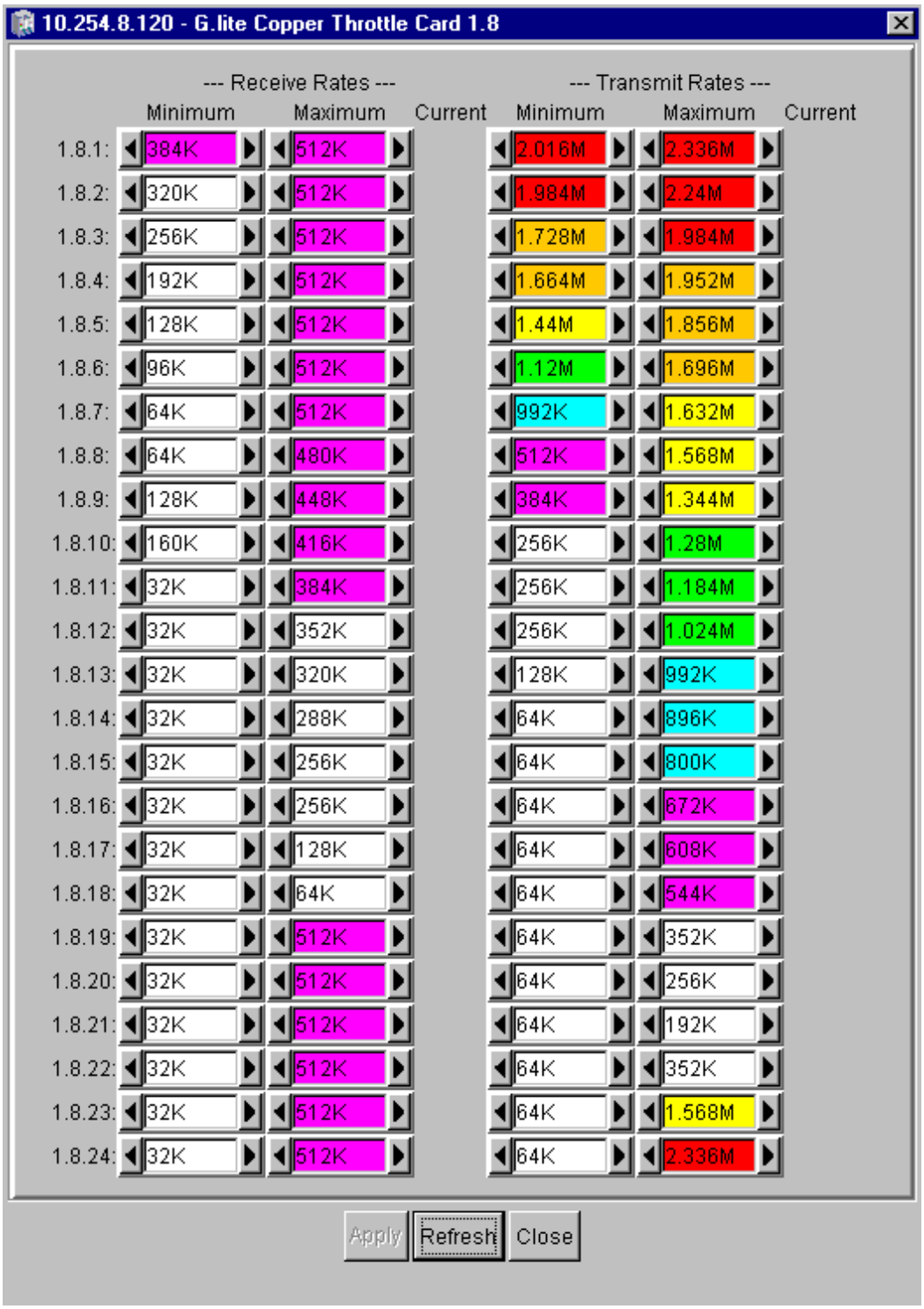
   The minimum rate must be less than or equal to the maximum rate. The *Copper Throttle* will not allow this rule to be violated. The *Copper Throttle* will warn the user with a beep if the speed cannot be set higher or lower in a particular direction.

3. When the desired rates have been configured, click on *Apply* to update the port rates and click on *Close* to exit *Copper Throttle*.

4. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Setting Data Rates for Asymmetrical Subscriber Ports (ADSL and G.lite)

Click to select an ADSL or G.lite module; then click on the *Copper Throttle* icon to display a *Copper Throttle* window.



The *Copper Throttle* window includes four sets of controls for each port: *Minimum Receive Rates*, *Maximum Receive Rates*, *Minimum Transmit Rates* and *Maximum Transmit Rates*. *Current Receive*

Rates and *Current Transmit Rates* fields are also displayed for each port.

To change an asymmetrical subscriber port's data rate:

1. Each port displays colored text boxes indicating data speed control. The text field can only be changed with the arrows. Click on the left-arrow button to decrease the speed by one decrement. Click on the right-arrow button to increase the speed by one increment. The increment and decrement are based on the port's current displayed speed.

   For any transmission direction, the minimum rate must be less than or equal to the maximum rate. The *Copper Throttle* will not allow this rule to be violated. The *Copper Throttle* will warn the user with a beep if the speed cannot be set higher or lower in a particular direction.

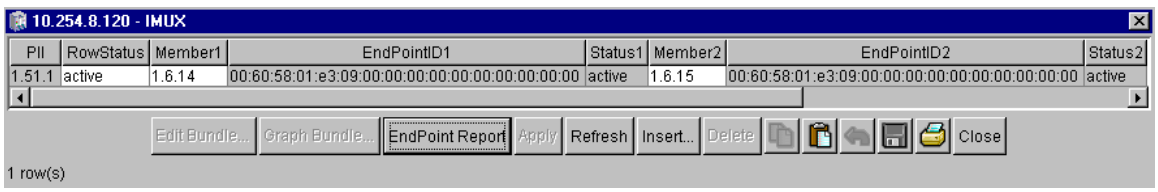
2. When the desired rates have been configured, click on *Apply* to update the port rates and click on *Close* to exit *Copper Throttle*.

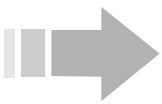
3. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Using IMUX to Create a Bundle

Use the *IMUX* feature to combine up to four subscriber ports into a bundle and increase the throughput capacity to an IMUX-capable CPE (CR202 or CR212). Bundled subscriber ports need not be consecutive, or even on the same DSL module. Bundles are assigned characteristics (*NetModel*, *EncapsulationType*, virtual circuits) like a single port. Subscriber ports can only be bundled when they are connected with an IMUX-compatible CPE.

Click on the *Edit* menu and select *IMUX*. The *IMUX* window will appear and display every bundle configured on the DSL concentrator.





N O T E

If you click to select a bundle in the IMUX window, the LED representing every subscriber port that is part of that bundle will be highlighted in the Shelf View display.

The *IMUX* window identifies each bundle, and includes the following fields to describe each member in the bundle:

PII: Identifies the bundle using a special "Bundle PII." The Bundle PII always identifies the slot as 51 and includes a bundle identifier that can range from 1 to 63 in the position normally occupied by

port number; i.e., the Bundle PII format is c.51.pp, where c is the chassis (shelf) number and pp is the bundle identifier.

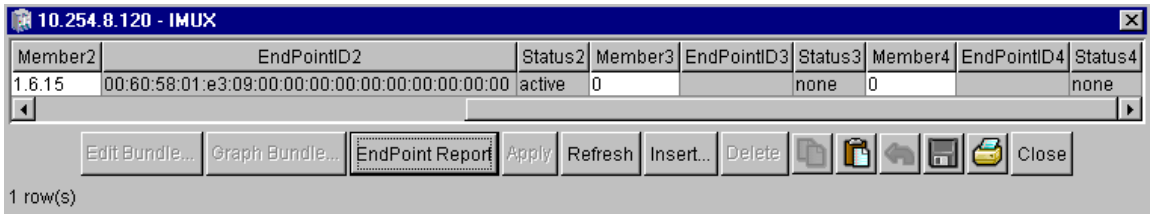
RowStatus: Displays *active*. You can delete an entire bundle by clicking on this field, selecting *destroy*, clicking on *Apply* and then clicking on *Refresh*. This is functionally the same as selecting a bundle and clicking on *Delete* and *Apply*.

Member#: Lists each member port in the bundle as *Member1* through *Member4* and displays the member port's PII. Edit the value in this field, click on *Apply* and then *Refresh* to change a member to a different subscriber port. Change this field to 0, click on *Apply* and then *Refresh* to delete that member from the bundle.

EndPointID#: The EndPoint ID uniquely identifies the IMUX CPE connected to the subscriber port represented by the member PII. All ports in a bundle must be on the same CPE and must therefore have the same EndPoint ID. If the CPE is not IMUX-capable, or if the port is not trained, the EndPoint ID will be all zeros.

N O T E

Click on the arrow at the bottom of the IMUX window to access the remaining fields.



Status#: This field indicates the current status of member subscriber ports:

none: Indicates that there is no link configured or the configured link has not trained.

active: Indicates that the port is trained and available to transmit user data.

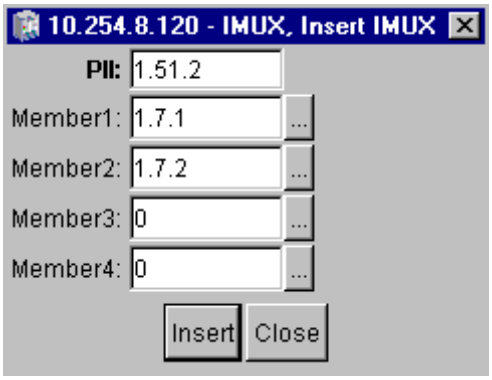
waitForAdd: Indicates that the link is trained and the system is waiting for an addition acknowledgement from the IMUX CPE.

Adding an IMUX Bundle

To create an IMUX bundle, click on *Insert* in the *IMUX* window to access the *IMUX, Insert IMUX* window.

N O T E S

- *The CE200 and CE150 DSL concentrators only support two subscriber ports per IMUX bundle.*
- *The IMUX-capable CR202 and CR212 CPE only support connection with SDSL and IDSL subscriber ports.*



The Slot portion of the Bundle PII displayed in the *PII* field will be populated by the EM with a value of 51. Append a Bundle ID number in the *PII* field. The bundle identifier can range from 1 to 63. Enter the PII of each subscriber port to be included in the bundle in the *Member1* through *Member4* fields. Then click on *Insert* to add the new bundle to the DSL concentrator's configuration.

N O T E

A subscriber port's NetModel must be configured as none and the attached CPE must be IMUX capable before that subscriber port can be added to a bundle. However, a subscriber port with no attached CPE can be added to a bundle.

Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

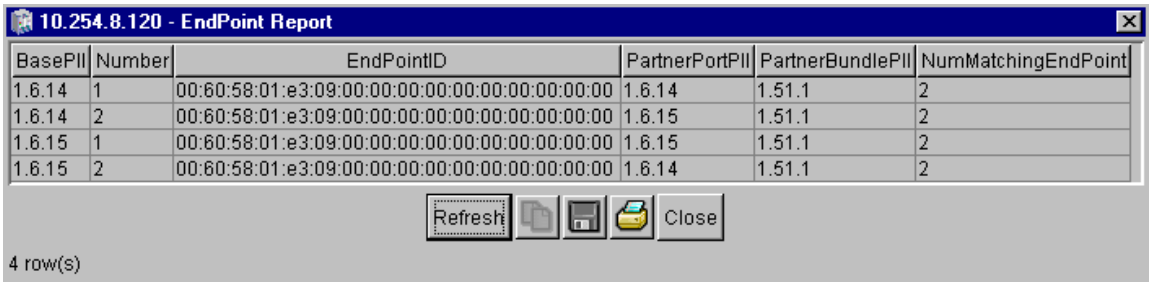
Removing an IMUX Bundle

To remove an IMUX bundle, click on the *Edit* menu and select *IMUX*. The *IMUX* window will appear and display every bundle configured on the DSL concentrator. Click to select the bundle you want to delete; then click on *Delete*. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Viewing IMUX CPE Configuration

You can view a list of configuration and connection information for IMUX-capable CPE connected with subscriber ports on the DSL concentrator in the *EndPoint Report* window. This window is useful for troubleshooting multilink configuration problems. It displays a list of all subscriber ports trained on an IMUX CPE. Click on the

EndPoint Report button in the *IMUX* window to access the *EndPoint Report* window.



N O T E

If a subscriber port is connected to an IMUX CPE but not trained, it will not appear in the EndPoint Report window.

The following fields are included:

BasePII: The PII of a subscriber port trained on the IMUX CPE identified in *EndPointID*.

Number: Index number assigned by the DSL concentrator to a subscriber port reporting the same *EndPointID* as the *BasePII* subscriber port. For example, the second port on a two-port IMUX CPE, with both lines trained, will have the *Number* 2.

EndPointID: The EndPoint ID being reported by both the CPE connected to the *BasePII* subscriber port and the CPE connected to the *PartnerPortPII* subscriber port. (Each IMUX-capable CPE is identified with a unique *EndPointID*, usually derived from the CPE's MAC address.)

PartnerPortPII: The PII of the subscriber port trained on an IMUX CPE reporting the same *EndPointID* as the *BasePII* subscriber port. If *Number*=1, the *PartnerPortPII* is the same as the *BasePII*.

PartnerBundlePII: The PII of the IMUX bundle that includes the *PartnerPortPII* subscriber port. If no IMUX bundle exists, this value will be 0.

NumMatchingEndPoint: The total number of currently trained subscriber ports with the same *EndPointID* as the *BasePII* subscriber port. (This value includes the *BasePII* port.)

Using Redundancy with the DS3 Protection Switch

When a CE200 that has been configured for redundant operation through a DS3 protection switch is first initialized, the *Redundancy* feature will be *disabled*. The Preferred (left) Redundancy Complex will be configured as the Primary complex, the complex that controls the system. WAN ports on both the Primary (left) side and Secondary (right) side will be synchronized with the network, but WAN modules on the Secondary side will be red in the EM display; those modules will also indicate that *OperState* is *disabled*. There should be no near-end or far-end alarms.

To enable redundancy:

1. Double click on the Shelf View in the area above the module slots, or on an empty slot in the display. The *System/Shelf* window suite will appear with the *System* window displayed.
2. Click on the *Redundancy* tab and when that window appears, click in the *Redundancy* field to select *enable*; then click on *Apply*. Redundancy will be enabled and the WAN modules on the Secondary side will indicate that *OperState* is *enabled* (green in the Shelf View).

If a failover occurs, the Secondary Redundancy Complex will take over the primary role within 5 seconds. After the Secondary Redundancy Complex has become the Primary Redundancy Complex, the CE200 will no longer be configurable via the EM or the *Craft* port of the (formerly *Primary*) SCM. A warning dialog will display, indicating that the system is not manageable from the secondary SCM. The EM will display the system as a CE200 with an SCM in slot 1.2, and no other installed modules. To communicate with that CE200, it will be necessary to reconnect with the CE200 via its new Primary SCM.

When a failover occurs:

- The *Redundancy* feature will automatically be disabled. This is to prevent the CE200 from being controlled alternately by the two Redundancy Complexes if the former *Primary Complex* operates intermittently. The WAN modules of the *Secondary* (formerly *Primary*) *Redundancy Complex* will indicate that their *OperState* is *disabled*.
- Circuits configured on the Preferred WAN port will automatically communicate over the Backup WAN port. It is not necessary to configure circuits on the Backup WAN port. After a failover, all circuits will continue to operate normally.
- Once you have reconnected with the CE200's new Primary Redundancy Complex, the WAN circuits that are communicating over the new Primary WAN ports can be viewed and changed via either the EM or the *Craft* interface. However, when you open a *Circuits* window, *OAM* window, *All Interfaces* window or *ATM* window, circuits in those windows will be referenced by their logical index, so while the window may indicate 1.16.1, for example, circuits in that window will indicate and be configured by 1.3.1.nn.

Once the cause of a failover has been remedied, you can restart the Secondary Redundancy Complex without interrupting the CE200, because the CE200 will still be in the control of the Primary Redundancy Complex.

1. Connect to the CE200 via the Secondary Redundancy Complex.
2. Double click on the SCM to open the *SCM Card* window.

3. Click in the *Command* field to select *Restart*, then click on *Apply*.

The entire Secondary Redundancy Complex will restart without interrupting CE200 operation.

After proper operation has been restored to the Preferred (Secondary) Complex, restore the system so it will be controlled by the Preferred Redundancy Complex:

1. Click on *Save to NVRAM* to save the configuration file to the DSL concentrator's nonvolatile memory. This ensures that any changes are transferred from the current Primary Redundancy Complex to the other side. The Secondary Redundancy Complex will restart automatically.
2. Connect with the Primary Redundancy Complex, then double click on the Shelf View in the area above the module slots or on an empty slot in the display. The *System/Shelf* window suite will appear with the *System* window displayed. Click on the *Redundancy* tab and when that window appears, click in the *Redundancy* field to select *enable*; then click on *Apply*.
3. Click on the *System* tab of the *System/Shelf* window suite. When the *System* window appears, click on *Relinquish* in the *Command* field and click on *Apply* to restore the Preferred Redundancy Complex as the Primary Complex. Then reconnect with the CE200 through its new Primary Redundancy Complex so you can communicate with it. Because redundancy complexes have changed, the *Redundancy* feature will be *disabled* and the new Secondary WAN module *OperState* will be *disabled*.
4. Double click on the Shelf View in the area above the module slots, or on an empty slot in the display. The *System/Shelf* window suite will appear with the *System* window displayed. Click on the *Redundancy* tab and when that window appears, click in the *Redundancy* field to select *enable*; then click on *Apply*. The Secondary Redundancy Complex WAN module's *OperState* will be *enabled*.

Chapter 3
Initial Configuration

This chapter describes procedures for preparing a DSL concentrator for use with the *CopperView* EM, and procedures for configuring WAN ports and WAN virtual circuits. Only procedural steps for operating the DSL concentrator are included in this chapter. See "*CopperView EM: Introduction*" for descriptions of EM windows and fields.

Preparing a DSL Concentrator for Operation with the EM

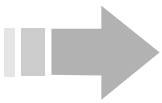
Before the EM can communicate with a *CopperEdge* product, several DSL concentrator parameters must have already been configured using *Craft* commands. These include:

- cmOperator privileges.
- A port must be configured through which the EM can communicate. An Ethernet port or WAN port can be used, but if a WAN port is used, a virtual circuit must also be configured.
- A default route must be configured using *Craft* commands. If the DSL concentrator and the EM are on different networks, a route must be established to provide a link between them.

For detailed procedures, refer to the manual for your DSL concentrator.

DSL Concentrator Configuration Procedure

Once communication is established between the EM and the DSL concentrator, each of the following steps must be performed to configure the DSL concentrator.



N O T E

Ensure that the CopperView AMS server is running before attempting to start the EM.

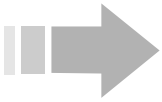
1. Enter system information.
2. Configure SNMP trap receivers.
3. Configure WAN port network interfaces.
4. Configure additional IP routes.

5. Add subscribers to the DSL concentrator.

Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Enter System Information

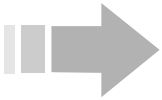
1. Double click in the area above the circuit modules, or on an empty module slot in the Shelf View. The *System/Shelf* window suite will appear with the *System* window displayed.
2. Enter the name of the person to contact for information about the DSL concentrator in the *sysContact* field.
3. Enter a unique name for the DSL concentrator in the *sysName* field.
4. Enter the physical location of the DSL concentrator in the *sysLocation* field.
5. If desired, click to *enable* or *disable* Frame Relay Traps, Authentication Traps, or both, from the DSL concentrator to designated trap receivers.
6. If you have a multi-shelf system, enter a Class C IP address in the *ExpIpSubNet* field that the system can use for internal subnetworking. (The format of the Class C subnetwork should be A.B.C.0, where A, B, and C are in the range 0 to 255.)



C A U T I O N

It is up to the operator to ensure that this address range does not conflict with other assigned addresses, and to provide any necessary security filtering to prevent external access.

7. If desired, enter a PII in the *MgmtPII* field to designate a WAN port as the source of all traps and SNMP response messages. When the *MgmtPII* field contains a PII to designate a port, the DSL concentrator will always enter the IP address assigned to that port in the *Source IP Address* field of traps and SNMP response messages.



N O T E

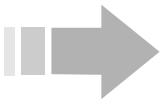
When using a WAN port to manage a DSL concentrator (in-band management), be sure to enter a PII in the MgmtPII field to designate a specific WAN port IP Address as the source of management messages. If you do not designate a source IP address in the MgmtPII field, the AMS server will be flooded with polling messages from the Ethernet IP address of the DSL concentrator.

8. Enter the date and time in the format YYYY/MM/DD-HH:MM:SS in the *CalendarTime* field to set the DSL concentrator's real-time clock and calendar.
9. Click on *Apply* to update the DSL concentrator's configuration.

10. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Configure an SNMP Trap Receiver

1. Click on *Diag* in the EM menu bar and select *Trap Receiver*. The *Trap_Receiver* window will display all trap receivers that are configured in the DSL concentrator.
2. Click on the *Insert* button. The *Trap_Receiver, Insert Traps* window will appear.
3. Enter the IP address of the new trap receiver in the *IpAddr* field.
4. Enter the TCP port number that the DSL concentrator will use when sending traps to this receiver in the *Port* field.



N O T E

The EM automatically takes the number in the Trap Port field in the Misc window of the Properties window suite in the Device menu and enters it in the Port field. The EM also automatically enters the local IP address in the IpAddr field, the IP address of the managed device in the Community field, and the default user login name in the OwnerString field. You can change any of these fields. However, if you change the value in the Port field, be sure to also change that value in the Trap Port field in the Misc window. The DSL concentrator will route traps to the port number shown in the Misc window of the EM Properties window suite, regardless of what port number you enter in the Trap_Receiver, Insert Traps window.

5. Click on *Insert* in the *Trap_Receiver, Insert Traps* window to add the newly-entered trap receiver to the *Trap_Receiver* window.
6. Click on *Refresh* in the *Trap_Receiver* window.
7. Repeat steps 2 through 6 for additional trap receivers.
8. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Configure the DSL Concentrator WAN Ports

Follow the appropriate procedure (described in "Configure WAN Ports" on page 24) to configure network interfaces for the DSL concentrator on your WAN ports.

Configure IP Routes

1. Click on *Protocols* in the EM menu bar and select *IP*. The *IP* window suite will appear.
2. Click on the *IP Route* tab. The *IP Route* window displays a row of data for each destination address in the configuration file.
3. Click on *Insert*. The *IP, Insert IP Route* window will appear.
4. Enter the destination IP address in the *Dest* field.

5. Enter an IP address in the *NextHop* field to identify the next hop in the route. The EM will determine the interface that will be used for the route and enter a value in the *Interface* field of the *IP Route* window to identify that interface.
6. Enter a netmask to apply to the route in the *Mask* field.
7. Click on *Insert* to add the route to the *IP Route* window; then click on *Refresh*.
8. Repeat steps 3 through 7 for each additional route to be added to the DSL concentrator.
9. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Adding Subscribers

Add subscribers by configuring DSL links to conform with the appropriate *NetModel* (described in "Adding Subscribers" on page 111). This process will connect the subscriber on a DSL link with a circuit on a WAN port.

Configure WAN Ports

DS3 ATM WAN Port

The five steps required to configure a DS3 ATM WAN port are detailed in the following sections. These steps consist of:

1. Selecting communication protocols for the port.
2. Configuring ATM Connection Admission Control (CAC).
3. Configuring traffic parameters that can be assigned to ATM circuits as they are created.
4. Creating circuits on the DS3 ATM port.
5. Configuring an interface for the newly added circuits.

When the DS3 ATM port has been configured, click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Select Communication Protocols

1. Double click on the port in the Shelf View. The *DS3 ATM Port* window suite will appear with the *DS3 Control* window displayed.
2. Configure the following parameters to conform with your system:

   ⇒ **LineType:** Only *ClearChannel* is supported on an ATM interface.

   ⇒ **LineCoding:** Only *dsx3B3ZS* is supported by the ATM Interface.

   ⇒ **SendCode:** Select *dsx3SendNoCode* (send no diagnostic command code) to configure the DS3 ATM port for normal operation.

⇒ **CircuitIdentifier:** If desired, enter a user-defined name for the port.

⇒ **LoopbackConfig:** Select *dsx3NoLoop* (no loopback mode) when configuring a DS3 ATM port.

⇒ **TransmitClockSource:** Click to select the source of the transmit clock:

loopTiming: Recovered receive clock will be used as the transmit clock.

localTiming: A local clock source will be used as the transmit clock.

⇒ **LineLength:** Enter the length of the DS3 line in meters for line build out (LBO). This value must be an integer ranging from 0 to 137. Default: 1.

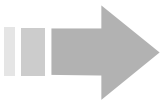
⇒ **LineStatusChangeTrapEnable:** Click to determine whether *dsx3LineStatusChange* traps will be generated for the DS3 ATM port.

3. Click on *Apply*.

Configure ATM Connection Admission Control

1. Click on the *ATM* tab to access that window.
2. Configure the following parameters to conform with your system.

Over-Subscription Factors:



N O T E

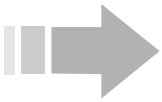
When entering over-subscription factors, the default value of 100 represents no over-subscription. Values under 100 represent under-subscription, and values above 100 represent over-subscription (e.g., 50 indicates half the line rate, 200 indicates double the line rate). Range: 1 to 2500.

⇒ **RtPCR:** Enter a Peak Cell Rate (PCR) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *rtVBR* virtual circuits on the port.

⇒ **RtSCR:** Enter a Sustained Cell Rate (SCR) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *rtVBR* virtual circuits on the port.

⇒ **NrtPCR:** Enter a Peak Cell Rate (PCR) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *nrtVBR* virtual circuits on the port.

⇒ **NrtSCR:** Enter a Sustained Cell Rate (SCR) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *nrtVBR* virtual circuits on the port.



N O T E

ATM CAC Enable in the Device window of the EM Properties window suite must be turned on (indicated by a check) to enable Connection Admission Control over-subscription checking, or configured over-subscription factors will not be applied.

Interface Config:

⇒ **CellPayloadScrambling:** Click to *enable* or *disable* payload scrambling on the ATM interface. Default: *disable*.

⇒ **CellMapping:** Click to set the data format on the physical layer of the ATM interface to *hec* (Header Error Control) or *plcp* (Physical Layer Convergence Protocol). Default: *hec*.

⇒ **CbitParityEnable:** Click to *enable* or *disable* C-bit parity checking on the interface. Default: *enable*.

3. Click on *Apply* to update the ATM port control parameters.
4. Click on the *OAM* tab to display the *OAM* window.
5. Click in the *OAM enabled on this port* field, if required, to place a check in the field and enable Operations, Administration and Management (OAM) fault management for the port, or click to remove the check and disable OAM.
6. Click on *Apply* in the *OAM* window.

Configure Traffic Parameters

1. Click on the *Traffic Parameters* tab. When the *Traffic Parameters* window appears, click on the *Insert* button. When the *Insert Traffic Parameters* window appears, *ATM* will be automatically selected in the *Param Type* field and the *Index* field will be incremented by one.
2. Click in the *ServiceCategory* field to select *rtVBR* or *nrtVBR*. The *ubr* service category cannot be configured because it is fixed with an *Index* of 1, and with *PCR*, *SCR* and *MBS* fixed at 0.
3. If *rtVBR* was selected in step 2, click in the *CDV* (Cell Delay Variation) field to select:

⇒ **minimum:** Assigns the circuit a higher priority than *rtVBR* circuits with a *nominal CDV*.

⇒ **nominal:** Assigns the lowest *rtVBR* priority to the circuit.

4. Enter values for *PCR*, *SCR* and *MBS* in the *ATM* fields. Configure these values to control the flow of traffic through circuits that have been assigned this service category as follows:

   ⇒ **PCR:** Enter the maximum rate (Peak Cell Rate) up to which the circuit can burst, typically the circuit's maximum data rate, in cells per second. Range: 150 to 104430.

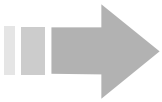
   ⇒ **SCR:** Enter the guaranteed rate of the circuit (Sustained Cell Rate) in cells per second. Range: 150 to 104430.

   ⇒ **MBS:** Enter the maximum number of cells that can be transmitted at *Peak Cell Rate* while still conforming with the *Sustained Cell Rate* (Maximum Burst Size). Range: 1 to 2048.

Example

An rtVBR service is set so that at *PCR* (Peak Cell Rate), one cell will transmit every 100 microseconds, and at *SCR* (Sustained Cell Rate), one cell will transmit every 400 microseconds. If the *MBS* (Maximum Burst Size) is five cells, only five cells may be transmitted at *PCR*, which will entail transmission at *PCR* for 500 microseconds. At the configured *SCR*, transmission of five cells would require 2000 microseconds (5 x 400 microseconds). Therefore, after transmitting *MBS* number of cells, transmission will be quiescent for the next 1500 microseconds to conform with the *SCR*.

5. After all selections have been made, click on *Insert* to return to the *Traffic Parameters* window; then click on *Refresh*. Check that the value in the *PhysicalType* field corresponds to the type of module to which you want these traffic parameters to apply (*ds3* for DS3 ATM modules).



N O T E

Due to algorithmic or hardware constraints, the system may set PCR, SCR and MBS values that closely match but are not exactly equal to the values entered by the operator.

6. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Configure ATM Traffic Parameters for a Frame Relay Link

To configure a circuit on the DS3 ATM port so it will conform with a frame relay link provided by the attached CPE:

1. With the *Traffic Parameters* window displayed, click on the *Insert* button. When the *Insert Traffic Parameters* window appears, *ATM* will be automatically selected in the *Param Type* field and the *Index* field will be incremented by one.

2. Click in the *ServiceCategory* field to select *rtVBR* or *nrtVBR*. The *ubr* service category cannot be configured because it is fixed with an *Index* of 1, and with *PCR*, *SCR* and *MBS* fixed at 0.

3. If *rtVBR* was selected in step 2, click in the *CDV* (Cell Delay Variation) field to select:

   ⇒ **minimum:** Assigns the circuit a higher priority than *rtVBR* circuits with a *nominal CDV*.

   ⇒ **nominal:** Assigns the lowest *rtVBR* priority to the circuit.

4. Click in the *Param Type* field to select *Frame Relay*. The EM will disable fields that configure *ATM* parameters (*PCR*, *SCR* and *MBS*) and enable *Frame Relay* fields (*CIR*, *Bc* and *Be*).

5. Enter the parameter values for the supported frame relay link in the *CIR* (Committed Information Rate), *Bc* (Burst committed) and *Be* (Burst excess) fields.

6. Click on the *Calculate* button. The EM will convert frame relay values into their ATM equivalents (*PCR*, *SCR* and *MBS*) and insert the converted values in the appropriate ATM fields of the *Insert Traffic Parameters* window.

7. Click on *Insert* to return to the *Traffic Parameters* window; then click on *Refresh*. Check that the value in the *PhysicalType* field corresponds to the type of module to which you want these traffic parameters to apply (*ds3* for DS3 ATM modules).

8. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Create Circuits on a DS3 ATM WAN Port

1. Click on the *Circuits* tab to access that window.

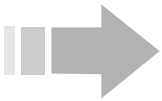
2. In the *Circuits* window, click on the *Insert* button.

3. Configure each field of the *DS3 ATM Port, Insert Circuits* window:

   ⇒ **PII:** The EM will automatically enter the PII of the WAN port. Append a Virtual Channel Link (VCL) to identify the circuit. Range: 16 to 991.

   ⇒ **Vpi:** Enter a Virtual Path Identifier for the circuit. Range: 0 to 15.

   ⇒ **Vci:** Enter a Virtual Channel Identifier for the circuit. Range: 32 to 511.



N O T E S

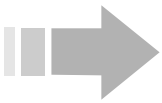
- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for loopback testing.*

   ⇒ **AdminStatus:** Click to configure the circuit's *AdminStatus* to *up*.

⇒ **TransmitTrafficDescrIndex:** Every time a service category with unique *PCR*, *SCR* and *MBS* variables is created in the *Traffic Parameters* window, it is assigned a unique *Index*. Click in this field to select a service category's *Index* and assign that service category, with its *PCR*, *SCR* and *MBS* values, to the circuit you are creating. *TransmitTrafficDescrIndex* 1 always identifies the *ubr* service category.

⇒ **AalType:** Click to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0. With AAL5 trailer suppression, the 8-bit trailer normally appended to the end of each AAL5 PDU is omitted, resulting in a savings of one ATM cell for each AAL5 PDU. This provides better throughput on the WAN connection. When AAL0 is selected, data is not transmitted as message- or packet-based data. Instead, it is transmitted as single raw ATM cells.

⇒ **OAMAutoLBState:** Click to *enable* periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

⇒ **OAMLBInterval:** Enter a value to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ **OAMLBTimeout:** Enter a value to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

⇒ **OAMAdminState:** Click to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to return to the *Circuits* window; then click on *Refresh*.
5. Repeat steps 2 through 4 for each circuit to be added to the DS3 ATM port.

Create an Interface for the New Circuit

This procedure usually is not necessary because an interface is created automatically on a WAN circuit when a subscriber port, circuit, or bundle of subscriber ports is linked with that WAN circuit. However, interfaces for WAN circuits must be created or edited by the operator in the following cases:

- To configure a WAN interface with non-default encapsulation type. WAN interface encapsulation type can be set in the *Circuit* window of a selected WAN port circuit or in the *Insert All Interfaces* window of the WAN port.
- To assign IP addresses to either end of a WAN circuit that will be used in the IP *NetModel*. (An IP address for the DSL concentrator end of the circuit is entered in the *IpAddr* field of the *Insert All Interfaces* window; an IP address for the far end of the circuit is entered in the *FarEndAddr* field.)
- To link a WAN port circuit to another WAN port circuit. The PII of the second WAN circuit is entered in the *DestPII* field in the *Circuit* or *Insert All Interfaces* window for the first WAN circuit.

See "Adding Subscribers" on page 111 for more information about *NetModels*, encapsulation types, and forwarding modes.

To create an interface:

1. In the DS3 ATM WAN port window suite, click on the *All Interfaces* tab.
2. Click on *Insert*.
3. Configure the following fields in the *DS3 ATM Port, Insert All Interfaces* window:

   ⇒ **PII:** The EM will enter the PII of the WAN port. Append the Virtual Channel Link (VCL) for the newly created circuit. For example, 1.3.1.19 is port 1.3.1, VCL 19.

   ⇒ **NetModel:** Click to set the *NetModel* to *ip*, *vwan*, *cross-connect*, or *copperVPN*.

   ⇒ **IpAddr:** If the *ip NetModel* was selected above, enter an IP address to assign it to the DSL concentrator end of the WAN circuit.

   ⇒ **NetMask:** If the *ip NetModel* was selected above, enter a subnet mask for the interface.

   ⇒ **FarEndAddr:** If the *ip NetModel* was selected above, enter a destination IP address for point-to-point WAN links (i.e., enter an IP address for the far end of the WAN circuit.)

   ⇒ **DestPII:** If the *NetModel* has been set to *cross-connect*, and the destination PII for the interface is another WAN port circuit, enter the PII of that WAN

port circuit here. In all other cases, leave this field set to its default value of 0.0.0.0.

⇒ **EncapsulationType:** Click to select an encapsulation type (the format of data frames or packets exchanged over the interface).

⇒ **GroupName:** Click on the arrow to the right of the *GroupName* field and select a name from the drop-down menu to identify the user group to which the circuit belongs (optional). New user group names must be entered using the *User Group Members* feature in the EM *Edit* menu (see "Configuring User Groups" on page 6). For example, you can enter the name of a company using multiple ports to provide DSL services to subscribers.

⇒ **Name:** Enter a name to identify the circuit (optional). For example, you can enter the name of the subscriber using this circuit.

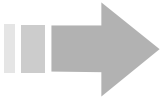
⇒ **AdditionalInfo:** Enter an arbitrary string of information about the circuit (optional). For example, you can enter the telephone number of the subscriber using this circuit.

4. Click on *Insert* to return to the *All Interfaces* window; then click on *Refresh*.
5. Repeat steps 2 through 4 to create an interface for each new circuit being added to the DS3 ATM WAN port.
6. When all interfaces have been configured, click on *Save to NVRAM* to save the updated configuration file to nonvolatile memory.

Change an Existing Interface

Once an interface has been configured on a DS3 ATM WAN port, either by connecting a subscriber port with it or by means of the *Insert All Interfaces* window, perform the following steps if you need to change interface parameters:

1. In the WAN port window suite for a DS3 ATM WAN port, click on the *Circuits* tab.
2. In the *Circuits* window, click in the *PII* field to select a circuit; then click on the *Edit Interface* button.



N O T E

If the EM responds with an Error message saying "Interface for [PII] doesn't exist," the interface for the selected circuit has not been configured. Refer to the procedure "Create an Interface for the New Circuit" on page 30 *and create the interface.*

3. Change the fields in the *Circuit* window as required. The *Circuit* window provides access to the same parameters that are

described in "Create an Interface for the New Circuit" on page 30.

4. Click on *Apply*; then click on *Close* to return to the *Circuits* window.
5. Click on the *All Interfaces* tab and when that window appears, click on *Refresh* and check that the desired changes to the interface have been made.
6. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Frame Relay WAN Port

The steps required to configure a frame relay WAN port (DS3 Frame, Quad T1 and V.35) are detailed in the following sections. These steps consist of:

1. Selecting communication protocols for the port (DS3 Frame and Quad T1 WAN ports only).
2. Configuring a frame relay link.
3. Creating circuits on the frame relay link.
4. Configuring an interface for the newly added circuits.

When the frame relay port has been configured, click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Select Communication Protocols

Configure communication protocols for DS3 Frame and Quad T1 WAN ports only. The order of these parameters may differ between DS3 Frame and Quad T1 WAN ports.

1. Double click on a DS3 Frame port or Quad T1 port in the Shelf View. The window suite for the selected port will appear.
2. If you have selected a Quad T1 port, click on the *DS1* tab.
3. Configure the following parameters to conform with your system:

   ⇒ **LineType:** Select the line type to implement on the interface.

   For a DS3 Frame port, click to select:

   ClearChannel (C-bit), or

   M23Multiplex (Multiplex T2 to T3).

   For a Quad T1 port, *ESF* is the only *LineType* supported.

   ⇒ **LineCoding:** The only type of line coding supported on a DS3 Frame port is *dsx3B3ZS*. The only type of line coding supported on a Quad T1 port is *B8ZS*.

   ⇒ **SendCode:** This field identifies the diagnostic command code that the DSL concentrator will send across the interface. Click to select

dsx3SendNoCode when configuring a DS3 Frame port; click to select *SendNoCode* when configuring a Quad T1 port.

⇒ **CircuitIdentifier:** If desired, enter a user-defined name for the port.

⇒ **LoopbackConfig:** This field identifies the frame relay WAN port loopback mode. Click to select *NoLoop* when configuring a DS3 Frame or Quad T1 WAN port.

⇒ **TransmitClockSource:** Click to select the source of transmit clock:

loopTiming: Recovered receive clock will be used as the transmit clock.

localTiming: A local clock source will be used as the transmit clock (default).

⇒ **LineLength:** Configure line build out (LBO). If you are configuring a DS3 Frame port, enter an integer ranging from 0 to 137 to indicate the length of the DS3 line in meters. If you are configuring a Quad T1 port, click to configure the length of the T1 line for Short Haul (*0-133feet*, *133-266feet*, *266-399feet*, *399-533feet*, or *533-655feet*), or *longHaul*. Default: *399-533feet*.

⇒ **LongHaulTxAttenuation:** If *longHaul* is selected in the *LineLength* field, click to configure long haul transmit attenuation (Quad T1 port only). Default: 0 dB.

⇒ **Fdl:** Click in this field to select the facilities data link used by the port (Quad T1 port only):

AnsiT1403: Indicates that the port uses ANSIT1403 facilities data link, where one of every two framing bits is used as a data channel for exchanging information with the network termination.

None: Indicates that the port does not use the ANSIT1403 facilities data link (default).

⇒ **LineStatusChangeTrapEnable:** Click to determine whether *LineStatusChange* traps will be generated for this port. Default: *disabled*.

4. Click on *Apply* to update the window parameters.

Configure the Frame Relay Link

1. If you are configuring a V.35 port, double click on the port in the Shelf View.
2. On any frame relay WAN port, click on the *FR DLC* tab to configure a frame relay link.
3. If *enable* is selected in the *AdminState* field, click on *disable*, then click on *Apply* to disable link.

4. Click in the *State* field to select one of the following LMI schemes for the frame relay interface:

   ⇒ *noLmiConfigured* (default)

   ⇒ *lmiRev1*

   ⇒ *ansiT1-617-D*

   ⇒ *q9.33-Annex-A*

5. Place the cursor in the *PollingInterval* field and enter a number between 5 and 30 to determine the number of seconds between successive status inquiry messages. Default: 10.

6. Place the cursor in the *FullEnquiryInterval* field and enter a number between 1 and 255 to determine the number of status inquiry intervals before a Full Status Inquiry message will be issued. Default: 6.

7. Place the cursor in the *ErrorThreshold* field and enter a number between 1 and 10 to determine the number of unanswered status inquiry intervals that will trigger an *interface down* message from the DSL concentrator. Default: 3.

8. Place the cursor in the *MonitoredEvents* field and enter a number between 1 and 10 to determine the number of status polling intervals within which the error threshold lies. Example: if the number of errors during *MonitoredEvents* polling intervals equals the value in the *ErrorThreshold* field, the DSL concentrator will rule the interface down. Default: 4.

9. Configure the link's LMI mode to *dte* (Unit-to-Network Interface DTE), *dce* (Unit-to-Network Interface DCE) or *nni* (Network-to-Network Interface) by clicking in the *LMIMode* field. *LMIMode* only applies when the *State* field is configured to *lmiRev1*, *ansiT1-617-D* or *q933-Annex-A*.

10. Place the cursor in the *DceN392* field and enter the maximum number of unreceived or invalid Status Enquiries the DSL concentrator will accept before it will remove the interface from service. Default: 3.

11. Place the cursor in the *DceN393* field and enter a value to determine the number of polling intervals over which the error threshold is counted. For example, if within *DceN393* events the DSL concentrator receives *DceN392* errors, the DSL concentrator will remove the interface from service. Default: 4.

12. Place the cursor in the *DceT392* field and enter a value to determine the maximum number of seconds that the DCE will wait to receive a Status Enquiry message before determining that an error has occurred. Default: 15.

13. Click on *Apply* in the *FR DLC* window.

14. Click on *enable* in the *AdminStatus* field, then click on *Apply* to enable the link.

15. Click on *Save to NVRAM* to save the updated configuration file to nonvolatile memory.

Create Circuits on the Frame Relay Link

1. Click on the *Circuits* tab.
2. Click on the *Insert* button in the *Circuits* window. The *Insert Circuits* window for the selected frame relay WAN port will appear.
3. Enter values in the following fields as required to configure the circuit:
   - ⇒ **IfIndex:** The EM will enter the Permanent Interface Identifier (PII) of the selected port.
   - ⇒ **Dlci:** Enter a Data Link Circuit Identifier (DLCI) to assign it to the circuit. The DLCI is a number used to uniquely identify a frame relay virtual circuit. Range: 16 to 991.
   - ⇒ **CommittedBurst:** Enter a Committed Burst rate in bits to assign it to the circuit. Committed Burst (*BcMax*) is the maximum data burst that the network will accept with a reasonable probability of reliable delivery. Default: 0.
   - ⇒ **ExcessBurst:** Enter an Excess Burst (*Be*) rate in bits to assign it to the circuit. Excess Burst is the maximum amount of data that, although in excess of the Committed Burst, can still be handled by the network under normal conditions. However, since the Excess Burst exceeds the Committed Burst rate, packets that exceed the Committed Burst Rate will be marked by having the DE (Discard Eligible) bit set, which means that if the network becomes congested, the packets will simply be dropped. Default: 44736000 for DS3 Frame and V.35; 1536000 for Quad T1.
   - ⇒ **Throughput:** Enter a Committed Information Rate (*CIR*) in bits per second to assign it to the circuit. *CIR* is the average number of frame relay information field bits transferred per second across a user network interface in one direction over the measurement interval. Default: 0.
4. Click on *Insert* to return to the *Circuits* window; then click on *Refresh*.
5. Repeat steps 2 through 4 for each circuit being added to the frame relay WAN port.
6. When all circuits have been added, click on *Refresh* in the *Circuits* window to display the new circuits.
7. Click on *Save to NVRAM* to save the updated configuration file to nonvolatile memory.

Create an Interface for the New Circuit

This procedure usually is not necessary because an interface is created automatically on a WAN circuit when a subscriber port,

circuit, or bundle of subscriber ports is linked with that WAN circuit. However, interfaces for WAN circuits must be created or edited by the operator in the following cases:

- To configure a WAN interface with non-default encapsulation type. WAN interface encapsulation type can be set in the *Circuit* window for a selected WAN circuit or in the *Insert All Interfaces* window for the WAN port.
- To assign IP addresses to either end of a WAN circuit that will be used in the IP *NetModel*. (An IP address for the DSL concentrator end of the circuit is entered in the *IpAddr* field of the *Insert All Interfaces* window; an IP address for the far end of the circuit is entered in the *FarEndAddr* field.)
- To link a WAN circuit to another WAN circuit. The PII of the second WAN circuit is entered in the *DestPII* field in the *Circuit* or *Insert All Interfaces* window for the first WAN circuit.

See "Adding Subscribers" on page 111 for more information about *NetModels*, encapsulation types, and forwarding modes.

To create an interface:

1. In the window suite for the selected WAN port, click on the *All Interfaces* tab.
2. Click on *Insert* in the *All Interfaces* window.
3. Configure the following parameters in the *Insert All Interfaces* window for the selected frame relay WAN port:

   ⇒ **PII:** The EM will enter the PII of the WAN port. Append the DLCI assigned to the newly created circuit. For example, 1.3.1.19 is port 1.3.1, DLCI 19.

   ⇒ **NetModel:** Click to set the *NetModel* to *ip*, *vwan*, *cross-connect*, or *copperVPN*.

   ⇒ **IpAddr:** If the *ip NetModel* was selected above, enter an IP address to assign it to the DSL concentrator end of the WAN circuit.

   ⇒ **NetMask:** If the *ip NetModel* was selected above, enter a subnet mask for the interface.

   ⇒ **FarEndAddr:** If the *ip NetModel* was selected above, enter a destination IP address for point-to-point WAN links (i.e., enter an IP address for the far end of the WAN circuit.)

   ⇒ **DestPII:** If the *NetModel* has been set to *cross-connect* or *copperVPN*, and the destination PII for the interface is another WAN port circuit, enter the PII of that WAN port circuit here. In all other cases, leave this field set to its default value of 0.0.0.0.

⇒ **EncapsulationType:** Click to select an encapsulation type (the format of data frames or packets exchanged over the interface).

⇒ **GroupName:** Click on the arrow to the right of the *GroupName* field and select a name from the drop-down menu to identify the user group to which the circuit belongs (optional). New user group names must be entered using the *User Group Members* feature in the EM *Edit* menu (see "Configuring User Groups" on page 6). For example, you can enter the name of a company using multiple ports to provide DSL services to subscribers.

⇒ **Name:** Enter a name to identify the circuit (optional). For example, you can enter the name of the subscriber using this circuit.

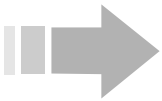
⇒ **AdditionalInfo:** Enter an arbitrary string of information about the circuit (optional). For example, you can enter the telephone number of the subscriber using this circuit.

4. Click on *Insert* to return to the *All Interfaces* window; then click on *Refresh*.
5. Repeat steps 2 through 4 to create an interface for each new circuit being added to the frame relay WAN port.
6. When all interfaces have been configured, click on *Save to NVRAM* to save the updated configuration file to nonvolatile memory.

Change an Existing Interface

Once an interface has been configured on a frame relay WAN port, either by connecting a subscriber port with it or by means of the *Insert All Interfaces* window, perform the following steps if you need to change interface parameters:

1. In the WAN port window suite for a frame relay WAN port, click on the *Circuits* tab.
2. In the *Circuits* window, click in the *PII* field to select a circuit; then click on the *Edit Interface* button.



N O T E

If the EM responds with an Error message saying "Interface for [PII] doesn't exist," the interface for the selected circuit has not been configured. Refer to the procedure "Create an Interface for the New Circuit" on page 35 *and create the interface.*

3. Change the fields in the *Circuit* window as required. The *Circuit* window provides access to the same parameters that are described in "Create an Interface for the New Circuit" on page 35.

4. Click on *Apply*; then click on *Close* to return to the *Circuits* window.
5. Click on the *All Interfaces* tab and when that window appears, click on *Refresh* and check that the desired changes to the interface have been made.
6. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

OC-3c/STM-1 WAN Port

The five steps required to prepare an OC-3c/STM-1 port are detailed in the following sections. These steps consist of:

1. Selecting communication protocols for the OC-3c/STM-1 port.
2. Configuring ATM Connection Admission Control (CAC).
3. Configuring traffic parameters that can be assigned to ATM circuits as they are created.
4. Creating circuits on the OC-3c/STM-1 port.
5. Configuring an interface for newly added circuits.

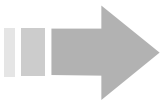
When the OC-3c/STM-1 port has been configured, click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Select Communication Protocols

1. Double click on the port in the Shelf View. The *OC-3c/STM-1 Port* window suite will appear with the *Sonet* window displayed.
2. Click in the *Type* field to select *sonet* or *sdh* framing.
3. Ensure that *sonetNoLoop* is selected in the *LoopbackConfig* field.
4. Click to determine whether the SONET/SDH transmit clock will use the port's own clock (*localTiming*) or the recovered receive clock (*loopTiming*). Default: *localTiming*.
5. Click on *Apply*; then click on the *OAM* tab.
6. Click in the *OAM enabled for this port* field, if required, to place a check in the field and enable Operations, Administration and Management (OAM) fault management for the port, or click to remove the check and disable OAM.
7. Click on *Apply* in the *OAM* window.

Configure ATM Connection Admission Control

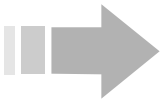
1. Click on the *ATM* tab to access that window.
2. Configure the following parameters to conform with your system.



N O T E

ATM CAC Enable in the Device window of the EM Properties window suite must be turned on (indicated by a check) to enable Connection Admission Control over-subscription checking or configured over-subscription parameters will not be applied.

⇒ **RtPCR:** Enter a Peak Cell Rate (PCR) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *rtVBR* virtual circuits on the port.



N O T E

The default value of 100 represents no over-subscription. Values under 100 represent under-subscription, and values above 100 represent over-subscription (e.g., the value of 50 indicates half the line rate, 200 indicates double the line rate). Default: 100. Range: 1 to 2500.

⇒ **RtSCR:** Enter a Sustained Cell Rate (*SCR*) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *rtVBR* virtual circuits on the port.

⇒ **NrtPCR:** Enter a Peak Cell Rate (*PCR*) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *nrtVBR* virtual circuits on the port.

⇒ **NrtSCR:** Enter a Sustained Cell Rate (*SCR*) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *nrtVBR* virtual circuits on the port.

⇒ **CellPayloadScrambling:** Click to *enable* or *disable* payload scrambling on the interface.
Default: *disable*.

3. Click on *Apply*.

Configure Traffic Parameters

1. Click on the *Traffic Parameters* tab. When the *Traffic Parameters* window appears, click on the *Insert* button. When the *Insert Traffic Parameters* window appears, ATM will be automatically selected in the *Param Type* field and the *Index* field will be incremented by one.
2. Click in the *ServiceCategory* field to select *rtVBR* or *nrtVBR*. The *ubr* service category cannot be configured because it is fixed with an *Index* of 1, and with *PCR*, *SCR* and *MBS* fixed at 0.

3. If *rtVBR* was selected in step 2, click in the *CDV* (Cell Delay Variation) field to select:

   ⇒ **minimum:** Assigns the circuit a higher priority than *rtVBR* circuits with a *nominal CDV*.

   ⇒ **nominal:** Assigns the lowest *rtVBR* priority to the circuit.

4. Enter values for *PCR*, *SCR* and *MBS* in the *ATM* fields. Configure these values to control the flow of traffic through circuits that have been assigned this service category as follows:

   ⇒ **PCR:** Enter the maximum rate (Peak Cell Rate) up to which the circuit can burst, typically the circuit's maximum data rate, in cells per second. Range: 150 to 353200.

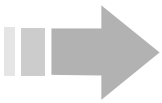
   ⇒ **SCR:** Enter the guaranteed rate of the circuit (Sustained Cell Rate) in cells per second. Range: 150 to 353200.

   ⇒ **MBS:** Enter the maximum number of cells that can be transmitted at *Peak Cell Rate* while still conforming with the *Sustained Cell Rate* (Maximum Burst Size). Range: 1 to 2048.

Example

An *rtVBR* service is set so that at *PCR* (Peak Cell Rate), one cell will transmit every 100 microseconds, and at *SCR* (Sustained Cell Rate), one cell will transmit every 400 microseconds. If the *MBS* (Maximum Burst Size) is five cells, only five cells may be transmitted at *PCR*, which will entail transmission at *PCR* for 500 microseconds. At the configured *SCR*, transmission of five cells would require 2000 microseconds (5 x 400 microseconds). Therefore, after transmitting *MBS* number of cells, transmission will be quiescent for the next 1500 microseconds to conform with the *SCR*.

5. After all selections have been made, click on *Insert* to return to the *Traffic Parameters* window; then click on *Refresh*. Check that the value in the *PhysicalType* field corresponds to the type of module to which you want these traffic parameters to apply (*oc3stm1* for OC-3c/STM-1 modules).



N O T E

Due to algorithmic or hardware constraints, the system may set PCR, SCR and MBS values that closely match but are not exactly equal to the values entered by the operator.

6. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Configure ATM Traffic Parameters for a Frame Relay Link

To configure a circuit on the OC-3c/STM-1 port so it will conform with a frame relay link provided by the attached CPE:

1. With the *Traffic Parameters* window displayed, click on the *Insert* button. When the *Insert Traffic Parameters* window appears, *ATM* will be automatically selected in the *Param Type* field and the *Index* field will be incremented by one.
2. Click in the *ServiceCategory* field to select *rtVBR* or *nrtVBR*. The *ubr* service category cannot be configured because it is fixed with an *Index* of 1, and with *PCR*, *SCR* and *MBS* fixed at 0.
3. If *rtVBR* was selected in step 2, click in the *CDV* (Cell Delay Variation) field to select:

   ⇒ **minimum:** Assigns the circuit a higher priority than *rtVBR* circuits with a *nominal CDV*.

   ⇒ **nominal:** Assigns the lowest *rtVBR* priority to the circuit.
4. Click in the *Param Type* field to select *Frame Relay*. The EM will disable fields that configure *ATM* parameters (*PCR*, *SCR* and *MBS*) and enable *Frame Relay* fields (*CIR*, *Bc* and *Be*).
5. Enter the parameter values for the supported frame relay link in the *CIR*, *Bc* and *Be* fields.
6. Click on the *Calculate* button. The EM will convert frame relay values into their ATM equivalents (*PCR*, *SCR* and *MBS*) and insert the converted values in the appropriate ATM fields of the *Insert Traffic Parameters* window.
7. Click on *Insert* to return to the *Traffic Parameters* window; then click on *Refresh*. Check that the value in the *PhysicalType* field corresponds to the type of module to which you want these traffic parameters to apply (*oc3stm1* for OC-3c/STM-1 modules).
8. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

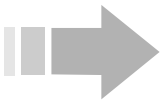
Create Circuits on an OC-3c/STM-1 WAN Port

1. Click on the *Circuits* tab to access that window.
2. In the *Circuits* window, click on the *Insert* button.
3. Configure each field of the *OC-3c/STM-1 Port, Insert Circuits* window:

   ⇒ **PII:** The EM will automatically enter the PII of the WAN port. Append a Virtual Channel Link (VCL) to identify the circuit. Range: 16 to 991.

   ⇒ **Vpi:** Enter a Virtual Path Identifier for the circuit. Range: 0 to 15.

   ⇒ **Vci:** Enter a Virtual Channel Identifier for the circuit. Range: 32 to 511.



N O T E S

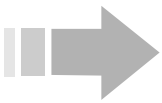
- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for loopback testing.*

⇒ **AdminStatus:** Click to configure the circuit's *AdminStatus* to *up*.

⇒ **TransmitTrafficDescrIndex:** Every time a service category with unique *PCR*, *SCR* and *MBS* variables is created in the *Traffic Parameters* window, it is assigned a unique *Index*. Click in this field to select a service category's *Index* and assign that service category, with its *PCR*, *SCR* and *MBS* values, to the circuit you are creating. *TransmitTrafficDescrIndex* 1 always identifies the *ubr* service category.

⇒ **AalType:** Click to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0. With AAL5 trailer suppression, the 8-bit trailer normally appended to the end of each AAL5 PDU is omitted, resulting in a savings of one ATM cell for each AAL5 PDU. This provides better throughput on the WAN connection. When AAL0 is selected, data is not transmitted as message- or packet-based data. Instead, it is transmitted as single raw ATM cells.

⇒ **OAMAutoLBState:** Click to *enable* periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

⇒ **OAMLBInterval:** Enter a value to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ **OAMLBTimeout:** Enter a value to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

⇒ **OAMAdminState:** Click to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to return to the *Circuits* window; then click on *Refresh*.
5. Repeat steps 2 through 4 for each circuit to be added to the OC-3c/STM-1 WAN port.
6. Click on *Save to NVRAM* to save the updated configuration file to nonvolatile memory.

Create an Interface for the New Circuit

This procedure usually is not necessary because an interface is created automatically on a WAN circuit when a subscriber port, circuit, or bundle of subscriber ports is linked with that WAN circuit. However, interfaces for WAN circuits must be created or edited by the operator in the following cases:

- To configure a WAN interface with non-default encapsulation type. WAN interface encapsulation type can be set in the *Circuit* window for a selected WAN circuit or in the *Insert All Interfaces* window for the WAN port.
- To assign IP addresses to either end of a WAN circuit that will be used in the IP *NetModel*. (An IP address for the DSL concentrator end of the circuit is entered in the *IpAddr* field of the *Insert All Interfaces* window; an IP address for the far end of the circuit is entered in the *FarEndAddr* field.)
- To link a WAN circuit to another WAN circuit. The PII of the second WAN circuit is entered in the *DestPII* field in the *Circuit* or *Insert All Interfaces* window for the first WAN circuit.

See "Adding Subscribers" on page 111 for more information about *NetModels*, encapsulation types, and forwarding modes.

To create an interface:

1. In the OC-3c/STM-1 WAN port window suite, click on the *All Interfaces* tab.
2. Click on *Insert*.
3. Configure the following fields in the *OC-3c/STM-1 Port, Insert All Interfaces* window.

   ⇒ **PII:** The EM will enter the PII of the WAN port. Append the Virtual Channel Link (VCL) for the newly created circuit. For example, 1.3.1.19 is port 1.3.1, VCL 19.

   ⇒ **NetModel:** Click to set the *NetModel* to *cross-connect, ip, vwan* or *copperVPN*.

⇒ **IpAddr:** If the *ip NetModel* was selected above, enter an IP address to assign it to the DSL concentrator end of the WAN circuit.

⇒ **NetMask:** If the *ip NetModel* was selected above, enter a subnet mask for the interface.

⇒ **FarEndAddr:** If the *ip NetModel* was selected above, enter a destination IP address for point-to-point WAN links (i.e., enter an IP address for the far end of the WAN circuit.)

⇒ **DestPII:** If the *NetModel* has been set to *cross-connect* or *copperVPN*, and the destination PII for the interface is another WAN port circuit, enter the PII of that WAN port circuit here. In all other cases, leave this field set to its default value of 0.0.0.0.

⇒ **EncapsulationType:** Click to select an encapsulation type (the format of data frames or packets exchanged over the interface).

⇒ **GroupName:** Click on the arrow to the right of the *GroupName* field and select a name from the drop-down menu to identify the user group to which the circuit belongs (optional). New user group names must be entered using the *User Group Members* feature in the EM *Edit* menu (see "Configuring User Groups" on page 6). For example, you can enter the name of a company using multiple ports to provide DSL services to subscribers.

⇒ **Name:** Enter a name to identify the circuit (optional). For example, you can enter the name of the subscriber using this circuit.

⇒ **AdditionalInfo:** Enter an arbitrary string of information about the circuit (optional). For example, you can enter the telephone number of the subscriber using this circuit.

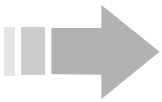
4. Click on *Insert* to return to the *All Interfaces* window; then click on *Refresh*.
5. Repeat steps 2 through 4 to create an interface for each new circuit being added to the WAN port.
6. When all interfaces have been configured, click on *Save to NVRAM* to save the updated configuration file to nonvolatile memory.

Change an Existing Interface

Once an interface has been configured on an OC-3c/STM-1 WAN port, either by connecting a subscriber port with it or by means of the *Insert All Interfaces* window, perform the following steps if you need to change interface parameters:

1. In the WAN port window suite for an OC-3c/STM-1 port, click on the *Circuits* tab.

2. In the *Circuits* window, click in the *PII* field to select a circuit; then click on the *Edit Interface* button.



N O T E

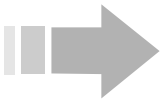
If the EM responds with an Error message saying "Interface for [PII] doesn't exist," the interface for the selected circuit has not been configured. Refer to the procedure "Create an Interface for the New Circuit" on page 43 *and create the interface.*

3. Change the fields in the *Circuit* window as required. The *Circuit* window provides access to the same parameters that are described in "Create an Interface for the New Circuit" on page 43.
4. Click on *Apply*; then click on *Close* to return to the *Circuits* window.
5. Click on the *All Interfaces* tab and when that window appears, click on *Refresh* and check that the desired changes to the interface have been made.
6. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

T1/E1 IMA WAN Port

The five steps required to configure a T1/E1 IMA WAN port are detailed in the following sections. These steps consist of:

1. Selecting communication protocols for the port.
2. Configuring ATM Connection Admission Control (CAC).
3. Configuring traffic parameters that can be assigned to ATM circuits as they are created.
4. Creating circuits on the T1/E1 IMA port.



N O T E

Circuits can only be added to Port 1 on a T1/E1 IMA module being used in regular T1/E1 mode. For information on creating circuits when the module is being used in Inverse Multiplexing for ATM (IMA) mode, see "Configuring IMA Groups" on page 99.

5. Configuring an interface for the newly added circuits.

When the T1/E1 IMA port has been configured, click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Select Communication Protocols

1. Double click on a T1/E1 IMA WAN port in the Shelf View to display the *T1/E1 IMA Port* window suite.
2. Click on the *DS1* tab.
3. In the *DS1* window, configure the following parameters to conform with your system:

⇒ **LineType:** Select the line type to implement on the interface. For a T1 line, click to select *ESF*; for an E1 line, click to select *E1* or *E1CRC*.

⇒ **LineCoding:** When you select a *LineType*, the appropriate line coding for the interface is set automatically by the EM. *B8ZS* line coding is applied on T1 lines; *HDB3* is applied on E1 lines.

⇒ **LineLength:** If *ESF LineType* is selected, click to configure the length of the T1 line for short haul (*0-133feet*, *133-266feet*, *266-399feet*, *399-533feet*, or *533-655feet*), or *longHaul* for line build out (LBO). Default: *399-533feet*.

⇒ **LongHaulTxAttenuation:** If *longHaul* is selected in the *LineLength* field, click to configure long haul transmit attenuation. Default: 0 dB.

⇒ **CircuitIdentifier:** If desired, enter a user-defined name for the port.

⇒ **TransmitClockSource:** Click to select the source of the transmit clock:

LoopTiming: Recovered receive clock will be used as the transmit clock.

LocalTiming: A local clock source will be used as the transmit clock.

⇒ **SendCode:** This field displays the diagnostic command code that the DSL concentrator will send across the interface. For a T1 line (*ESF LineType*), click to select *SendNoCode* when configuring the interface.

⇒ **LoopbackConfig:** This field identifies the port loopback mode. Click to select *NoLoop* when configuring a T1/E1 IMA WAN port.

⇒ **Fdl:** Click in this field to select the facilities data link (FDL) used by the port if you selected a T1 line (*ESF LineType*):

AnsiT1403: Indicates that the port uses the ANSIT1403 facilities data link, where one of every two framing bits is used as a data channel for exchanging information with the network termination.

None: Indicates that the port does not use the ANSIT1403 facilities data link.

⇒ **LineStatusChangeTrapEnable:** Click to determine whether *LineStatusChange* traps will be generated for the port.

⇒ **RxFdlLoopbackCmdProc:** Displays control port processing of facilities data link (FDL) based loopback commands. If *enabled* is selected, FDL commands will be processed. If *disabled* is selected,

FDL commands will be ignored and discarded. Only configurable for T1 line (*ESF LineType*).

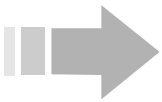
PortDownConfig: Select the port's AIS configuration. If *generateAis* is selected, the port will generate an AIS signal when the port *AdminState* is *down*. If *noOutput* is selected, the port will not generate an AIS signal when the port *AdminState* is down.

CellPayloadScrambling: Click to *enable* or *disable* payload scrambling on the interface.

4. Click on *Apply* to update the *DS1* window parameters.

Configure ATM Connection Admission Control

1. Click on the *ATM* tab to access that window.
2. Configure the following over-subscription factors to conform with your system:



N O T E

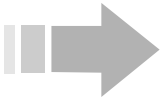
When entering over-subscription factors, the default value of 100 represents no over-subscription. Values under 100 represent under-subscription, and values above 100 represent over-subscription (e.g., 50 indicates half the line rate, 200 indicates double the line rate). Range: 1 to 2500.

⇒ **RtPCR:** Enter a Peak Cell Rate (PCR) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *rtVBR* virtual circuits on the port.

⇒ **RtSCR:** Enter a Sustained Cell Rate (*SCR*) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *rtVBR* virtual circuits on the port.

⇒ **NrtPCR:** Enter a Peak Cell Rate (*PCR*) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *nrtVBR* virtual circuits on the port.

⇒ **NrtSCR:** Enter a Sustained Cell Rate (*SCR*) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *nrtVBR* virtual circuits on the port.



N O T E

ATM CAC Enable in the Device window of the EM Properties window suite must be turned on (indicated by a check) to enable Connection Admission Control over-subscription checking, or configured over-subscription factors will not be applied.

3. Click on *Apply* to update the ATM CAC parameters.

Configure Traffic Parameters

1. Click on the *Traffic Parameters* tab. When the *Traffic Parameters* window appears, click on the *Insert* button. When the *Insert Traffic Parameters* window appears, *ATM* will be automatically selected in the *Param Type* field and the *Index* field will be incremented by one.
2. Click in the *ServiceCategory* field to select *rtVBR* or *nrtVBR*. The *ubr* service category cannot be configured because it is fixed with an *Index* of 1, and with *PCR*, *SCR* and *MBS* fixed at 0.
3. If *rtVBR* was selected in step 2, click in the *CDV* (Cell Delay Variation) field to select:

   ⇒ **minimum:** Assigns the circuit a higher priority than *rtVBR* circuits with a *nominal CDV*.

   ⇒ **nominal:** Assigns the lowest *rtVBR* priority to the circuit.

4. Enter values for *PCR*, *SCR* and *MBS* in the *ATM* fields. Configure these values to control the flow of traffic through circuits that have been assigned this service category as follows:

   ⇒ **PCR:** Enter the maximum rate (Peak Cell Rate) up to which the circuit can burst, typically the circuit's maximum data rate, in cells per second. Range: 150 to 27848.

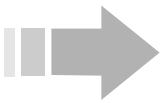
   ⇒ **SCR:** Enter the guaranteed rate of the circuit (Sustained Cell Rate) in cells per second. Range: 150 to 27848.

   ⇒ **MBS:** Enter the maximum number of cells that can be transmitted at *Peak Cell Rate* while still conforming with the *Sustained Cell Rate* (Maximum Burst Size). Range: 1 to 2048.

Example

An rtVBR service is set so that at *PCR* (Peak Cell Rate), one cell will transmit every 100 microseconds, and at *SCR* (Sustained Cell Rate), one cell will transmit every 400 microseconds. If the *MBS* (Maximum Burst Size) is five cells, only five cells may be transmitted at *PCR*, which will entail transmission at *PCR* for 500 microseconds. At the configured *SCR*, transmission of five cells would require 2000 microseconds (5 x 400 microseconds). Therefore, after transmitting *MBS* number of cells, transmission will be quiescent for the next 1500 microseconds to conform with the *SCR*.

5. After all selections have been made, click on *Insert* to return to the *Traffic Parameters* window.



N O T E

Due to algorithmic or hardware constraints, the system may set PCR, SCR and MBS values that closely match but are not exactly equal to the values entered by the operator.

6. Click in the *PhysicalType* field in the *Traffic Parameters* window and select *t1e1ima*. Click on *Apply*; then click on *Refresh*. (In this release, the EM inserts traffic parameters entered from the window suite of a T1/E1 IMA port as *PhysicalType ds3*.)
7. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Configure ATM Traffic Parameters for a Frame Relay Link

To configure a circuit on the T1/E1 IMA port so it will conform with a frame relay link provided by the attached CPE:

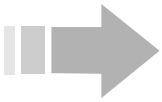
1. With the *Traffic Parameters* window displayed, click on the *Insert* button. When the *Insert Traffic Parameters* window appears, *ATM* will be automatically selected in the *Param Type* field and the *Index* field will be incremented by one.
2. Click in the *ServiceCategory* field to select *rtVBR* or *nrtVBR*. The *ubr* service category cannot be configured because it is fixed with an *Index* of 1, and with *PCR*, *SCR* and *MBS* fixed at 0.
3. If *rtVBR* was selected in step 2, click in the *CDV* (Cell Delay Variation) field to select:

   ⇒ **minimum:** Assigns the circuit a higher priority than *rtVBR* circuits with a *nominal CDV*.

   ⇒ **nominal:** Assigns the lowest *rtVBR* priority to the circuit.
4. Click in the *Param Type* field to select *Frame Relay*. The EM will disable fields that configure *ATM* parameters (*PCR*, *SCR* and *MBS*) and enable *Frame Relay* fields (*CIR*, *Bc* and *Be*).
5. Enter the parameter values for the supported frame relay link in the *CIR* (Committed Information Rate), *Bc* (Burst committed) and *Be* (Burst excess) fields.
6. Click on the *Calculate* button. The EM will convert frame relay values into their ATM equivalents (*PCR*, *SCR* and *MBS*) and insert the converted values in the appropriate ATM fields of the *Insert Traffic Parameters* window.
7. Click on *Insert* to return to the *Traffic Parameters* window.
8. Click in the *PhysicalType* field in the *Traffic Parameters* window and select *t1e1ima*. Click on *Apply*; then click on *Refresh*. (In this release, the EM inserts traffic parameters entered from the window suite of a T1/E1 IMA port as *PhysicalType ds3*.)
9. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Create Circuits on a T1/E1 IMA WAN Port

1. Click on the *Circuits* tab to access that window.



I M P O R T A N T

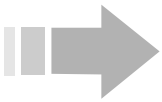
On a T1/E1 IMA module that is being used in T1/E1 mode (i.e., that has no IMA group configured on it), circuits may only be added to Port 1. You will receive an error message if you try to add circuits to ports 2 through 8. For information on configuring ports when the module is being used in Inverse Multiplexing for ATM (IMA) mode, see "Configuring IMA Groups" on page 99.

2. In the *Circuits* window, click on the *Insert* button.
3. Configure each field of the *T1/E1 IMA Port, Insert Circuits* window:

   ⇒ **PII:** The EM will automatically enter the PII of the WAN port. Append a Virtual Channel Link (VCL) to identify the circuit. Range: 16 to 991.

   ⇒ **Vpi:** Enter a Virtual Path Identifier for the circuit. Range: 0 to 15.

   ⇒ **Vci:** Enter a Virtual Channel Identifier for the circuit. Range: 32 to 511.



N O T E S

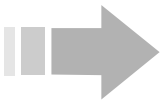
- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for loopback testing.*

  ⇒ **AdminStatus:** Click to configure the circuit's *AdminStatus* to *up*.

  ⇒ **TransmitTrafficDescrIndex:** Every time a service category with unique *PCR*, *SCR* and *MBS* variables is created in the *Traffic Parameters* window, it is assigned a unique *Index*. Click in this field to select a service category's *Index* and assign that service category, with its *PCR*, *SCR* and *MBS* values, to the circuit you are creating. *TransmitTrafficDescrIndex* 1 always identifies the *ubr* service category.

  ⇒ **AalType:** Click to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0. With AAL5 trailer suppression, the 8-bit trailer normally appended to the end of each AAL5 PDU is omitted, resulting in a savings of one ATM cell for each AAL5 PDU. This provides better throughput on the WAN connection. When AAL0 is selected, data is not transmitted as message- or packet-based data. Instead, it is transmitted as single raw ATM cells.

⇒ **OAMAutoLBState:** Click to *enable* periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

⇒ **OAMLBInterval:** Enter a value to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ **OAMLBTimeout:** Enter a value to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

⇒ **OAMAdminState:** Click to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to return to the *Circuits* window; then click on *Refresh*.
5. Repeat steps 2 through 4 for each circuit to be added to the T1/E1 IMA port.
6. Click on *Save to NVRAM* to save the updated configuration file to nonvolatile memory.

Create an Interface for the New Circuit

This procedure usually is not necessary because an interface is created automatically on a WAN circuit when a subscriber port, circuit, or bundle of subscriber ports is linked with that WAN circuit. However, interfaces for WAN circuits must be created or edited by the operator in the following cases:

- To configure a WAN interface with non-default encapsulation type. WAN interface encapsulation type can be set in the *Circuit* window for a selected WAN circuit or in the *Insert All Interfaces* window for the WAN port.
- To assign IP addresses to either end of a WAN circuit that will be used in the IP *NetModel*. (An IP address for the DSL concentrator end of the circuit is entered in the *IpAddr* field of the *Insert All Interfaces* window; an

IP address for the far end of the circuit is entered in the *FarEndAddr* field.)

- To link a WAN circuit to another WAN circuit. The PII of the second WAN circuit is entered in the *DestPII* field in the *Circuit* or *Insert All Interfaces* window for the first WAN circuit.

See "Adding Subscribers" on page 111 for more information about *NetModels*, encapsulation types, and forwarding modes.

To create an interface:

1. In the T1/E1 IMA WAN port window suite, click on the *All Interfaces* tab.
2. Click on *Insert*.
3. Configure the following fields in the *T1/E1 IMA Port, Insert All Interfaces* window:

   ⇒ **PII:** The EM will enter the PII of the WAN port. Append the Virtual Channel Link (VCL) for the newly created circuit. For example, 1.3.1.19 is port 1.3.1, VCL 19.

   ⇒ **NetModel:** Click to set the *NetModel* to *ip*, *vwan*, *cross-connect*, or *copperVPN*.

   ⇒ **IpAddr:** If the *ip NetModel* was selected above, enter an IP address to assign it to the DSL concentrator end of the WAN circuit.

   ⇒ **NetMask:** If the *ip NetModel* was selected above, enter a subnet mask for the interface.

   ⇒ **FarEndAddr:** If the *ip NetModel* was selected above, enter a destination IP address for point-to-point WAN links (i.e., enter an IP address for the far end of the WAN circuit.)

   ⇒ **DestPII:** If the *NetModel* has been set to *cross-connect* or *copperVPN*, and the destination PII for the interface is another WAN port circuit, enter the PII of that WAN port circuit here. In all other cases, leave this field set to its default value of 0.0.0.0.

   ⇒ **EncapsulationType:** Click to select an encapsulation type (the format of data frames or packets exchanged over the interface).

   ⇒ **GroupName:** Click on the arrow to the right of the *GroupName* field and select a name from the drop-down menu to identify the user group to which the circuit belongs (optional). New user group names must be entered using the *User Group Members* feature in the EM *Edit* menu (see "Configuring User Groups" on page 6). For example, you can enter the name of a company using multiple ports to provide DSL services to subscribers.

⇒ **Name:** Enter a name to identify the circuit (optional). For example, you can enter the name of the subscriber using this circuit.

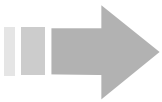
⇒ **AdditionalInfo:** Enter an arbitrary string of information about the circuit (optional). For example, you can enter the telephone number of the subscriber using this circuit.

4. Click on *Insert* to return to the *All Interfaces* window; then click on *Refresh*.
5. Repeat steps 2 through 4 to create an interface for each new circuit being added to the WAN port.
6. When all interfaces have been configured, click on *Save to NVRAM* to save the updated configuration file to nonvolatile memory.

Change an Existing Interface

Once an interface has been configured on a T1/E1 IMA WAN port, either by connecting a subscriber port with it or by means of the *Insert All Interfaces* window, perform the following steps if you need to change interface parameters:

1. In the WAN port window suite for a T1/E1 IMA port, click on the *Circuits* tab.
2. In the *Circuits* window, click in the *PII* field to select a circuit; then click on the *Edit Interface* button.



N O T E

If the EM responds with an Error message saying "Interface for [PII] doesn't exist," the interface for the selected circuit has not been configured. Refer to the procedure "Create an Interface for the New Circuit" on page 51 *and create the interface.*

3. Change the fields in the *Circuit* window as required. The *Circuit* window provides access to the same parameters that are described in "Create an Interface for the New Circuit" on page 51.
4. Click on *Apply*; then click on *Close* to return to the *Circuits* window.
5. Click on the *All Interfaces* tab and when that window appears, click on *Refresh* and check that the desired changes to the interface have been made.
6. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Connection Admission Control

The EM includes two Connection Admission Control (CAC) tools to help allocate the bandwidth of ATM WAN ports (DS3 ATM, OC-3c/STM-1, and T1/E1 IMA) or IMA groups.

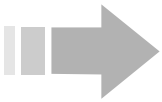
CAC Chart

The *CAC Chart* feature displays a bar chart of the current bandwidth allocations for the selected DS3 ATM, OC-3c/STM-1, or T1/E1 IMA WAN port, or IMA group. The bar chart displays allocation for *Peak Traffic* (*rtPCR* and *nrtPCR*) and for *Sustained Traffic* (*rtSCR* and *nrtSCR*). To view an ATM WAN port's CAC chart, double click on the port and click on the *Circuits* tab to display the *Circuits* window; then click on *CAC Chart*. To view the CAC chart for an IMA group, click on *CAC Chart* in the *Circuits* window for the IMA group or for any member port.

Note that the values displayed using the *CAC Chart* feature may differ from limitations configured using *CAC Over-Subscription Monitoring*. If *Over-Subscription Monitoring* is disabled, or if a value in a circuit's *TransmitTrafficDescrIndex* field has been edited to change the bandwidth allocation on the port or group, the *Over-Subscription Monitoring* configured limitations will no longer apply.

CAC Over-Subscription Monitoring

Use this feature to control allocation of bandwidth when you are adding circuits to an ATM WAN port (DS3 ATM, OC-3c/STM-1, or T1/E1 IMA) or IMA group. With *Over-Subscription Monitoring*, you can configure over-subscription limits for the ATM WAN port or IMA group's *rtVBR* and *nrtVBR* peak and sustained cell rates. Then as circuits are added to the port or group, the EM monitors *Traffic Parameters* assigned to those circuits and ensures that the over-subscription limits are not exceeded.



N O T E

CAC Over-Subscription Monitoring restrictions are only enforced when circuits are added to an ATM WAN port or IMA group.

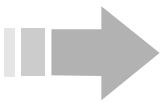
1. Click on the *Device* menu in the EM menu bar and select *Properties*. The *Properties* window suite will appear with the *Polling* window displayed.
2. Click on the *Device* tab and when that window appears, click to place a check in the *ATM CAC Enable* field and enable *CAC Over-Subscription Monitoring*. Then click on *Ok*.
3. For an ATM WAN port, double click on the port in the Shelf View to open that port's window suite; then click on the *ATM* tab. For an IMA group, select *IMA Group* in the *Protocols* menu, click to select the IMA group, and click on *Edit Group*; then click on the *ATM* tab. Configure the four over-subscription factors listed below. Enter the percentage of the port or IMA group's line rate that CAC will allow you to allocate to all circuits on that port or group. Over-subscription factors can be limited to 1% of line rate; they can be set to 2500, allowing for over-subscription 25 times the line rate, or they can be set to any value between. When all four over-subscription factors have been configured, click on *Apply*.

⇒ **RtPCR:** Enter a Real-Time Peak Cell Rate (PCR) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *rtVBR* virtual circuits on the port.

⇒ **RtSCR:** Enter a Real-Time Sustained Cell Rate (*SCR*) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *rtVBR* virtual circuits on the port.

⇒ **NrtPCR:** Enter a Non Real-Time Peak Cell Rate (*PCR*) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *nrtVBR* virtual circuits on the port.

⇒ **NrtSCR:** Enter a Non Real-Time Sustained Cell Rate (*SCR*) over-subscription factor for the EM to use during CAC over-subscription monitoring. Specify the over-subscription factor as percentage of all *nrtVBR* virtual circuits on the port.



N O T E

When applying ATM traffic parameters to an IMA group, remember that the bandwidth associated with IMA groups is dynamic in nature, and can be reduced as a consequence of link failure.

4. In the *Traffic Parameters* window, configure *rtVBR* and *nrtVBR* traffic parameters to be assigned to circuits as they are created.

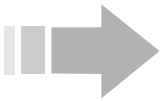
   Whenever you configure a circuit on that ATM WAN port or IMA group, the EM will use the appropriate CAC over-subscription formula to ensure that bandwidth allocation for all circuits on the port or group will not exceed the over-subscription limitations. If insufficient bandwidth remains within the limitations established in step 3 for the circuit you are attempting to add, the EM will not add the circuit, but will display the error message:

   ```
   CAC rejected insertion on PCR. (OSF) Available:
   [N] OSF Requested: [n]
   ```

   Where:

   N: indicates the remaining bandwidth that is available for allocation.

   n: indicates the amount of bandwidth the assigned traffic parameters would allocate to the circuit you are trying to add.



N O T E

If you reallocate the ATM port or IMA group's bandwidth by editing the value in a circuit's TransmitTrafficDescrIndex field in the Circuits window, CAC Over-Subscription will not be enforced.

Chapter 4
Configuring Protocols

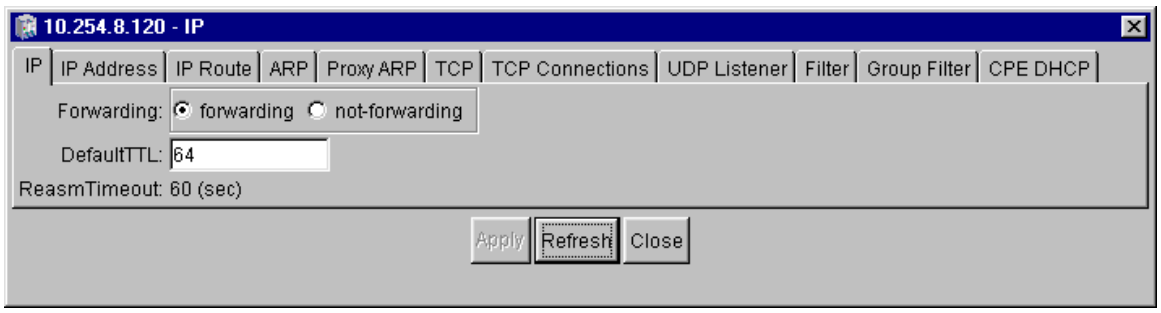
The *Protocols* pull-down menu allows you to configure and display protocol information pertaining to IP links, frame relay virtual circuits, ATM circuits, *CopperVPN* groups, and IMA groups.

Configuring IP Protocols

The *IP* window suite provides access to statistics and configurable objects associated with datagrams and IP packets transmitted or received through the DSL concentrator. To access the *IP* window suite, click on *Protocols* in the EM menu bar and select *IP*.

Configuring IP Forwarding

Select *IP* in the *Protocols* menu to display the *IP* window and configure IP forwarding.



Configure the following fields:

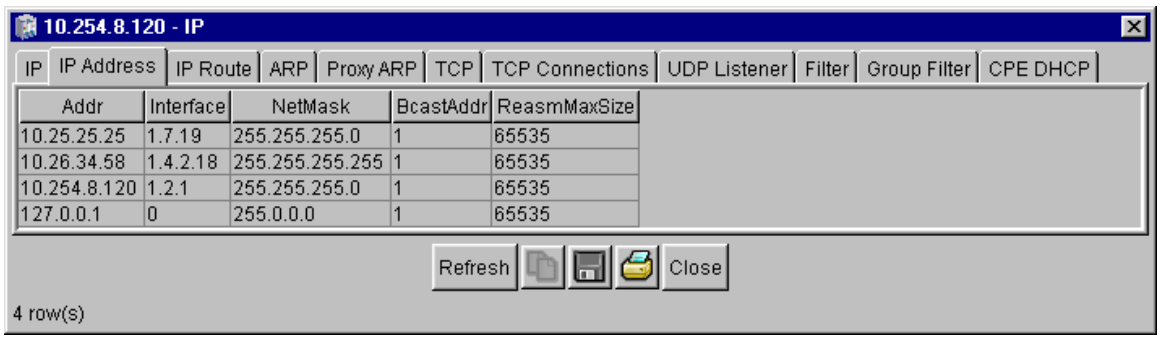
Forwarding: Click to select *forwarding* to configure the DSL concentrator to operate as an IP gateway and route individual packets over the public network based on their destination IP address. Select *not-forwarding* to disable packet forwarding.

DefaultTTL: Enter a value to determine the number of hops allowed (Time-To-Live) before the network will discard packets because they are undeliverable. Range: 0 to 255.

ReasmTimeout: This field displays the maximum length of time, in seconds, that fragments will be held for reassembly.

Viewing IP Addresses Configured on the DSL Concentrator

With the *IP* window suite displayed, click on the *IP Address* tab. This read-only window displays the address table for every IP address configured on the DSL concentrator.



The following fields are displayed for each IP address in the *IP Address* window:

Addr: Assigned IP address.

Interface: PII of the interface associated with this IP address.

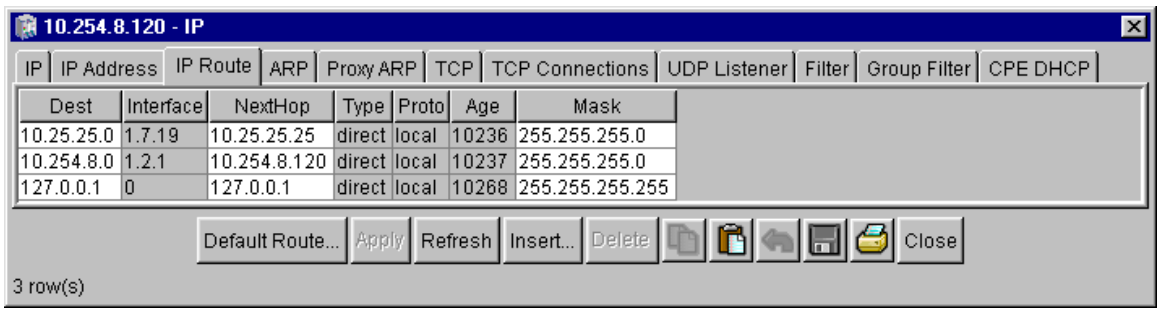
NetMask: Subnet mask associated with this IP address.

BcastAddr: Broadcast address used for this IP address. A value of 1 indicates the Internet-standard all-ones address.

ReasmMaxSize: Maximum IP datagram size that can be reassembled from fragments.

Viewing and Configuring IP Routes

With the *IP* window suite displayed, click on the *IP Route* tab. Use this window to view or configure routing instructions for any destination IP address in the DSL concentrator configuration file. Only route entries that have been configured by the operator are stored in the configuration file. Transient entries are not stored, but are created automatically when needed.



The *IP Route* window displays a row of data for each destination address in the configuration file. The following fields are displayed for each destination address:

Dest: Route's destination IP address.

Interface: PII of the local interface through which the next hop of this route is reached.

NextHop: IP address of the next hop of the route. Edit the value in this field and click on *Apply* to change the *NextHop* value.

Type: This field identifies the type of route:

Direct: A route to a directly connected net/subnet.

Indirect: A route to a non-local host/net/subnet.

Invalid: The route is not valid and will be deleted.

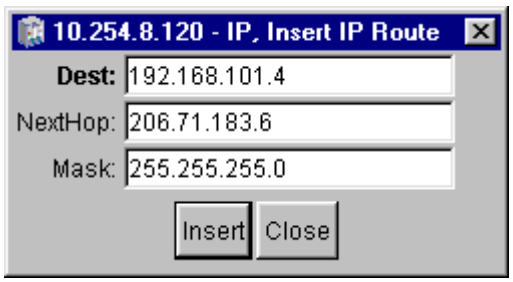
Proto: Routing mechanism by which the route was learned.

Age: Elapsed time in seconds since the route was last updated.

Mask: Subnet mask that is applied to the route. Edit the value in this field and click on *Apply* to change a subnet mask.

Adding an IP Route

Click on the *Insert* button in the *IP Route* window to add a route to a DSL concentrator's configuration file. The *IP, Insert IP Route* window will appear.



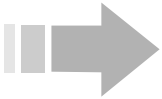
Complete the fields in the *IP, Insert IP Route* window:

Dest: Enter the destination IP address. The EM allows you to configure a default route by entering 0.0.0.0 in the *Dest* field. Refer to *Default Route*, below, for viewing the default route.

NextHop: Enter an IP address for the next hop of the route.

Mask: Enter the subnet mask. If you are configuring a default IP route, you must enter 0.0.0.0.

Click on *Insert* to add the IP Route and return to the *IP Route* window; then click on *Refresh*.



N O T E

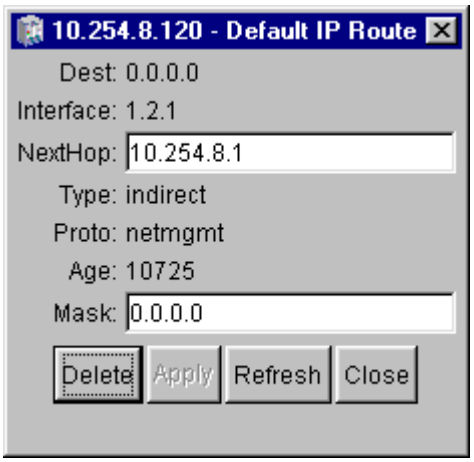
Be sure to configure DSL concentrator routes so that SNMP replies will be sent through the interface that connects with the EM.

Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Default IP Route

For any messages that do not have an assigned routing, the default IP route establishes the "next hop" address. If no default route is configured, packets addressed to unknown destinations are discarded.

You can view the default IP route, or change it by modifying its *NextHop* or *Mask* (or both). Click on *Default Route* in the *IP Route* window. The *Default IP Route* window will appear.



The following fields are included in the *Default IP Route* window:

Dest: The default route's destination IP address (0.0.0.0).

Interface: PII of the interface that is configured with the default route.

NextHop: IP address of the next hop of the default route. Packets addressed to unknown destinations will be forwarded to this address. Edit the value in this field and click on *Apply* to change the default IP route.

Type: Identifies the type of route. This field will display:

Direct: A route to a directly connected net or subnet.

Indirect: A route to a non-local host, net or subnet.

Invalid: The route is not valid and will be deleted.

Proto: Routing mechanism by which the route was learned.

Age: Elapsed time in seconds since the route was last updated.

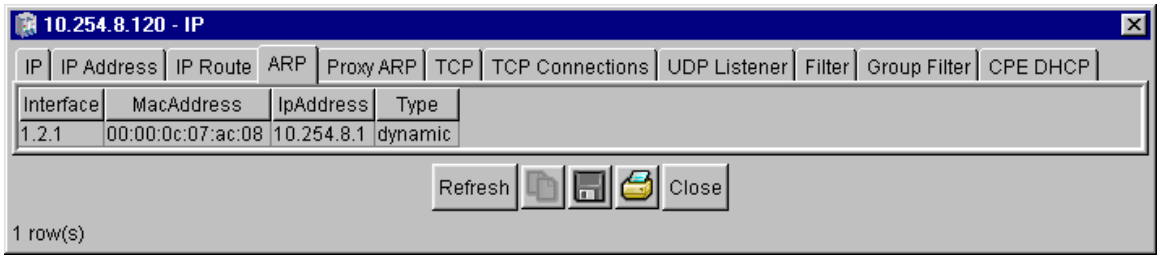
Mask: Subnet mask that is applied to the default IP route. The value in this field must be 0.0.0.0.

Removing an IP Route

To remove a route from the DSL concentrator's configuration file, click on the route in the *IP Route* window to select it; then click on *Delete*. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Viewing the Address Translation Table

The *ARP* (Address Resolution Protocol) window displays the DSL concentrator's address translation table. With the *IP* window suite displayed, click on the *ARP* tab.



The following fields are displayed for each ARP interface:

Interface: Index (PII) representing the interface associated with the entry.

MacAddress: Physical address associated with the interface.

IpAddress: IP address associated with the interface.

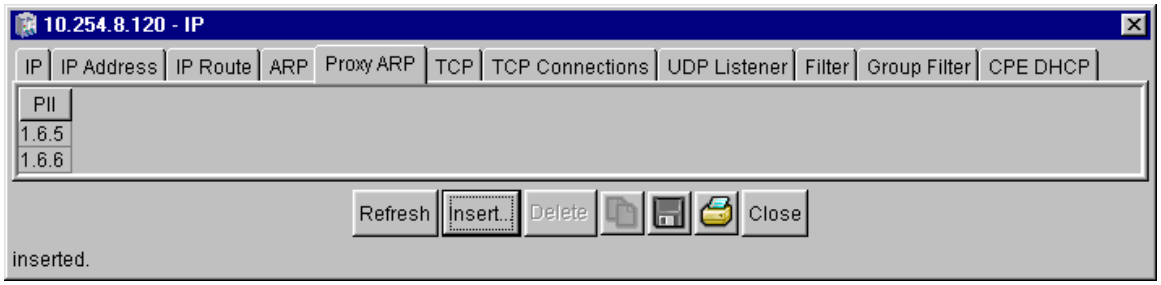
Type: Identifies the mapping as *dynamic*, *static*, *invalid*, or *other*.

Configuring the DSL Concentrator for Proxy ARP

When a subscriber port is enabled for Proxy ARP, the DSL concentrator will reply to ARPs from an upstream router for that subscriber port. Then, when the router sends packets to the DSL concentrator, the DSL concentrator will forward those packets to the CPE. See "Adding a Proxy ARP Interface" on page 62 for information about enabling a subscriber port for Proxy ARP.

The DSL concentrator will only reply to ARPs received on its Ethernet port and it will only respond to an ARP if the target subscriber link is up. The DSL concentrator does not attempt to directly forward the ARP or verify the presence of the host on the subscriber link. A subscriber port must be configured in the *IP NetModel* before it can be enabled for Proxy ARP.

With the *IP* window suite displayed, click on the *Proxy ARP* tab.



The *Proxy ARP* window displays the PII of every subscriber port that has been enabled for Proxy ARP.

Adding a Proxy ARP Interface

Click on *Insert* in the *Proxy ARP* window to add a subscriber port to the DSL concentrator's Proxy ARP table. The *IP, Insert Proxy ARP* window will appear.

N O T E

Only subscriber ports that are configured for IP can be added to the DSL concentrator's Proxy ARP table.

Enter a subscriber port's PII and click on *Insert* to add that port to the *Proxy ARP* table; then click on *Refresh* in the *Proxy ARP* window. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

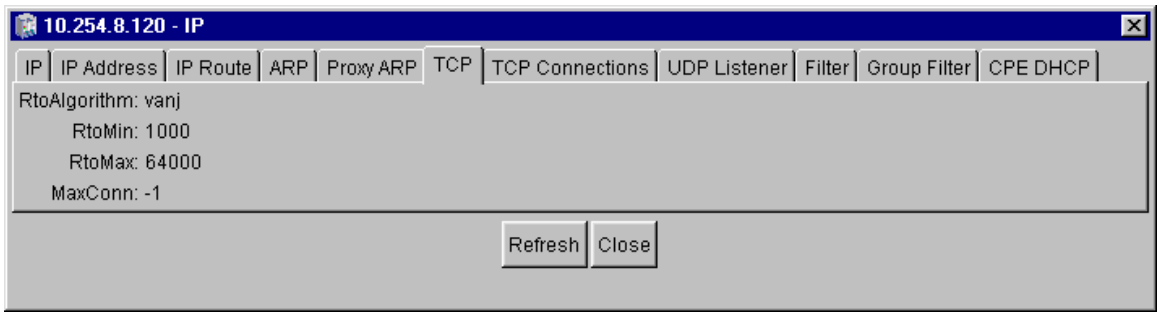
Removing a Proxy ARP Interface

To remove an interface from the *Proxy ARP* table, click on the interface in the *Proxy ARP* window to select it; then click on *Delete*. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Viewing TCP Connection Information

Use the *TCP* window to display information about TCP connections and connection criteria. Note that information relating to actual TCP connections is transient, and remains valid only as long as all the connections are in place.

With the *IP* window suite displayed, click on the *TCP* tab.



The following information is displayed:

RtoAlgorithm: This field identifies the algorithm used for determining the retransmit timeout (rto). The rto value is used to control retransmission of unacknowledged octets:

Constant: A constant rto

rsre: MIL-STD-1778, Appendix B

vanj: Van Jacobson algorithm

Other: None of the above

RtoMin: This field displays the minimum rto value in milliseconds.

RtoMax: This field displays the maximum rto value in milliseconds.

MaxConn: This field displays the maximum number of TCP connections that can be supported by the DSL concentrator. A value of -1 indicates a dynamic maximum.

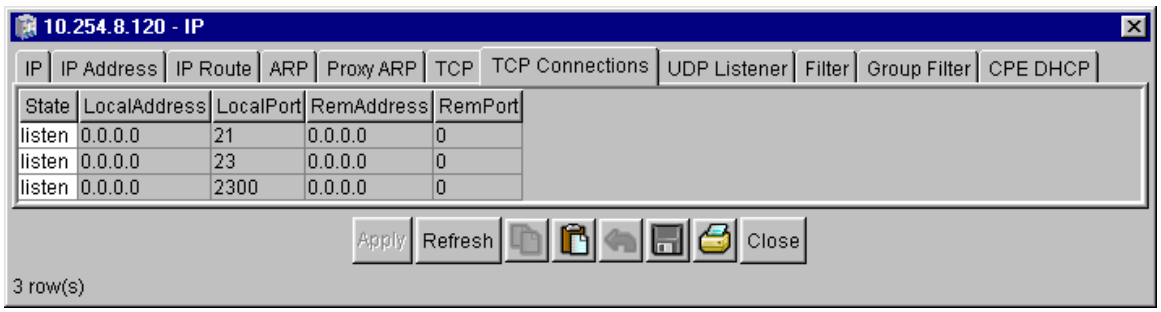
Viewing the State of TCP Connections

The *TCP Connections* window displays the state of TCP connections. Note that the state and the values of all objects in this group are transient. They remain valid only as long as the connection continues.

N O T E

LocalPort and RemPort do not refer to physical interfaces but to the IP port numbers (value: 0 to 65535).

With the *IP* window suite displayed, click on the *TCP Connections* tab.



The following fields are displayed for each TCP connection:

State: Displays the state of this connection as:

- *closed*
- *listen*
- *synSent*
- *synReceived*
- *established*
- *finWait1*
- *finWait2*
- *closeWait*
- *lastAck*
- *closing*

- *timeWait*
- *deleteTCB*

LocalAddress: Displays the IP address of the local side of the connection. If the local side of the connection is in the listen state (i.e., will accept connections for any IP interface associated with the node), this field will display 0.0.0.0.

LocalPort: Displays the TCP port number on the local side of the connection. Note that this is a logical assignment, not a physical address.

RemAddress: Displays the IP address of the remote side of the connection.

RemPort: Displays the TCP port number of the remote side of the connection.

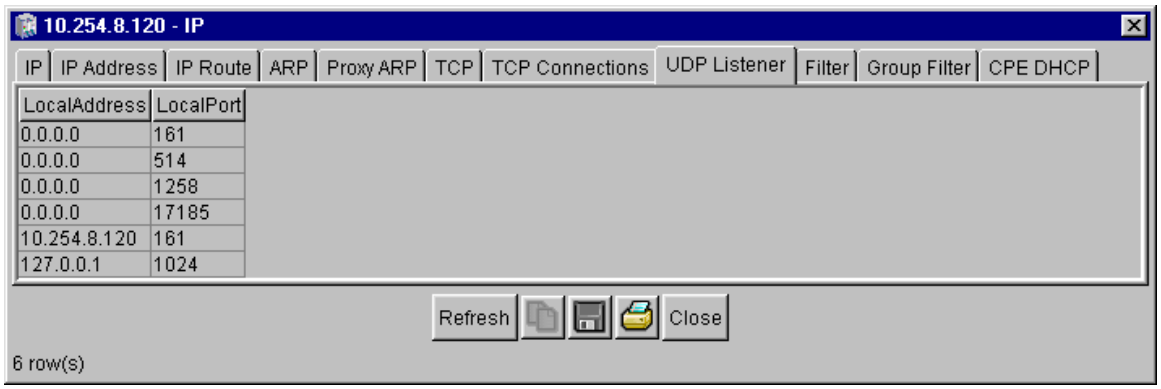
Viewing UDP Endpoints

Use the *UDP Listener* window to display information about UDP endpoints (UDP Listeners) that are currently accepting datagrams. The values of all objects in the group are transient; they remain valid only as long as connections continue.

N O T E

LocalPort does not refer to a physical interface, but rather to a UDP port number (value: 0 to 65535).

With the *IP* window suite displayed, click on the *UDP Listener* tab.



The *UDP Listener* table includes a row of data for each IP address connected as a UDP Listener. The following fields are included in each row:

LocalAddress: Displays the IP address of the local UDP Listener; if the listener will accept datagrams for any IP interface associated with the node, *LocalAddress* will be 0.0.0.0.

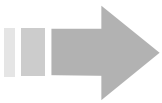
LocalPort: Displays the TCP port number of each local UDP Listener. Note that this is a logical assignment, not a physical address.

Configuring IP Filters

IP filtering allows you to set parameters that will selectively pass or discard inbound IP packets. You can configure and display two types of IP filters:

Interface Filter: Filters packets arriving at a particular interface: a subscriber port, a subscriber port virtual circuit, an IMUX bundle, a WAN port interface, an IMA group, or the DSL concentrator itself. An interface filter applied to packets addressed to the DSL concentrator is called a TCP stack filter, and is used to control management access to the system.

Group Filter: Group filters are applied to packets arriving at subscriber interfaces that have been configured as members of a *CopperVPN* group. These filters are used to reroute packets that meet filter criteria to secondary WAN uplinks in the *CopperVPN* group. (See "CopperVPN NetModel" on page 115.)

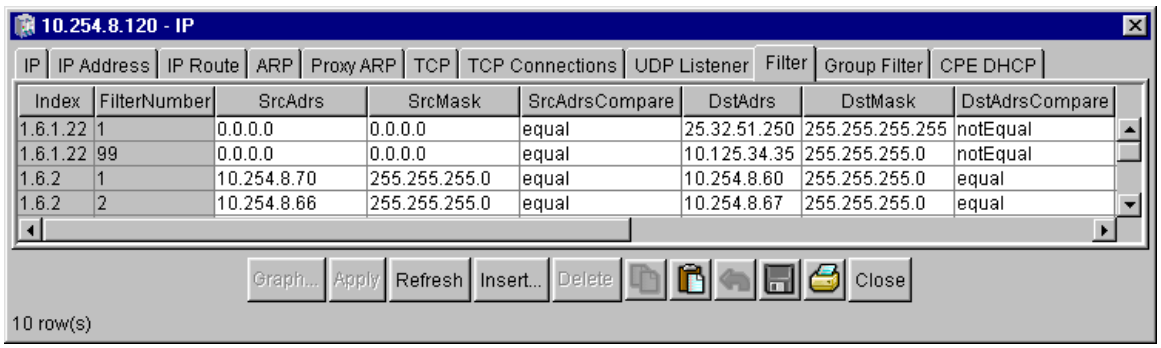


N O T E

If both Interface Filters and Group Filters are defined on a particular interface, only the Interface Filters will be applied.

Click on *Protocols* in the EM menu bar and select *IP*. With the *IP* window suite displayed, click on:

- the *Filter* tab to display and configure interface filters.
- the *Group Filter* tab to display and configure group filters for *CopperVPN* groups.



Since the *Filter* window and the *Group Filter* window contain the same fields, only the *Filter* window is shown here. These windows display a list of filters, in numerical order, that have been applied to each interface or *CopperVPN* group. See "Inserting a Filter" on page 68 to add a filter to the filter list.

The following fields are included for each filter:

Index: Displays the PII of the interface to which the filter applies. A value of 1.0 indicates a TCP stack filter.

FilterNumber: Displays an integer that identifies the filter's place in the filter list. Packets are checked against each filter in the filter

list, in *FilterNumber* order beginning with *FilterNumber* 1, until a filter is found that the packet matches.

SrcAdrs: Displays the IP address being compared with the source IP address in filtered packets.

SrcMask: Displays the mask for the source IP address.

SrcAdrsCompare: Displays the comparison standard used when comparing the packet's source IP address with the address in the *SrcAdrs* field. A match occurs if the packet's source IP address is:

equal (default): Equal to the number in the *SrcAdrs* field

notEqual: Not equal to the number in the *SrcAdrs* field

DstAdrs: Displays the IP address being compared with the destination IP address in filtered packets.

DstMask: Displays the mask for the destination IP address.

DstAdrsCompare: Displays the comparison standard used when comparing the packet's destination IP address with the address in the *DstAdrs* field. A match occurs if the packet's destination IP address is:

equal (default): Equal to the number in the *DstAdrs* field

notEqual: Not equal to the number in the *DstAdrs* field

IpProtocol: Displays the IP protocol to which the filter will be applied:

ip (default): Internet protocol, pseudo protocol number

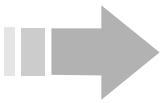
icmp: Internet control message protocol

igmp: Internet group multicast protocol

ggp: Gateway-gateway protocol

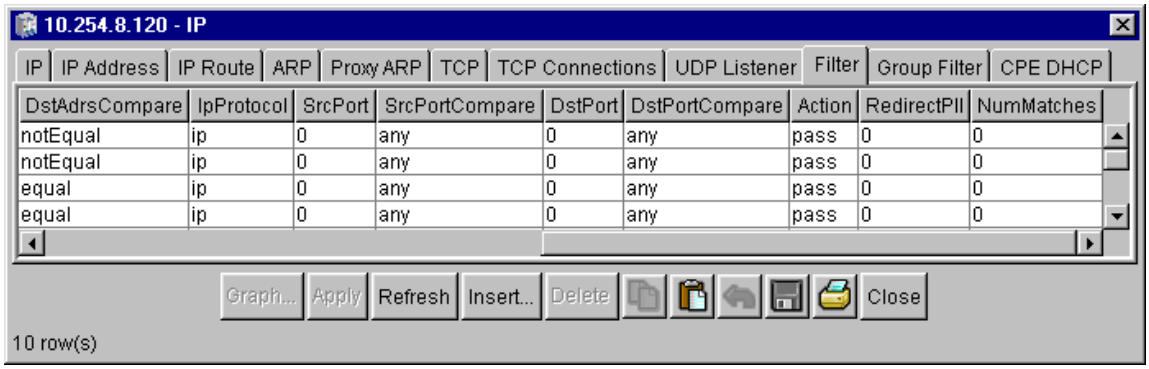
tcp: Transmission control protocol

udp: User datagram protocol



N O T E

Click on the arrow at the bottom of the Filter window to access the remaining fields.



SrcPort: Displays the source port number with which *tcp* and *udp* data packet source ports will be compared.

SrcPortCompare: For *tcp* and *udp* packets only, displays the comparison standard used when comparing the data packet's source port number with the number in the *SrcPort* field. A match occurs if a packet's source port is:

any: Anything

less: Less than the number in the *SrcPort* field

greater: Greater than the number in the *SrcPort* field

equal: Equal to the number in the *SrcPort* field

notEqual: Not equal to the number in the *SrcPort* field

DstPort: Displays the destination port number with which the data packet's destination port will be compared (*tcp* and *udp* packets only).

DstPortCompare: For *tcp* and *udp* packets only, displays the comparison standard used when comparing the data packet's destination port number with the number in the *DstPort* field. A match occurs if a packet's destination port is:

any: Anything

less: Less than the number in the *DstPort* field

greater: Greater than the number in the *DstPort* field

equal: Equal to the number in the *DstPort* field

notEqual: Not equal to the number in the *DstPort* field

Action: Displays the action the filter will take on packets that match all filter criteria:

pass: Packets that match filter criteria are forwarded to their destination. For *CopperVPN* group filters, packets are forwarded to the Default Uplink (*WanUplink1*).

block: Packets that match filter criteria are discarded. For *CopperVPN* group filters, the *PolicyBlocked* counter is incremented for each blocked packet.

chain: Packets that match filter criteria are forwarded to the next filter in the filter list. Only when a packet matches all filters in the chain will the action in the last filter in the chain be taken.

redirect: Packets that match filter criteria are forwarded to the WAN-side interface identified in the *RedirectPII* field.

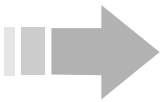
RedirectPII: Identifies the outgoing interface PII assigned to a *redirect* action. The PII in this field must be for a WAN-side interface. For *CopperVPN* group filters, the PII in this field must be for a WAN uplink that is included in the *CopperVPN* group (*WanUplink2* through *WanUplink5*).

NumMatches: Counter displaying the number of packets that match the filter criteria.

Inserting a Filter

Click on *Protocols* in the EM menu bar and select *IP*. With the *IP* window suite displayed, click on:

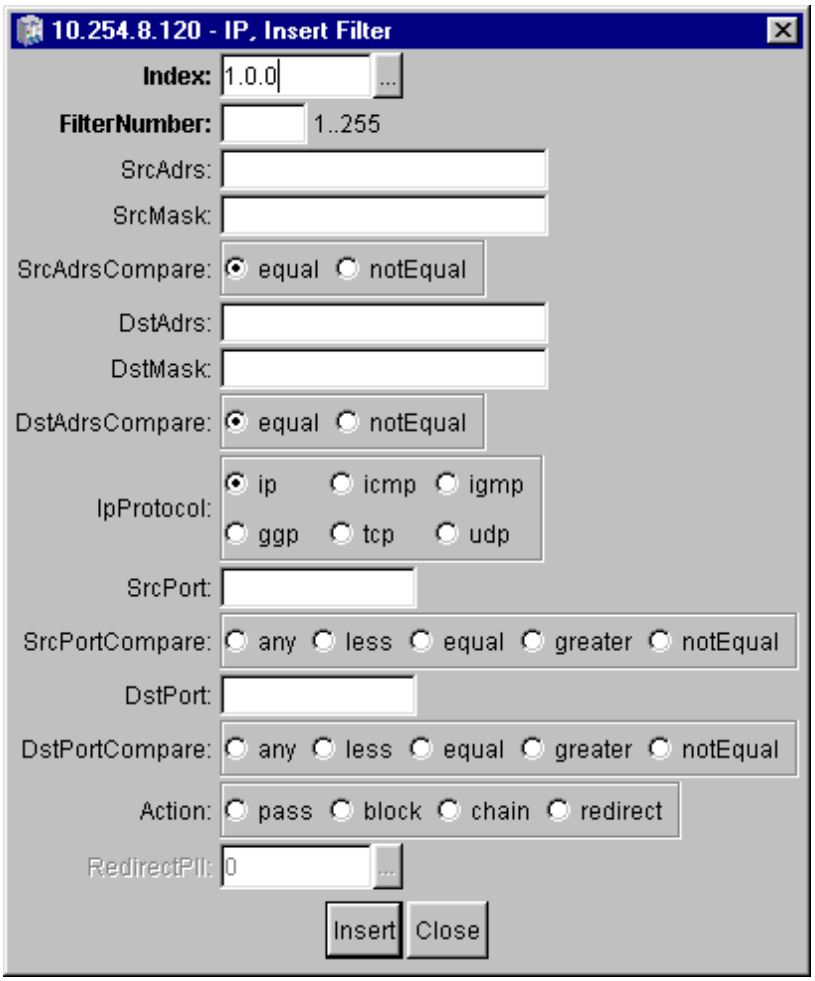
- the *Filter* tab, then the *Insert* button, to add a filter to an interface. The *IP, Insert Filter* window will appear.
- the *Group Filter* tab, then the *Insert* button, to add a group filter for a *CopperVPN* group. The *IP, Insert Group Filter* window will appear.



N O T E

In the IP, Insert Group Filter window, the EM will not block the addition of a group filter to an interface that does not belong to a CopperVPN group. For this reason, it is recommended that you add group filters in the Group Filters for VPN Group, Insert Group Filter window. To access this window, click on VPN Group in the Protocols menu; then click to select the CopperVPN group you want to apply the group filter to. Click on the Group Filter button to display the Group Filters for VPN Group window; then click on Insert. The Group Filters for VPN Group, Insert Group Filter window contains the same fields as the IP, Insert Group Filter window, but the EM inserts the PII of the selected CopperVPN group in the Index field.

Since the *IP, Insert Filter* window and the *IP, Insert Group Filter* window contain the same fields, only the *IP, Insert Filter* window is shown here.



C A U T I O N

When configuring IP filters, it is important that exit paths be included for all permitted packets. All packets that are not explicitly passed by filters will be blocked.

To insert a filter, complete the following fields:

Index: Enter the *PII* of the interface to which the filter will apply:

- For an interface filter, enter the *PII* of a subscriber port, subscriber port virtual circuit, IMUX bundle, WAN port virtual circuit, or IMA group. Enter 1.0.0.0, the "virtual PII" of the DSL concentrator, for a TCP stack filter.
- For a group filter, enter the *VPNGroupPii* of the *CopperVPN* group to be filtered.

C A U T I O N

Use care when adding TCP stack filters, as they control management access to the DSL concentrator. When you insert a TCP stack

filter it is immediately activated, so if your workstation is not included in the designated network, you will be disconnected.

FilterNumber: Enter a number between 1 and 255 to determine the filter's place in the filter list.

Packets are checked against each filter in the filter list in *FilterNumber* order beginning with *FilterNumber* 1, until a filter is found that the packet matches. It is thus important that filters be ordered in the filter list from those with the most specific criteria to those with the most general criteria.

SrcAdrs: Enter an IP address to compare with the source address in filtered packets.

SrcMask: Enter a mask for the source IP address.

SrcAdrsCompare: Click to select *equal* or *notEqual* for use as a comparison standard when comparing the value in the *SrcAdrs* field with the source address of the filtered packets.

DstAdrs: Enter an IP address to compare with the destination address in the filtered packet.

DstMask: Enter a mask for the destination IP address.

DstAdrsCompare: Click to select *equal* or *notEqual* for use as a comparison standard when comparing the value in the *DstAdrs* field with the destination address of the filtered packets.

IpProtocol: Click to select the IP protocol to be filtered:

- **ip (default):** Internet protocol, pseudo protocol number
- **icmp:** Internet control message protocol
- **igmp:** Internet group multicast protocol
- **ggp:** Gateway-gateway protocol
- **tcp:** Transmission control protocol
- **udp:** User datagram protocol

SrcPort: For *tcp* and *udp* packets, enter a 16-bit number to be compared with the source port in filtered packets.

SrcPortCompare: For *tcp* and *udp* packets, click to select a comparison standard for use when comparing the data packet's source port number with the number in the *SrcPort* field. A match occurs if a packet's source port is:

- **any:** Anything
- **less:** Less than the number in the *SrcPort* field
- **greater:** Greater than the number in the *SrcPort* field
- **equal:** Equal to the number in the *SrcPort* field
- **notEqual:** Not equal to the number in the *SrcPort* field

DstPort: For *tcp* and *udp* packets, enter a 16-bit number to be compared with the destination port number in filtered packets.

DstPortCompare: For *tcp* and *udp* packets, click to select a comparison standard for use when comparing the data packet's destination port number with the number in the *DstPort* field. A match occurs if a packet's destination port is:

any: Anything

less: Less than the number in the *DstPort* field

greater: Greater than the number in the *DstPort* field

equal: Equal to the number in the *DstPort* field

notEqual: Not equal to the number in the *DstPort* field

Action: Click to select the action to be taken when a packet matches all criteria in the filter:

pass: Packets that match filter criteria are forwarded to their destination. For *CopperVPN* group filters, packets are forwarded to the Default Uplink (*WanUplink1*).

block: Packets that match filter criteria are discarded. For *CopperVPN* group filters, the *PolicyBlocked* counter is incremented for each blocked packet.

chain: Packets that match filter criteria are forwarded to the next filter in the filter list. Only when a packet matches all filters in the chain will the action in the last filter in the chain be taken.

redirect: Packets that match filter criteria are forwarded to the WAN-side interface identified in the *RedirectPII* field.

RedirectPII: If redirect is selected in the *Action* field, enter the PII to which the packets will be forwarded. This PII must be for a WAN-side interface. For *CopperVPN* group filters, the PII in this field must be for a WAN uplink that is included in the *CopperVPN* group (*WanUplink2* through *WanUplink5*).

Click on *Insert* to add the filter; then click on *Refresh*. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Removing a Filter

To remove a filter, click on the filter in the *Filter* or *Group Filter* window in the *IP* window suite; then click on *Delete*. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Configuring the DSL Concentrator DHCP Feature

Use the *CPE DHCP* window to configure the DSL concentrator to respond to Dynamic Host Configuration Protocol (DHCP) requests. The DSL concentrator can support any of the following three modes on different subscriber ports:

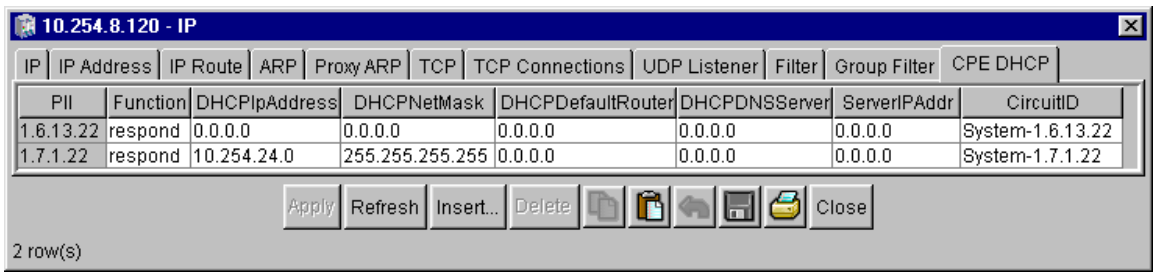
Respond Mode: Respond to DHCP requests from directly-connected CPE. In this mode, IP addresses and netmasks are entered in the DSL concentrator's DHCP table to assign them to specific subscriber ports. Then, when the DSL concentrator receives a DHCP request from a CPE that is connected to the

DHCP-enabled subscriber port, it will download the assigned IP addresses and netmask to the CPE.

Relay Mode: Respond to DHCP requests from directly-connected CPE by inserting a Circuit ID and the subscriber port IP address in the DHCP requests and forwarding them to a specific DHCP server.

Forward Mode: Respond to DHCP requests from directly-connected CPE by inserting a Circuit ID in the DHCP requests and forwarding them upstream.

With the *IP* window suite displayed, click on the *CPE DHCP* tab. The *CPE DHCP* window will appear.



This window displays a row for each DHCP table entry. Each row includes the following fields:

PII: The PII of the subscriber port or a subscriber port's voice circuit.

Function: This field identifies the DHCP mode that is assigned to the PII. To change this mode, click in this field and select *respond*, *relay* or *forward*; then click on *Apply*.

DHCPIpAddress: The IP address that will be assigned to the CPE in response to a DHCP request in the *respond* mode.

DHCPNetMask: The NetMask that will be assigned to the CPE in response to a DHCP request in the *respond* mode. Default: 0.0.0.0.

DHCPDefaultRouter: The default router IP address that will be sent to the CPE in response to a DHCP request in the *respond* mode. Default: 0.0.0.0.

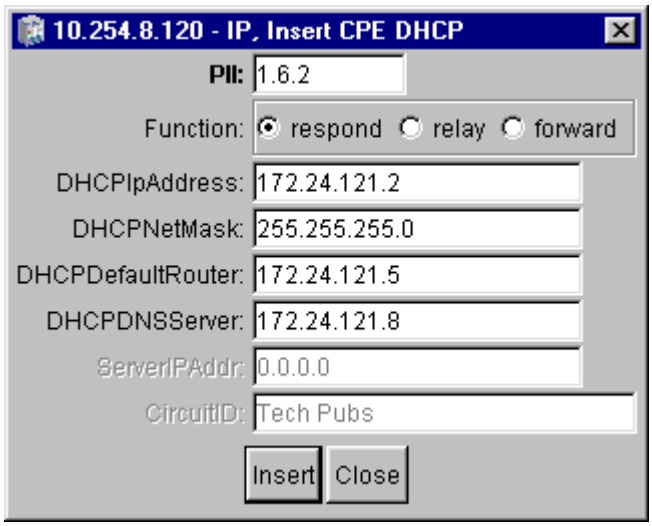
DHCPDNSServer: The DNS server IP address that will be sent to the CPE in response to a DHCP request in the *respond* mode. Default: 0.0.0.0.

ServerIPAddr: The IP Address of the upstream DHCP server to which the DSL concentrator will send DHCP requests when the DHCP *relay* mode is selected.

CircuitID: Displays a value that uniquely identifies the subscriber port and virtual circuit when applicable. This value is inserted into DHCP requests received from directly connected CPE that are *forwarded* or *relayed* to an upstream DHCP server so the upstream server can identify the source of the DHCP request and accordingly implement a configuration assignment. The default string for *CircuitID* is `systemname-PII`.

Inserting CPE DHCP

1. Click on *Insert* in the *CPE DHCP* window. The *IP, Insert CPE DHCP* window will appear.



2. Enter a PII identifying the subscriber port and voice circuit, if applicable, connected to the target CPE in the *PII* field.
3. Click in the *Function* field to select *respond*, *relay* or *forward* to determine how the DSL concentrator will respond to DHCP requests.

   ⇒ **respond mode:** The DSL concentrator functions as a DHCP server. When it receives a DHCP request from a CPE, the DSL concentrator will return the IP addresses and netmask entered in its DHCP table to the CPE. If there are no entries for the requesting CPE in the DHCP table, the DSL concentrator will forward the unmodified DHCP request upstream.

   ⇒ **relay mode:** The *relay* mode only applies when the *IP NetModel* has been applied to the port or circuit. In this mode, when the DSL concentrator receives a DHCP request, it will insert the *CircuitID* and IP address of the subscriber port in the DHCP message, and forward the message to the DHCP server identified in the *ServerIPAddr* field.

   ⇒ **forward mode:** The *forward* mode applies when a netmodel other than IP is applied to the port or circuit. When the DSL concentrator receives a DHCP request, it will insert the *CircuitID* in the DHCP message and forward the DHCP message upstream.
4. Enter an IP address in the *DHCPIpAddress* field for the DSL concentrator to assign to the CPE in response to a DHCP request when the *respond* mode is selected.
5. Enter a NetMask in the *DHCPNetMask* field for the DSL concentrator to assign to the CPE in response to a DHCP request when the *respond* mode is selected.

6. Enter the IP address of a default router in the *DHCPDefaultRouter* field for the DSL concentrator to assign to the CPE in response to a DHCP request when the *respond* mode is selected.
7. Enter the IP address of a DNS Server in the *DHCPDNSServer* field for the DSL concentrator to assign to the CPE in response to a DHCP request when the *respond* mode is selected.
8. Enter an IP address in the *ServerIPAddr* field to identify the DHCP server that the DSL concentrator will forward DHCP messages to when the *relay* mode is selected.
9. Enter a value that uniquely identifies the subscriber port and virtual circuit in the *CircuitID* field. This value will be used in DHCP requests received from directly connected CPE that are forwarded or relayed to an upstream DHCP server so that server can identify the source of the DHCP requests and accordingly implement a configuration assignment. The default string for *CircuitID* is `systemname-PII`.
10. Click on *Insert* to add the new row to the *CPE DHCP* window; then click on *Refresh*.
11. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Removing a DHCP Table Entry

To remove an entry from the DHCP table, click on the entry in the *CPE DHCP* window to select it, then click on *Delete*. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

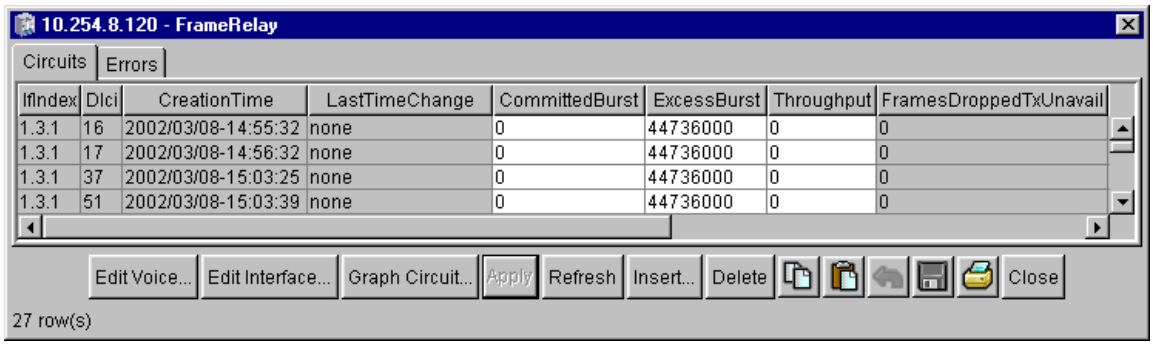
Configuring Frame Relay Parameters

Click on *Protocols* in the EM menu bar and select *Frame Relay*. The *FrameRelay* window suite will display, with link and error data for the DLCIs and corresponding virtual circuits that have been configured on subscriber ports, IMUX bundles and WAN ports on the DSL concentrator.

Frame Relay Circuits

The *Circuits* window can be used to view information about all frame relay virtual circuits configured on subscriber ports, IMUX bundles and WAN ports. This window also allows you to insert and delete circuits and edit performance parameters (*CommittedBurst*, *ExcessBurst*, and *Throughput*) on frame relay WAN ports. When

the *FrameRelay* window suite appears, the *Circuits* window is displayed.



N O T E

When you set the EncapsulationType for any subscriber port to rfc1483, ip-1483, or mac-1483, the EM automatically creates a frame relay virtual circuit with a DLCI of 528 on that port. These circuits can be viewed in the FrameRelay Circuits window. For subscriber ports on ATM modules, this is the only window in which the circuit will appear.

The *Circuits* window includes a row of data for each configured frame relay circuit. Each row contains the following fields:

IfIndex: Displays the circuit's location in PII format.

Dlci: Displays the circuit's Data Link Circuit Identifier (DLCI).

CreationTime: Displays the calendar date and time that the circuit was created.

LastTimeChange: Displays the calendar date and time of the most recent change to the circuit.

CommittedBurst: Displays the Committed Burst (*bcMAX*) rate assigned to the circuit. The Committed Burst is the maximum amount of data, in bits, that the network agrees to transfer under normal conditions during the measurement interval. For circuits on frame relay WAN ports, you can change the value of *bcMAX* by editing the value in this field and clicking on *Apply*.

ExcessBurst: Displays the Excess Burst (*be*) rate assigned to the circuit. Excess Burst is the maximum number of uncommitted data bits that the network will attempt to deliver over the measurement interval. For circuits on frame relay WAN ports, you can change the value of *be* by editing the value in this field and clicking on *Apply*.

Throughput: Displays the Committed Information Rate (CIR) assigned to the circuit. This value is expressed in bits per second. For circuits on frame relay WAN ports, you can change the CIR by editing the value in this field and clicking on *Apply*.

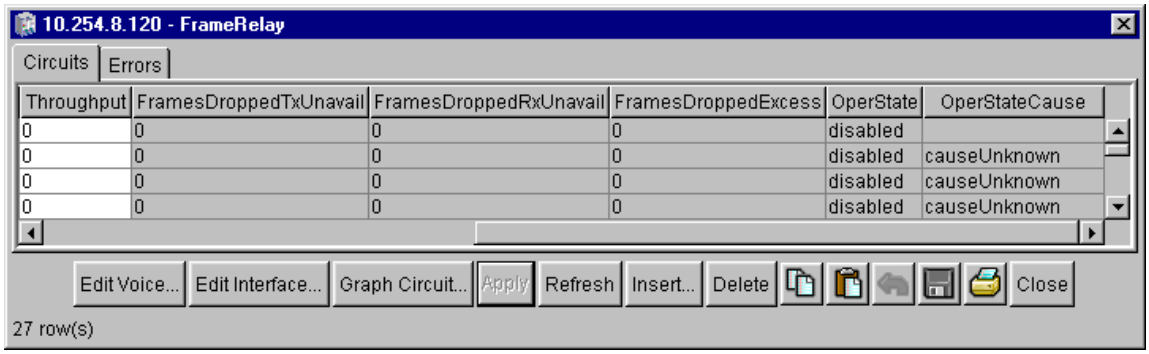
N O T E

CommittedBurst, ExcessBurst and Throughput cannot be configured on subscriber ports or bundles.

FramesDroppedTxUnavail: Displays the number of transmit frames which have been dropped by the circuit because the link was down or the circuit was inactive.

N O T E

Click on the arrow at the bottom of the Circuits window to access the remaining fields.



FramesDroppedRxUnavail: Displays the number of receive frames which have been dropped by the circuit because the link was down or the circuit was inactive.

FramesDroppedExcess: Displays the number of frames which have been dropped by the circuit because the hold queue was full.

OperState: Displays the operational state of the link as *enabled* or *disabled*.

OperStateCause: This field displays one of the circuit conditions listed below. The *OperStateCause* field will be blank until an interface is configured for the frame relay circuit.

noFault: The interface is operationally up. This value cannot coexist with any other *OperStateCause* value.

causeUnknown: *OperState* is down and the cause is unknown. This value cannot coexist with any other *OperStateCause* value.

logicalPortDown: The logical port is administratively and/or operationally down.

crossConnectDown: The interface is operationally down because the cross-connected interface is down. Please refer to the cross-connected interface's *OperStateCause* to determine why the interface is down.

physicalInterfaceDown: The physical interface is not operational.

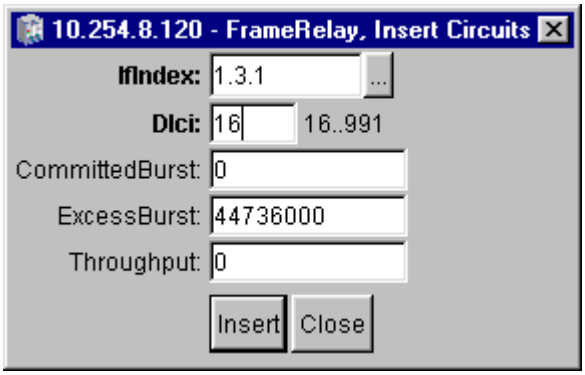
noCrossConnect: Subscriber-to-WAN mapping for this circuit has not been configured.

circuitAdminDown: The circuit is administratively configured to be down.

dslLinkDown: The DSL link is down as determined by CMCP protocol or DML Protocol (for IMUX bundles).

Adding a Virtual Circuit to a Frame Relay WAN Port

To add a virtual circuit to any frame relay WAN port on the DSL concentrator, click on the *Insert* button in the *Circuits* window. The *FrameRelay, Insert Circuits* window will appear.

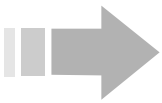


Complete the fields in the *FrameRelay, Insert Circuits* window. The value entered in *IfIndex* must be the PII of a DS3 Frame, Quad T1, or V.35 WAN port. Definitions of the other fields are provided in "Frame Relay Circuits" on page 74. Click on *Insert* to add the circuit and return to the *Circuits* window; then click on *Refresh*.

Be sure to click on *Save to NVRAM* in the EM tool bar to save the DSL concentrator's updated configuration file to nonvolatile memory.

Removing a Virtual Circuit from a Frame Relay WAN Port

To remove a virtual circuit from any frame relay WAN port on the DSL concentrator, click to select the circuit in the *Circuits* window; then click on the *Delete* button. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.



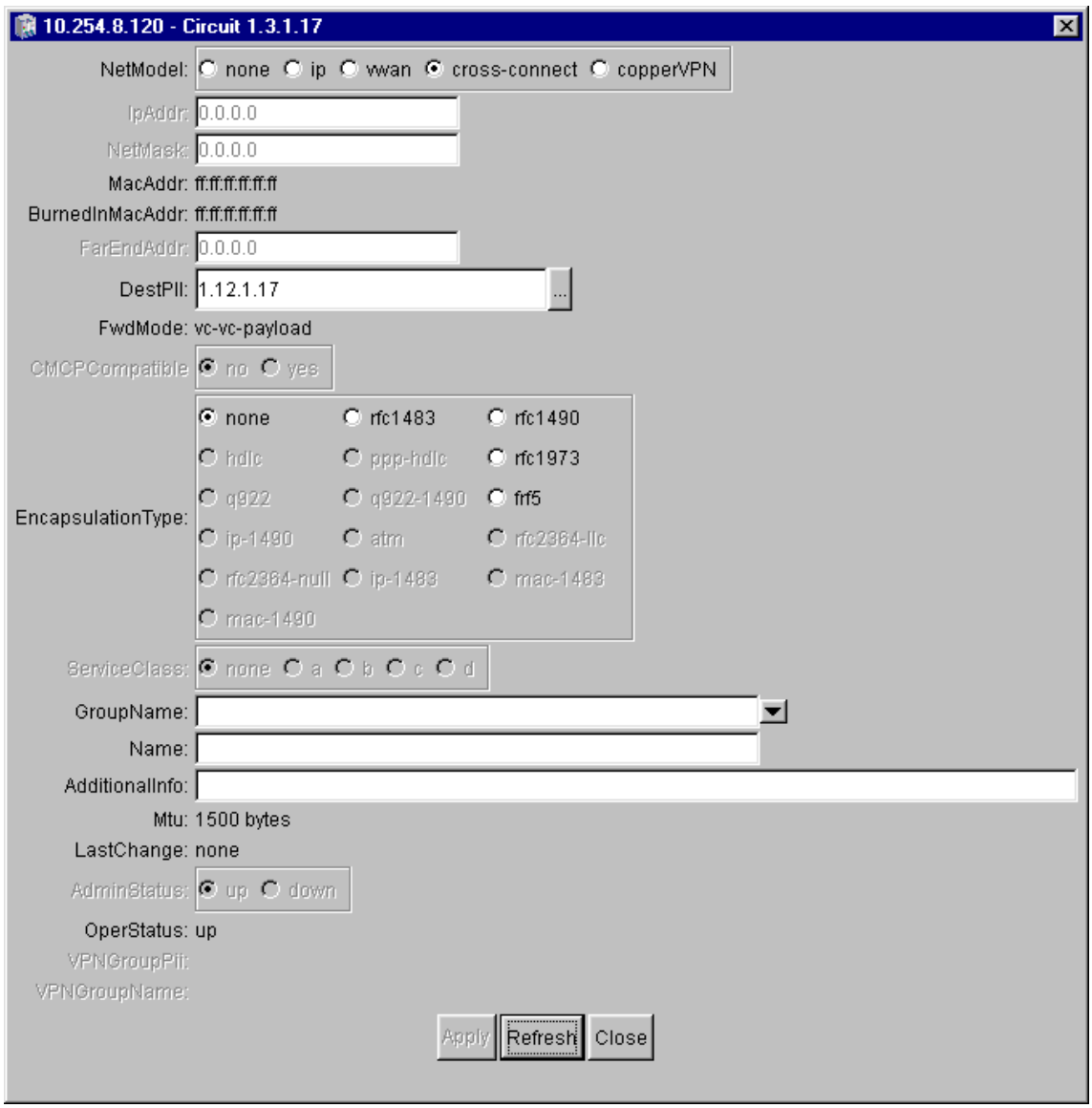
N O T E

Virtual circuits on subscriber ports and IMUX bundles can be viewed but not configured in the FrameRelay Circuits window suite. See "Adding Subscribers" on page 111 for information on configuring circuits on subscriber ports and IMUX bundles.

Changing a Configured Frame Relay Circuit's Interface

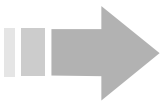
The *Circuit* window allows you to view or configure interface parameters that apply to a virtual circuit on a frame relay WAN port. To access this window, with the *Circuits* window in the *FrameRelay* window suite displayed, click on a WAN port circuit to

select it; then click on the *Edit Interface* button. If an interface has been created for the selected circuit, the *Circuit* window will appear.



The following fields are included:

NetModel: Click to select *ip*, *vwan* (Virtual Wide Area Network), *cross-connect* or *copperVPN* to change the internetworking model for this interface.



N O T E

Once you link a subscriber port with a WAN port virtual circuit by configuring their respective FwdModes (NetModels and EncapsulationTypes), you cannot change those forwarding modes until you disable that connection. To disable a connection, first set the NetModel of each subscriber port that references the WAN port

virtual circuit to none and click on Apply. Then set the WAN port NetModel to none (click in the NetModels field of the Circuit window and select none), then click on Apply. The subscriber ports and the WAN port virtual circuit can then be configured to different forwarding modes.

See "Adding Subscribers" on page 111 for more information about DSL concentrator NetModels.

IpAddr: When applicable (*NetModel* set to *ip*), enter an IP address for the interface.

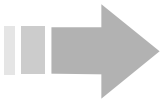
NetMask: When applicable (*NetModel* set to *ip*), the EM will automatically enter a subnet mask of `255.255.255.255` for the interface.

MacAddress: Not used with frame relay WAN ports.

BurnedInMacAddress: Not used with frame relay WAN ports.

FarEndAddr: When applicable (*NetModel* set to *ip*), enter a destination IP address for point-to-point WAN links (i.e., enter an IP address for the far end of the WAN circuit).

DestPII: Displays the PII of the connected subscriber port or IMUX bundle, subscriber port virtual circuit, or WAN port virtual circuit.



N O T E

A value of 0 will be displayed in the DestPII field if multiple ports or circuits are connected with the WAN port virtual circuit, or if the NetModel is set to copperVPN. Click on the rectangular button to the right of the DestPII field to display the Aggregate DestPII(s) window. This window displays a list of all PIIs connected with the virtual circuit, and the current operational status of each interface.

FwdMode: Displays the packet forwarding mode used to route packets received through this interface.

CMCPCompatible: This field has meaning for subscriber links only. It specifies whether the CPE at the end of a subscriber link uses Copper Mountain's Internal Control Protocol (CMCP). The frame relay WAN port automatically indicates *no*.

EncapsulationType: Click to select an encapsulation type (the format of data frames or packets exchanged over the interface).

ServiceClass: Displays the Class of Service of the subscriber port or bundle on which this interface is configured. (see "Configuring Class of Service Values" on page 4).

GroupName: Click on the arrow to the right of the *GroupName* field and select a name from the drop-down menu to identify the group to which the interface belongs (optional). New user group names must be entered using the *User Group Members* feature in the EM *Edit* menu (see "Configuring User Groups" on page 6). For example, you can enter the name of a company using multiple ports to provide DSL services to subscribers.

Name: Enter a name to identify the interface (optional). For example, you can enter the name of the subscriber using this circuit. The *Name* will appear in the title bar of the *Circuit* window.

AdditionalInfo: Enter an arbitrary string of information about the interface (optional). For example, you can enter the telephone number of the subscriber using this circuit.

Mtu: Displays the interface Maximum Transmit Unit (MTU); the largest datagram that the interface will support.

LastChange: Value displayed in this field is always *none*.

AdminStatus: Value displayed in this field is always *up*.

OperStatus: Value displayed in this field is always *up*.

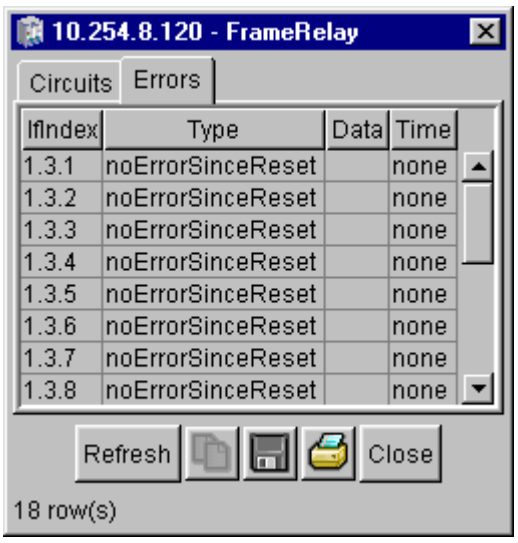
VPNGroupPii: If the WAN circuit is a member of a *CopperVPN* group, the PII of that group is displayed in this field.

VPNGroupName: If the WAN circuit is a member of a *CopperVPN* group to which the operator has assigned a name, that name is displayed in this field.

Click on the *Apply* button at the bottom of the *Circuit* window to apply your changes. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Viewing Frame Relay Errors

Use the *Errors* window in the *FrameRelay* window suite to view information about the most recently detected errors reported on DSL concentrator frame relay WAN ports. With the *FrameRelay* window suite displayed, click on the *Errors* tab.



The *Errors* window displays a row of data for every PII location in the DSL concentrator where a frame relay WAN port could be installed, whether a frame relay WAN port is installed in that location or not. Rows that do not correspond with an installed frame relay WAN port indicate *noErrorSinceReset*. The port in PII location

1.3 in the example is an ATM WAN port. The following fields are included in each row:

IfIndex: Displays the WAN port's Interface Index (PII).

Type: Displays the type of the last error encountered on the displayed interface. Possible error types are:

- *unknownError*
- *receiveShort*
- *receiveLong*
- *illegalDLCI*
- *unknownDLCI*
- *dlcmiProtoErr*
- *dlcmiUnknownIE*
- *dlcmiSequenceErr*
- *dlcmiUnknownRpt*
- *noErrorSinceReset*

Data: May display additional information about an error.

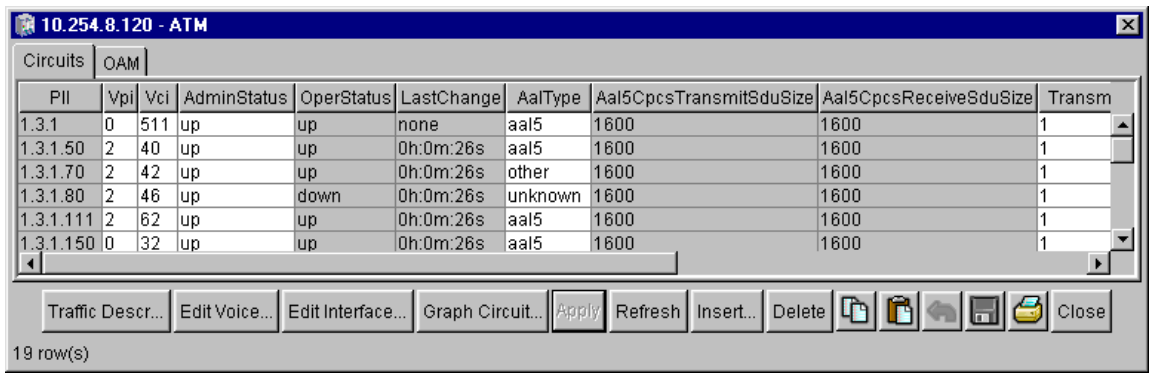
Time: Elapsed time since the error was detected.

Configuring ATM Parameters

Click on *Protocols* in the EM menu bar and select *ATM*. The *ATM* window suite will display with link and OAM data for ATM circuits configured on any ATM WAN port, ATM subscriber port, or IMA group on the DSL concentrator.

ATM Circuits

The *Circuits* window can be used to monitor and configure ATM circuits on the DSL concentrator. It displays information for each ATM circuit configured on DS3 ATM, OC-3c/STM-1, and T1/E1 IMA WAN ports; ADSL, G.lite, and G.shdsl subscriber ports; and IMA groups. When the *ATM* window suite appears, the *Circuits* window is displayed.



N O T E

The circuit identified as Vpi 0, Vci 511 is established automatically on ATM WAN ports to provide a circuit for loopback testing.

The *Circuits* window includes a row of data for each configured ATM circuit. Each row contains the following fields:

PII: Displays the circuit's location in PII format, including the Virtual Channel Link (VCL).

Vpi: The Virtual Path Identifier for the circuit.

Vci: The Virtual Channel Identifier for the circuit.

N O T E

Do not use Vci values 0-31. These values are reserved for path management functions.

AdminStatus: The desired operational status of the circuit. Click in this field and select *up* to enable the circuit or *down* to disable it; then click on *Apply*.

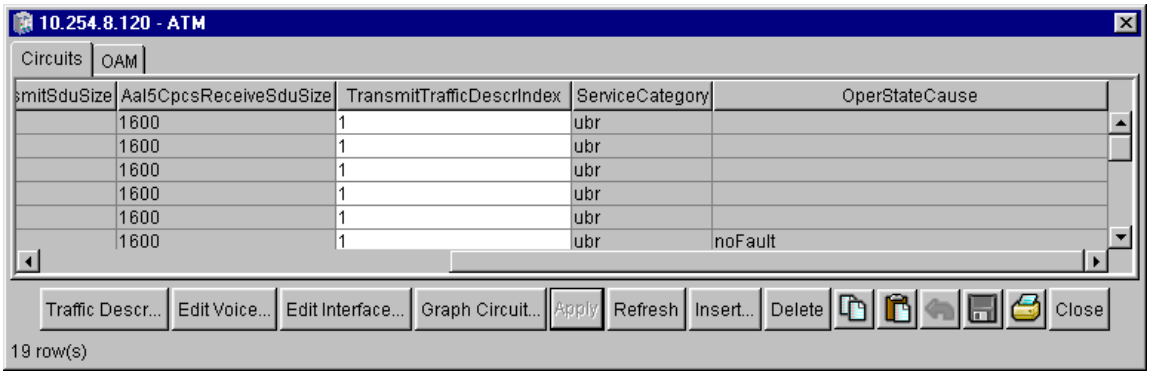
OperStatus: Displays the current operational status of the circuit. Depending on system and network conditions, the actual status of the circuit as displayed in this field may differ from the status selected in the *AdminStatus* field.

LastChange: Displays the length of time the system had been up at the instant of the last change to the circuit's *OperStatus*. If there has been no change since the system came up, the value displayed is *none*.

AalType: Displays *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0. With AAL5 trailer suppression, the eight-bit trailer appended to the end of each AAL5 PDU is omitted to reduce overhead. When AAL0 is selected, data is not transmitted as message- or packet-based data. Instead, it is transmitted in single raw ATM cells. Click in this field to select a value; then click on *Apply* to change the *AalType*. *AalType other* is not supported on subscriber ports.

N O T E

Click on the arrow at the bottom of the Circuits window to access the remaining fields.



Aal15CpcsTransmitSduSize: The maximum AAL5 Common Part Convergence Sublayer-Service Data Unit (CPCS-SDU) size, in octets, supported in the transmit direction of this Virtual Circuit Connection (VCC). This value only exists when the local Virtual Channel Link (VCL) end-point is also the VCC end-point and *aal5* is selected in the *AalType* field.

Aal15CpcsReceiveSduSize: The maximum AAL5 Common Part Convergence Sublayer-Service Data Unit (CPCS-SDU) size in octets supported in the receive direction on this VCC. This value only exists when the local VCL end-point is also the VCC end-point and *aal5* is selected in the *AalType* field.

TransmitTrafficDescrIndex: Every time a service category with unique *PCR*, *SCR* and *MBS* variables is created in the DSL concentrator, it is assigned a unique index. Click in this field to select a service category's *Index* and assign that service category, with its *PCR*, *SCR* and *MBS* values, to a circuit. *TransmitTrafficDescrIndex* 1 always identifies the *ubr* service category.

N O T E

To view the traffic parameters associated with a particular TransmitTrafficDescrIndex, select the Index and click on the Traffic Descr button. The Traffic Descriptor window will display.

ServiceCategory: This read-only field displays the circuit's assigned service category.

OperStateCause: This field displays one of the circuit conditions listed below. The *OperStateCause* field will be blank until an interface is configured for the ATM circuit.

> **noFault:** The interface is operationally up. This value cannot coexist with any other *OperStateCause* value.

causeUnknown: *OperState* is down and the cause is unknown. This value cannot coexist with any other *OperStateCause* value.

logicalPortDown: The logical port is administratively and/or operationally down.

crossConnectDown: The interface is operationally down because the cross-connected interface is down. Please refer to the cross-connected interface's *OperStateCause* to determine why the interface is down.

physicalInterfaceDown: The physical interface is not operational. For ATM WAN interfaces, this results in transmitting RDI cells over the WAN interface.

rxingAIS: AIS cells are being received on the interface, indicating upstream failure.

rxingRDI: RDI cells are being received on the interface, indicating upstream failure.

oamLoopbackFailure: No response has been received to LoopbackRequest cells.

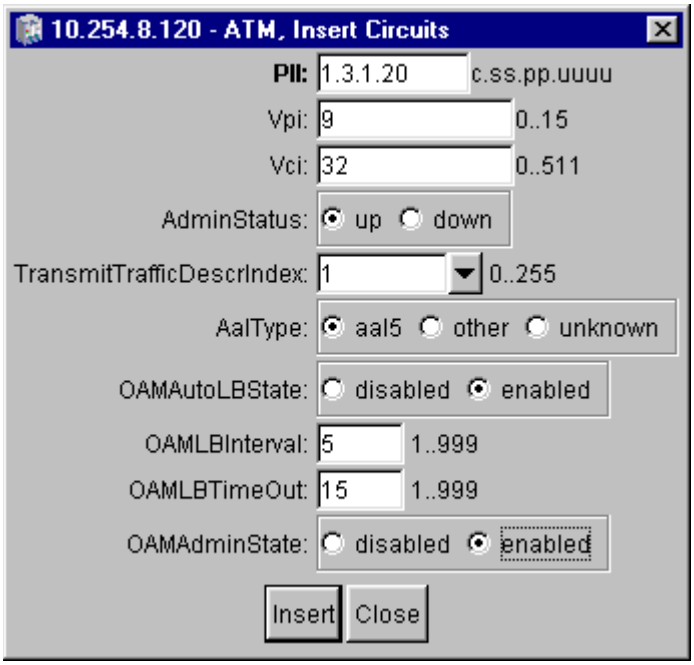
noCrossConnect: Subscriber-to-WAN mapping for this circuit has not been configured.

circuitAdminDown: The circuit is administratively configured to be down.

dslLinkDown: The DSL link is down as determined by CMCP protocol or DML Protocol (for IMUX bundles).

Adding an ATM Virtual Circuit

To add an ATM virtual circuit to an ATM WAN or subscriber port, or an IMA group, click on the *Insert* button in the *Circuits* window in the *ATM* window suite. The *ATM, Insert Circuits* window will appear.



IMPORTANT

On a T1/E1 IMA module that is being used in T1/E1 mode (i.e., that has no IMA group configured on it), circuits may only be added to Port 1. You will receive an error message if you try to add circuits to ports 2 through 8.Enter the location of the port in PII format, followed by the virtual channel link, in the PII field.

To add an ATM virtual circuit:

1. Enter a Virtual Path Identifier in the *Vpi* field.
2. Enter a Virtual Connection Identifier in the *Vci* field.

NOTES

- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for loopback testing.*

3. Click on *up* in the *AdminStatus* field to enable the circuit.
4. Click on the arrow to the right of the *TransmitTrafficDescrIndex* field and select an Index to determine the circuit's ATM traffic parameters.
5. Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0. With AAL5 trailer suppression, the eight-bit trailer normally appended to the end of each AAL5 PDU is omitted, resulting in a savings of one ATM cell for each AAL5 PDU. This provides better throughput on the WAN connection. When

AAL0 is selected, data is not transmitted as message- or packet-based data. Instead, it is transmitted in single raw ATM cells. *AalType other* is not supported on subscriber ports.

6. Click in the *OAMAutoLBState* field to enable or disable periodic generation of loopback request cells to continuously monitor the condition of the circuit. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* will change to *loopbackFailure*.
7. Enter a value in the *OAMLBInterval* field to determine how often the DSL concentrator will generate loopback request cells. Range: 1 to 999 seconds; Default: 5.
8. Enter a value in the *OAMLBTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.
9. Click in the *OAMAdminState* field to enable or disable OAM for the new circuit. When OAM is *disabled*, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.
10. Click on *Insert* to add the circuit to the ATM WAN or subscriber port, or IMA group, and return to the *Circuits* window; then click on *Refresh*.
11. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

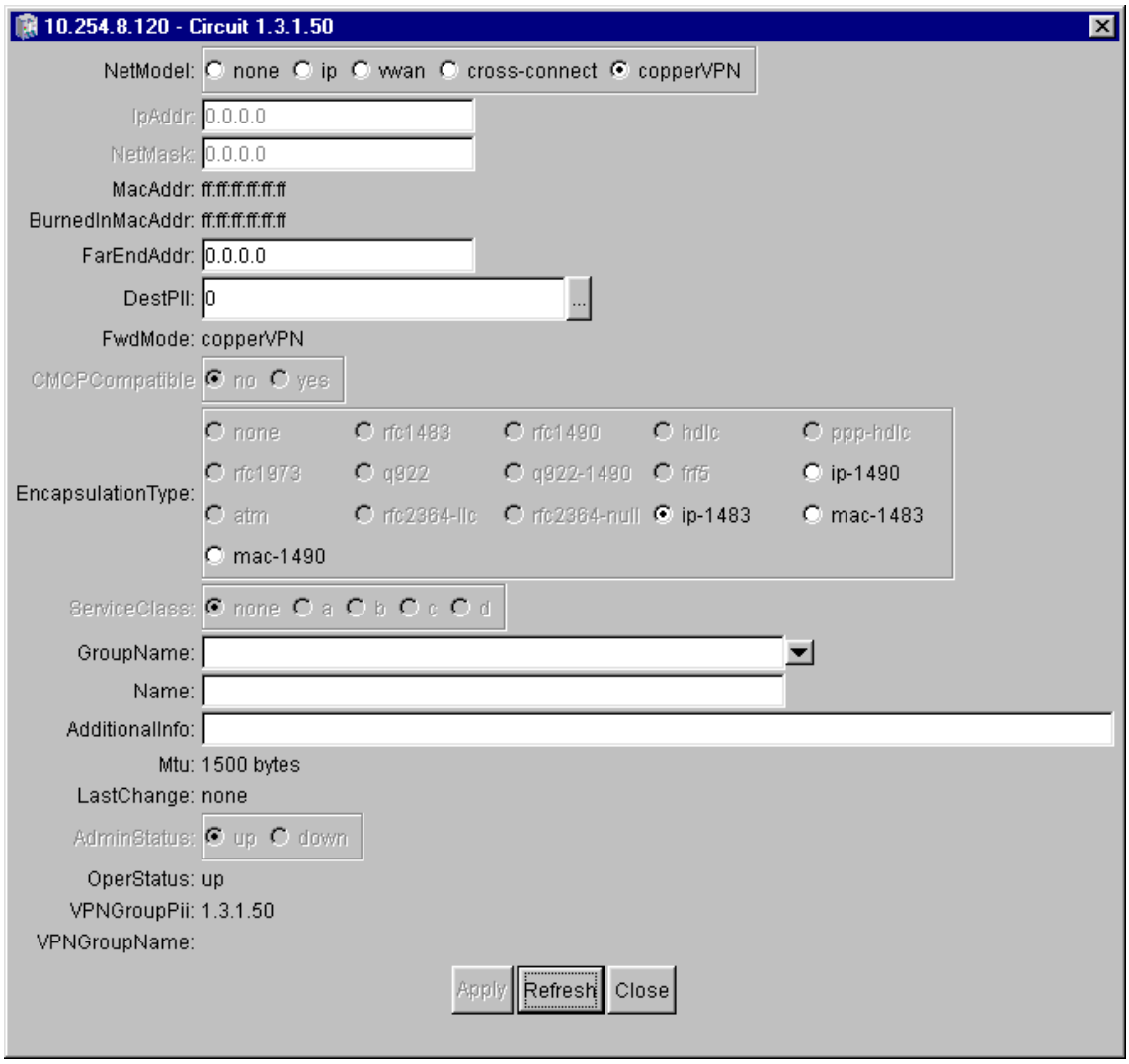
Removing an ATM Virtual Circuit

To remove an ATM virtual circuit from an ATM WAN or subscriber port, or an IMA group, click on the circuit in the *Circuits* window; then click on *Delete*. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Changing a Configured ATM Circuit's Interface

The *Circuit* window allows you to view or edit interface parameters that apply to an ATM virtual circuit configured on an ATM WAN port or IMA group. To access this window, with the *Circuits* window in the *ATM* window suite displayed, click on a circuit to select it; then click on the *Edit Interface* button. If an interface has been

created for the selected ATM circuit, the *Circuit* window will appear.



The following fields are included in the *Circuit* window:

NetModel: Click to change the internetworking model for this interface to *none*, *ip*, *vwan*, *cross-connect* or *copperVPN*.

N O T E

Once you link a subscriber port with a WAN port virtual circuit by configuring their respective FwdModes (NetModels and EncapsulationTypes), you cannot change those forwarding modes until you disable that connection. To disable a connection, first set the NetModel of each subscriber port that references the WAN port virtual circuit to none and click on Apply. Then set the WAN port NetModel to none (click in the NetModels field of the Circuit window and select none), then click on Apply. The subscriber ports and the WAN port virtual circuit can then be configured to different forwarding modes.

See "Adding Subscribers" on page 111 *for more information about DSL concentrator NetModels.*

IpAddr: When applicable (*NetModel* set to *ip*), enter an IP address for the interface.

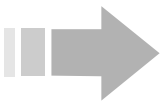
NetMask: When applicable (*NetModel* set to *ip*), enter a subnet mask for the interface.

MacAddress: Not applicable to ATM WAN ports or IMA groups.

BurnedInMacAddress: Not applicable to ATM WAN ports or IMA groups.

FarEndAddr: When applicable (*NetModel* set to *ip*), enter a destination IP address for point-to-point WAN links (i.e., enter an IP address for the far end of the WAN circuit).

DestPII: Displays the PII of the subscriber port or bundle, subscriber port virtual circuit, WAN port virtual circuit, or IMA group that is the destination for packets received on this interface.



N O T E

A value of 0 will be displayed in the DestPII field if multiple ports or circuits are connected with the WAN port virtual circuit, or if the NetModel is set to copperVPN. Click on the rectangular button to the right of the DestPII field to display the Aggregate DestPII(s) window. This window displays a list of all PIIs connected with the virtual circuit, and the current operational status of each interface.

FwdMode: Displays the packet forwarding mode used to route packets received on this interface.

CMCPCompatible: This field has meaning only for subscriber links. It specifies whether the CPE at the end of a subscriber link uses Copper Mountain's Internal Control Protocol (CMCP).

EncapsulationType: Click to select an encapsulation type (the format of data frames or packets exchanged over the interface).

ServiceClass: Not configured on ATM WAN ports or IMA groups. See "Configuring Class of Service Values" on page 4 for more information about Service Classes.

GroupName: Click on the arrow to the right of the *GroupName* field and select a name from the drop-down menu to identify the group to which the interface belongs (optional). New user group names must be entered using the *User Group Members* feature in the EM *Edit* menu (see "Configuring User Groups" on page 6). For example, you can enter the name of a company using multiple ports to provide DSL services to subscribers.

Name: Enter a name to identify the interface (optional). For example, you can enter the name of the subscriber using this interface. The *Name* will appear in the title bar of the *Circuit* window.

AdditionalInfo: Enter an arbitrary string of information about the interface (optional). For example, you can enter the telephone number of the subscriber using this interface.

Mtu: Maximum Transmission Unit (MTU); the largest datagram the circuit will support.

LastChange: Value displayed in this field is always *none*.

AdminStatus: Value displayed in this field is always *up*.

OperStatus: Value displayed in this field is always *up*.

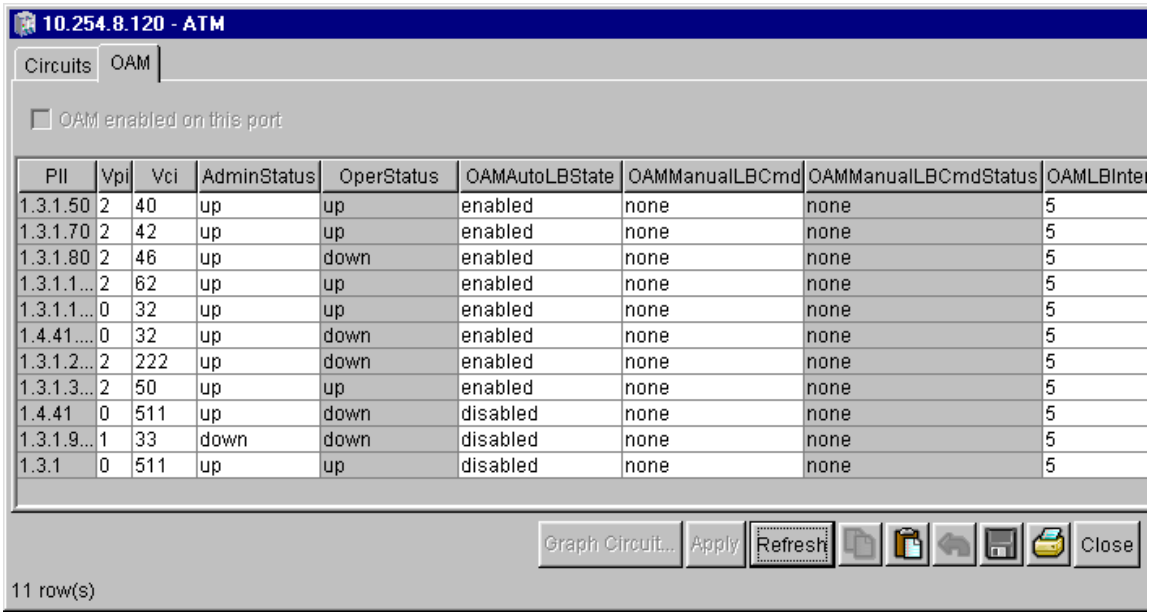
VPNGroupPii: If the WAN circuit is a member of a *CopperVPN* group, the PII of that group is displayed in this field.

VPNGroupName: If the WAN circuit is a member of a *CopperVPN* group to which the operator has assigned a name, that name is displayed in this field.

Click on the *Apply* button at the bottom of the *Circuit* window to apply your changes. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Configuring OAM Parameters

Use the *OAM* window to configure and monitor Operations, Administration and Management (OAM) fault management parameters on an ATM WAN or subscriber port, or an IMA group, and on circuits configured on these ports and groups. With the *ATM* window suite displayed, click on the *OAM* tab.



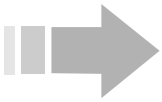
The *OAM* window includes a field labeled *OAM enabled on this port*, and a row of data for each circuit configured on the port.

OAM enabled on this port: This field is not supported when you access the *OAM* window via the *Protocols* menu.

PII: Displays the circuit's location in PII format, including the Virtual Channel Link (VCL).

Vpi: The Virtual Path Identifier for this circuit. Designates the virtual path over which ATM cells will be routed.

Vci: The Virtual Channel Identifier for this circuit. Designates the virtual channel over which ATM cells will travel.



N O T E S

- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for loopback testing.*

AdminStatus: The desired operational status of the circuit or port. Click in this field and select *up* to enable the circuit or port, or *down* to disable it; then click on *Apply*.

OperStatus: Displays the current operational status of the circuit or port. Depending on system and network conditions, the actual status as displayed in this field may differ from the status selected in the *AdminStatus* field.

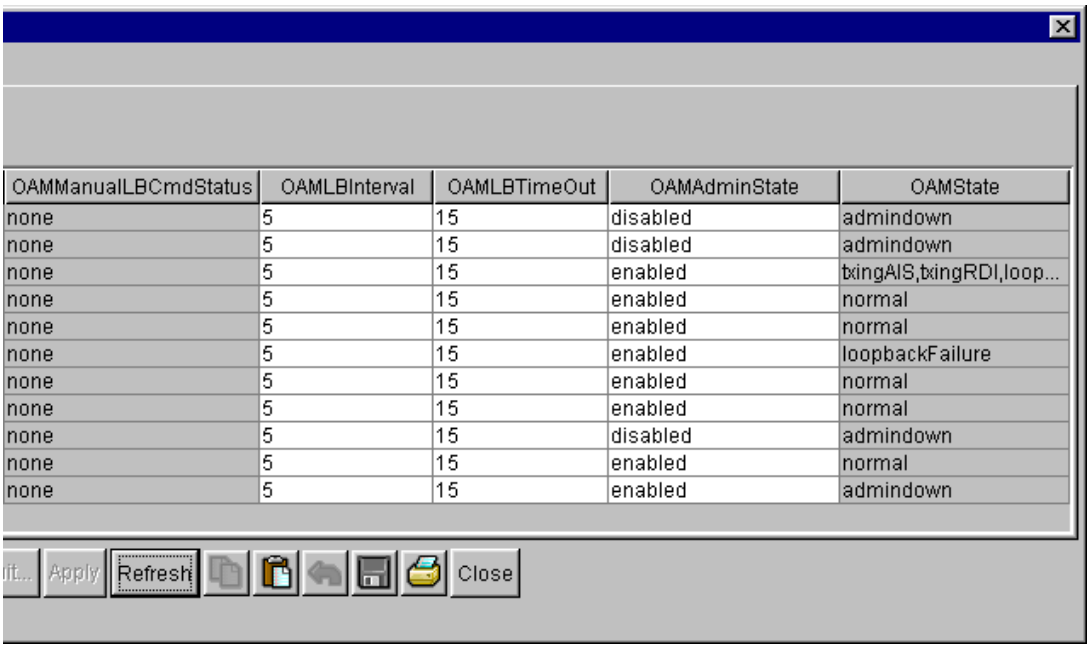
OAMAutoLBState: Configure automatic OAM loopback to *disabled* (default) or *enabled*. Select *enabled* to continuously monitor the stability of a circuit connection. When *enabled* is selected, the DSL concentrator will transmit *F5End2End* loopback request cells at intervals specified by the value in the *OAMLBInterval* field. If no response is received within *OAMLBTimeOut*, the value in the *OAMState* field will change to *loopbackFailure*. *OAMAutoLBState* will have no impact if *AdminStatus* for the port or circuit is *down*, if *OAMAdminState* is *disabled* for the circuit, or if OAM is disabled for the port or IMA group.

OAMManualLBCmd: Configure the OAM loopback command to *none* (default), *f5End2End*, or *f5Segment*. When *f5End2End* or *f5Segment* is selected, a loopback request will be transmitted and when a response is received, no more loopback requests will be generated. If no response is received, another loopback request will be generated after the interval specified in the *OAMLBInterval* field, up to the duration specified in the *OAMLBTimeOut* field. Loopback status is displayed in the *OAMManualLBCmdStatus* field. Manual loopback failure has no impact on a circuit's *OAMState* or its *OperStatus*, nor will it result in the generation of traps.

OAMManualLBCmd:

- Has no impact if the port or circuit *AdminStatus* is *down*, if *OAMAdminState* for the circuit is *disabled* or if OAM is disabled for the port.
- Is applicable only to primary SCMs.
- Will always be *none* after system reboot.

OAMManualLBCmdStatus: This field displays the status of the most recent OAM manual loopback command as *none*, *inProgress*, *succeeded*, or *failed*.



OAMLBInterval: Enter a value to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Then click on *Apply*. Range: 1 to 999 seconds; Default: 5.

OAMLBTimeout: Enter a value to determine the timeout for transmitted loopback cells. Then click on *Apply*. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

OAMAdminState: Click in this field to *enable* and *disable* OAM for a circuit. When OAM is *disabled*, OAM cells are not generated by the DSL concentrator, and any received OAM cells will be discarded. Default: *disabled*.

To enable OAM for a circuit:

1. *AdminStatus* must be *up* for both the ATM port and the circuit.
2. OAM must be enabled for the port and for the circuit in the *OAMAdminState* field.
3. For the secondary, redundancy must be enabled. Also, when OAM for the port is *disabled*, *OAMAutoLBState* has no impact.

OAMState: This field displays the status of the link as reported by OAM cells. A circuit can be in multiple states at one time. The default is *adminDown*.

admindown: OAM is administratively down. If the current state is *admindown*, the circuit cannot be in any of the other states.

normal: The circuit and any cross-connected subscriber port(s) and circuits are functioning properly.

txingAIS: The circuit is in an OAM fault state and transmitting AIS cells at a rate of one cell per second. This state is entered when the cross-connected subscriber interface is operationally down. This state will be cleared when the fault conditions no longer exist for at least 2.5 seconds.

txingRDI: The circuit is transmitting RDI cells at a rate of one cell per second. This state is entered when the circuit receives AIS cells or when the WAN port is operationally down. This state will be cleared when the circuit stops receiving AIS cells or when the WAN port is operationally up for at least 2.5 seconds.

loopbackFailure: Loopback is enabled and there is no response to Loopback Requests. When Loopback is enabled, Loopback Requests are periodically transmitted and as long as there is no fault condition as determined by the Loopback, the *loopbackFailure* state will not be entered.

rxingAIS: The circuit is receiving AIS cells. This state is cleared when the circuit stops receiving AIS cells for at least 2.5 seconds.

rxingRDI: The circuit is receiving RDI cells. This state is cleared when the circuit stops receiving RDI cells for at least 2.5 seconds.

Configuring CopperVPN Groups

CopperVPN groups function as transparent virtual routers; they perform the same basic functions as an IP router, but are invisible to the external network.

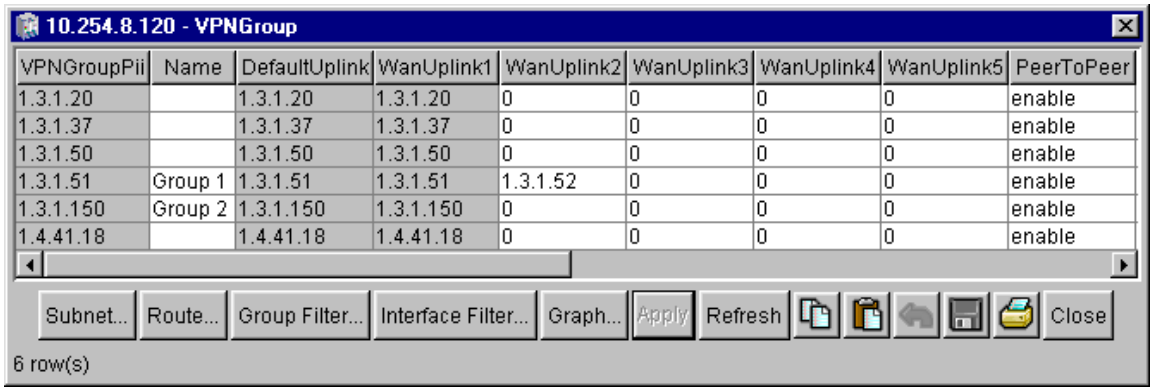
The *VPNGroup* window allows you to view and configure attributes for all *CopperVPN* groups on the DSL concentrator. This window also allows you to create and delete *CopperVPN* groups, and provides access to:

- Information stored in the DSL concentrator's VPN Group subnet and route tables
- *CopperVPN* group filters
- Statistics.

Click on *Protocols* in the EM menu bar and select *VPN Group*.

N O T E

A VPN group is created when a WAN circuit or Ethernet port is configured with the CopperVPN NetModel.



The *VPNGroup* window includes a row for every *CopperVPN* group. Each row includes the following fields:

VPNGroupPii: Automatically created when a *CopperVPN* group is configured. Same as the PII of the first WAN circuit or Ethernet port configured in the *CopperVPN* group.

Name: This field displays an optional name assigned by the network operator to a *CopperVPN* group.

DefaultUplink: Identifies the default upstream WAN interface used by the *CopperVPN* group.

WanUplink1: Displays the PII of the WAN interface assigned to the *CopperVPN* group when it was initially created. Same as the *VPNGroupPii*.

WanUplink2: Displays the PII of the secondary upstream WAN interface *WanUplink2*, which has been added to an established *CopperVPN* group. After initial configuration of a *CopperVPN* group, with one upstream WAN interface (*WanUplink1*) and subscriber ports, any additional WAN interfaces that are to be included in the *CopperVPN* group are entered as secondary WAN uplinks 2 through 5 in this window.

WanUplink3: Displays the PII of secondary upstream WAN interface *WanUplink3*.

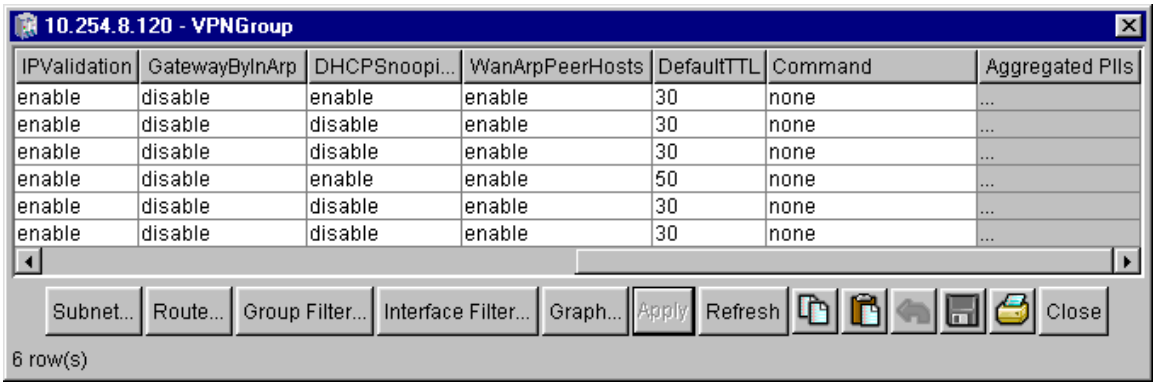
WanUplink4: Displays the PII of secondary upstream WAN interface *WanUplink4*.

WanUplink5: Displays the PII of secondary upstream WAN interface *WanUplink5*.

PeerToPeer: Determines whether peer-to-peer (subscriber interface to subscriber interface) communication is allowed within the *CopperVPN* group. To change this value, click in this field and select *enable* or *disable*, then click on *Apply*.

N O T E

Click on the arrow at the bottom of the VPNGroup window to access the remaining fields.



IPValidation: Determines whether the DSL concentrator will perform IP address validation on ingress traffic and restricted MAC address resolution on egress traffic in all subscriber interfaces in a *CopperVPN* group. To change this value, click in this field and select *enable* or *disable*; then click on *Apply*.

GatewayByInArp: Determines whether the DSL concentrator will learn the IP address of the *CopperVPN* group's upstream gateway by means of Inverse ARP. To change this value, click in this field and select *enable* or *disable*; then click on *Apply*.

N O T E

One gateway IP address should be used as an IP gateway for CPE hosts connected by means of a subscriber port. If no gateway is provided and GatewayByInARP is enabled, Inverse ARP will be used to learn the upstream router's IP address, which will be used as the gateway IP address. This is equivalent to the CopperVPNAuto forwarding mode of previous releases. If IPValidation is enabled, the IP address of every CPE host has to be within the range of one of the subnets constrained by the GatewayIpAddress and NetMask.

DHCPSnooping: Specifies whether to monitor communication between hosts and a DHCP server (DHCP snooping) to learn the assignment of host IP address and gateway/subnet information. Click in this field to select *enable* or *disable*; then click on *Apply*.

WanArpPeerHosts: Determines whether the *CopperVPN* group will ARP for the peer hosts over MAC encapsulated WAN interfaces. Peer hosts can also be on other DSL concentrators that are configured in the same bridge group. If *disabled*, the *CopperVPN* group forwards all packets to the *CopperVPN* group's default gateway.

DefaultTTL: Displays the default time to live (TTL) value in minutes for MAC addresses that have been obtained by means of ARP.

After TTL expiration, a new ARP request will be issued to resolve the MAC address.

Command: Click in this field and select a command to execute on a *CopperVPN* group. Then click on *Apply*.

none: Default.

flushArpCache: Clear the *MacAddr* field in the *CopperVPN Route* table for all entries that are not *dynamicDHCP Type*.

deleteDynamicARP: Clear entries in the *CopperVPN Route* table that were learned by the Inverse ARP process.

deleteDynamicDHCP: Clear entries in the *CopperVPN Route* table that were learned by monitoring communication between hosts and a DHCP server (i.e., by DHCP snooping).

deleteStatic: Clear all entries in the *CopperVPN Route* table that were manually entered by the operator.

deleteAll: Clear all entries in the *CopperVPN Route* table.

Aggregated PIIs: Click in this field to display the PIIs of all subscriber ports that are members of the *CopperVPN* group, and their current operational status (up or down).

Creating a CopperVPN Group

When a WAN circuit or Ethernet port is configured with the *CopperVPN NetModel*, a *CopperVPN* group is automatically created. This *CopperVPN* group uses the WAN circuit or Ethernet port as its *WanUplink1*. The PII of the WAN circuit or Ethernet port is also used as the *VPNGroupPII* that identifies this *CopperVPN* group.

For information on adding subscriber interfaces to a *CopperVPN* group, and other aspects of configuring interfaces with the *CopperVPN NetModel*, see "CopperVPN NetModel" on page 115.

Deleting a CopperVPN Group

To delete a *CopperVPN* group, first remove all of its WAN uplinks and members, then set the *NetModel* of the WAN circuit or Ethernet port serving as *WanUplink1* to *none*:

To delete a *CopperVPN* group, first remove all of its WAN uplinks and members, then set the *NetModel* of the WAN circuit or Ethernet port serving as *WanUplink1* to *none*:

1. In the *VPNGroup* window, remove any PIIs in the *WanUplink2* through *WanUplink5* fields for the selected *CopperVPN* group by double clicking in the field and deleting the PII. Then click on *Apply*.
2. Double click in the *Aggregated PIIs* field for the *CopperVPN* group to display a list of all subscriber interfaces that have been added to the group.
3. Remove each of the subscriber interfaces displayed in the *Aggregated PIIs* field from the *CopperVPN* group:

   ⇒ Double click on the subscriber port or Ethernet port to display its *Interface* window.

⇒ Set *NetModel* to *none*; then click on *Apply*.

4. After all of the subscriber interfaces have been removed, delete the *CopperVPN* group:

   ⇒ If the *VPNGroupPII* is a WAN port circuit, double click on that WAN port and select the *All Interfaces* tab. Click in the *NetModel* field for the circuit and select *none*; then click on *Apply*.

   ⇒ If the *VPNGroupPII* is an Ethernet port, double click on that port to display its *Interface* window and select *none* in the *NetModel* field; then click on *Apply*.

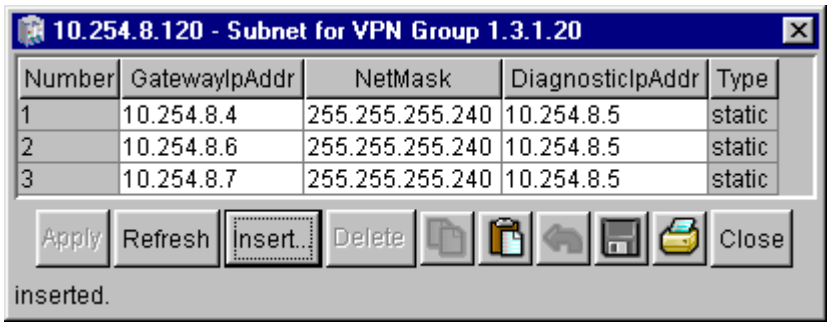
N O T E

The EM will respond with an error message if you try to delete a CopperVPN group that has any members or WAN uplinks.

5. Return to the *VPNGroup* window by clicking on *VPN Group* in the *Protocols* menu; then click on *Refresh* to display a current list of all *CopperVPN* groups on the DSL concentrator and confirm that you have successfully removed the target *CopperVPN* group.

Subnet for VPN Group Window

Use this window to configure and display data in a *CopperVPN* group's subnet table. With the *VPNGroup* window displayed, click to select a *CopperVPN* group; then click on *Subnet*.



The *Subnet for VPN Group* window displays a row for every subnet in the selected *CopperVPN* group. Each row includes:

Number: Displays an index that identifies the subnet entry in the *CopperVPN* group.

GatewayIpAddr: Displays the IP address of the upstream gateway serving the *CopperVPN* group. To change the *GatewayIpAddr*, edit this field and click on *Apply*.

N O T E

The GatewayIpAddr and NetMask fields cannot be changed if the CopperVPN Group Type is dynamicARP or dynamicDHCP.

NetMask: Displays the netmask associated with the upstream gateway for the *CopperVPN* group. To change the *NetMask*, edit this field and click on *Apply*.

DiagnosticIpAddr: Displays the IP address used in this subnet to support 'Ping' and 'TraceRoute' diagnostic functions for the *CopperVPN* group. To change the *DiagnosticIpAddr*, edit this field and click on *Apply*.

Type: Indicates how the gateway IP address was obtained:

static: The gateway IP address was manually input by the operator.

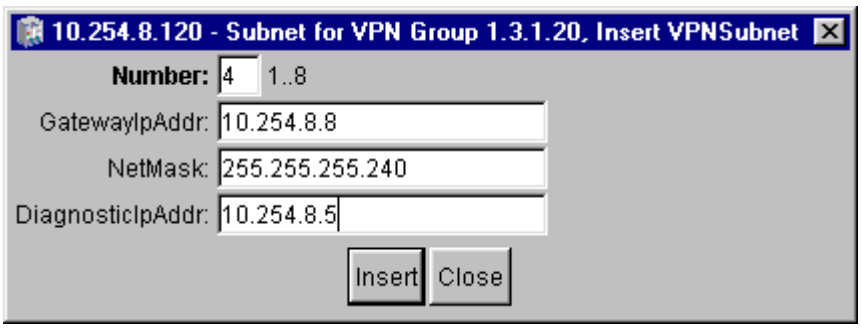
dynamicARP: The gateway IP address was learned by Inverse ARP. *GatewayByInARP* must be *enabled* in the *VPNGroup* window for *dynamicARP* to function.

dynamicDHCP: The gateway IP address was learned by reading DHCP communication between hosts and a DHCP server (i.e., by DHCP snooping). *DHCPSnooping* must be *enabled* in the *VPNGroup* window for *dynamicDHCP* to function.

When the DSL concentrator's configuration file is saved, only *Static Type* entries are saved.

Insert a Subnet

To manually add a subnet to a *CopperVPN* group, click on *Insert* in the *Subnet for VPN Group* window. The *Subnet for VPN Group, Insert VPNSubnet* window will display.



Up to eight subnets are supported in each *CopperVPN* group. Enter the following data to configure a *CopperVPN* subnet:

Number: Enter an index number in this field to identify the subnet in the *CopperVPN* group. Range: 1 to 8.

GatewayIpAddr: Enter the IP address of the upstream gateway serving the *CopperVPN* group.

NetMask: Enter the netmask associated with the IP gateway for the *CopperVPN* group.

DiagnosticIpAddr: Enter the IP address used in this subnet to support the 'Ping' and 'TraceRoute' diagnostic functions.

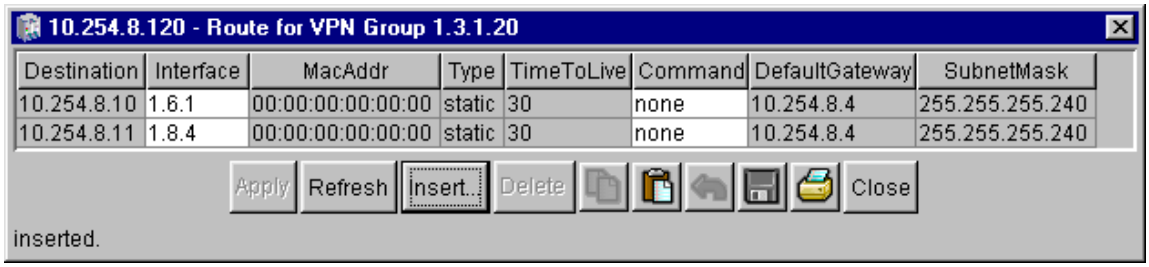
N O T E

The DiagnosticIpAddr is intended for use in trouble isolation only. Take care not to assign this address to any operational interface. This interface receives and replies to ICMP messages only. You cannot Telnet or FTP to it.

When all fields have been configured, click on *Insert* to add the subnet to the *CopperVPN* group and return to the *Subnet for VPN Group* window; then click on *Refresh*. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Route for VPN Group Window

Use this window to view and configure a *Route* table for a *CopperVPN* group. With the *VPNGroup* window displayed, click to select a *CopperVPN* group; then click on *Route*.



The *Route for VPN Group* window displays a row for each downstream route in the *CopperVPN* group. Each row contains the following fields:

Destination: Displays the downstream host's destination IP address from the address translation/forwarding table for the *CopperVPN* group.

N O T E

WAN port interfaces and MAC addresses may be stored in this table, but they are not used for routing. Upstream forwarding is determined by the DefaultUplink in the VPNGroup window and group filters.

Interface: Displays the PII of the interface associated with the IP address displayed in the *Destination* field.

MacAddr: Displays the MAC address associated with the destination IP address. This field is only applicable when the Ethernet encapsulation type is applied.

Type: Indicates how the gateway IP address was obtained:

static: The gateway IP address was manually entered.

dynamicARP: The gateway IP address was learned by the Inverse ARP process.

dynamicDHCP: The gateway IP address was learned by reading DHCP communication between hosts and a DHCP server (DHCP snooping).

TimeToLive: Indicates how much longer, in minutes, the entry will remain in the *CopperVPN* route table. Default: 30. If the entry *Type* is *Static*, this field is not applicable.

Command: Displays the most recent command executed on the route entry:

none: Default.

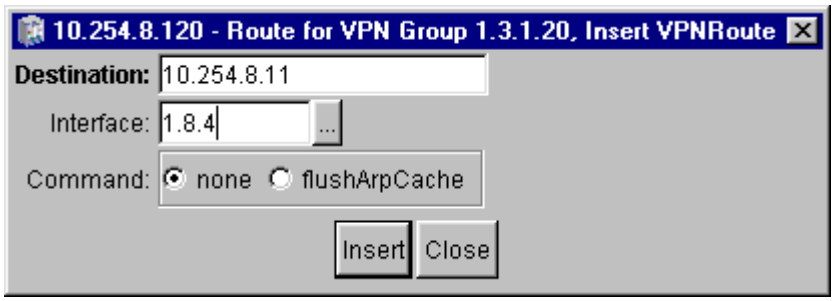
flushArpCache: Clears the *MacAddr* field in route table for all entries that are not *dynamicDHCP Type*.

DefaultGateway: Displays the IP address of the upstream default gateway (from the *CopperVPN* subnet table).

SubnetMask: Displays the subnet mask associated with the *Default Gateway*.

Insert VPN Route

To add a static route entry to a *CopperVPN* group, click on *Insert* in the *Route for VPN Group* window. The *Route for VPN Group, Insert VPNRoute* window will display.



Enter the following to configure the *CopperVPN* route.

Destination: Enter the downstream *Destination* IP address.

Interface: Enter in PII format the subscriber interface that is associated with the IP address in the *Destination* field.

Command: If required, click in the *Command* field to select the *flushArpCache* command and clear the *MacAddr* field.
Default: *none*.

When all fields have been configured, click on *Insert* to add the route and return to the *Route for VPN Group* window; then click on *Refresh*. Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

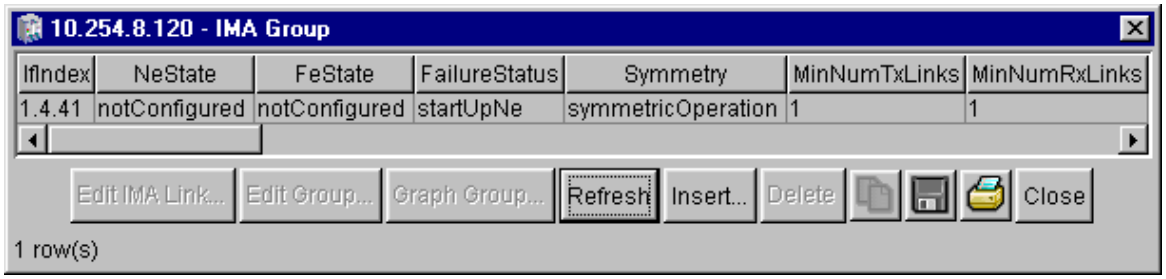
Configuring IMA Groups

Inverse Multiplexing over ATM (IMA) allows you to combine the transport bandwidths of multiple T1/E1 ports on a T1/E1 IMA module to form a higher-bandwidth logical link called an IMA group. The cell rate of an IMA group is approximately equal to the sum of the rates of the member links.

N O T E

Only one active IMA group per Shelf is supported in this release.

To view or configure an IMA group on a T1/E1 IMA module, click on *Protocols* in the EM menu bar and select *IMA Group*. The *IMA Group* window will appear.



I M P O R T A N T

If an IMA group is created on a T1/E1 IMA module, that module can only be used in IMA mode. Circuits can be added to that IMA group, but circuits cannot be added to individual T1/E1 ports that do not belong to the IMA group. Likewise, if a circuit has already been created on one of the T1/E1 ports on a module, that module can only be used in regular T1/E1 mode. No IMA group can be created on the module if there is already a circuit configured on a port.

The *IMA Group* window includes a row of information for a configured IMA group.

IfIndex: This field identifies the logical interface number (ifIndex) assigned to this IMA group. The index consists of the module PII, where port number is the IMA group number, which is fixed at 41.

NeState: This field displays the current operational state of the near-end IMA Group State Machine.

FeState: This field displays the current operational state of the far-end IMA Group State Machine.

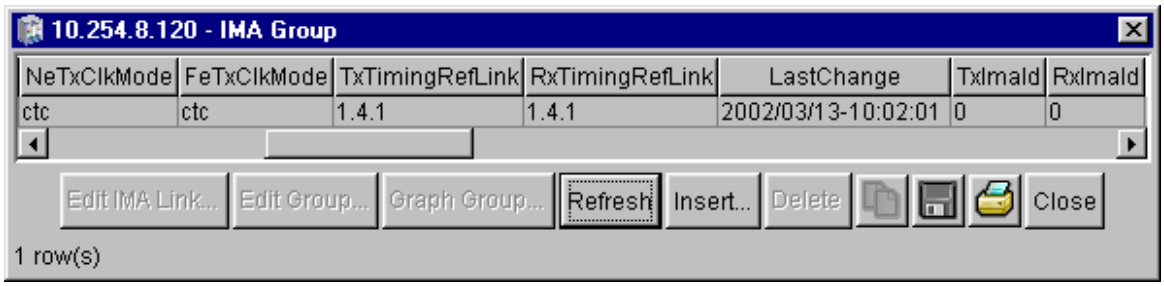
FailureStatus: This field displays the current failure status of the IMA group (the reason why the Group Traffic State Machine is in the down state).

Symmetry: This field identifies the symmetry of the IMA group.

MinNumTxLinks: This field displays the minimum number of transmit links required to be Active for the IMA group to be in the Operational state.

MinNumRxLinks: This field displays the minimum number of receive links required to be Active for the IMA group to be in the Operational state.

NeTxClkMode: This field identifies the transmit clocking mode used by the near-end IMA group.



FeTxClkMode: This field identifies the transmit clocking mode used by the far-end IMA group.

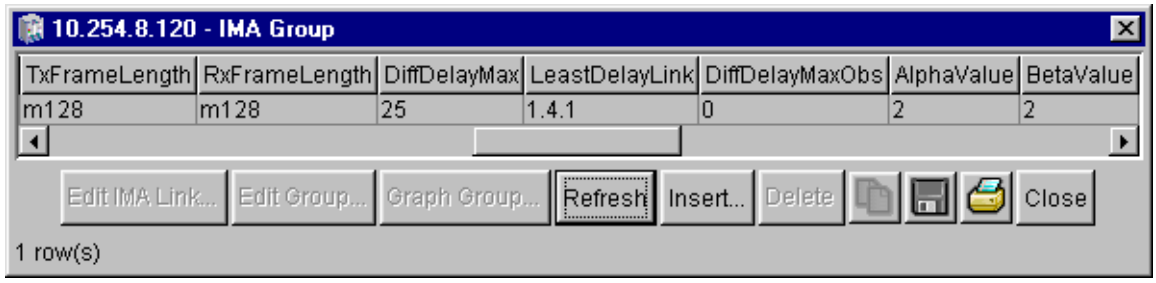
TxTimingRefLink: This field identifies the ifIndex in PII format of the transmit timing reference link to be used by the near-end for IMA data cell clock recovery from the ATM layer. Zero indicates that no link has been configured in the IMA group, or the transmit timing reference link has not yet been selected.

RxTimingRefLink: The ifIndex of the receive timing reference link to be used by near-end for IMA data cell clock recovery toward the ATM layer. Zero indicates that no link has been configured in the IMA group, or the receive timing reference link has not yet been detected.

LastChange: This field displays the calendar date and time the IMA group last changed operational state.

TxImaId: This field displays the IMA ID currently in use by the near-end IMA function.

RxImaId: This field displays the IMA ID currently in use by the far-end IMA function.



TxFrameLength: This field displays the frame length to be used by the IMA group in the transmit direction. Only 128 is supported.

RxFrameLength: This field displays the value of IMA frame length as received from remote IMA function. Only 128 is supported.

DiffDelayMax: This field displays the maximum number of milli-seconds of differential delay among the links that will be tolerated on this interface.

LeastDelayLink: This field displays the ifIndex of the link config-ured in the IMA group which has the smallest link propagation

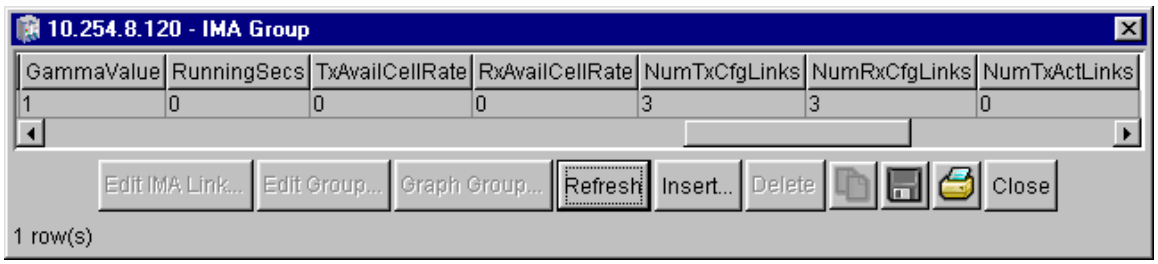
delay. Zero may be used if no link has been configured in the IMA group, or if the link with the smallest link propagation delay has not yet been determined.

DiffDelayMaxObs: This field displays the latest maximum differential delay observed (in milliseconds) between the links having the least and most link propagation delay, among the receive links that are currently configured in the IMA group.

AlphaValue: This field indicates the alpha value used to specify the number of consecutive invalid ICP (IMA Control Protocol) cells that will be detected before moving to the IMA Hunt state from the IMA Sync state. Only a value of 2 is supported.

BetaValue: This field indicates the beta value used to specify the number of consecutive errored ICP cells that will be detected before moving to the IMA Hunt state from the IMA Sync state. Only a value of 2 is supported.

GammaValue: This field indicates the gamma value used to specify the number of consecutive valid ICP cells that will be detected before moving to the IMA Sync state from the IMA PreSync state. Only a value of 1 is supported.



RunningSecs: This field displays the time (in seconds) that this IMA group has been in the Operational state.

TxAvailCellRate: This field displays the current cell rate (truncated value in cells per second) provided by this IMA group in the transmit direction, considering all the transmit links in the Active state.

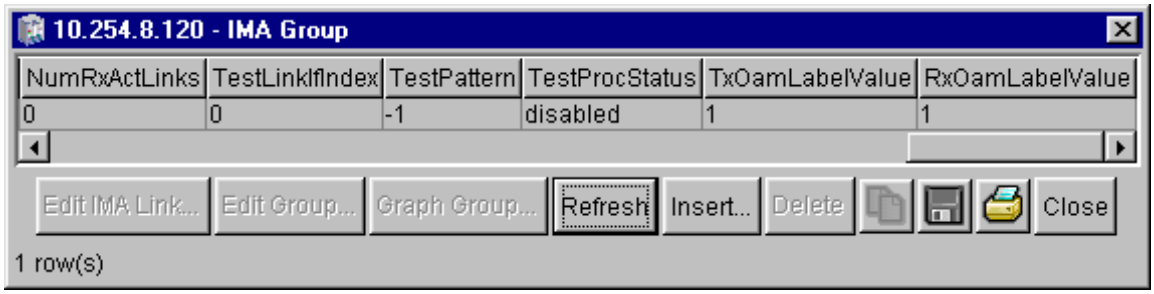
RxAvailCellRate: This field displays the current cell rate (truncated value in cells per second) provided by this IMA group in the receive direction, considering all the receive links in the Active state.

NumTxCfgLinks: This field displays the number of links that are configured to transmit in this IMA group. This value is used by a network operator to tell how many links are configured for transmit in the IMA group.

NumRxCfgLinks: This field displays the number of links that are configured to receive in this IMA group. This value is used by a network operator to tell how many links are configured for receive in the IMA group.

NumTxActLinks: This field displays the number of links which are configured to transmit and are currently Active in this IMA

group. This value is used by a network operator to tell how many links which are configured for transmit are also Active.



NumRxActLinks: This field displays the number of links which are configured to receive and are currently Active in this IMA group. This value is used by a network operator to tell how many links which are configured for receive are also Active.

TestLinkIfIndex: This field displays the PII of the interface designated as the test link for use in the Test Pattern Procedure. Test Patterns are not supported in this release; value displayed in this field is 0.

TestPattern: This field displays a number in the range 0 to 255 that designates the Tx Test Pattern that will be used in an IMA group loopback operation. A value of -1 specifies that the implementation may choose the value. In this case, the implementation may also choose the value in the *TestLinkIfIndex* field. Test Patterns are not supported in this release; value displayed is this field is -1.

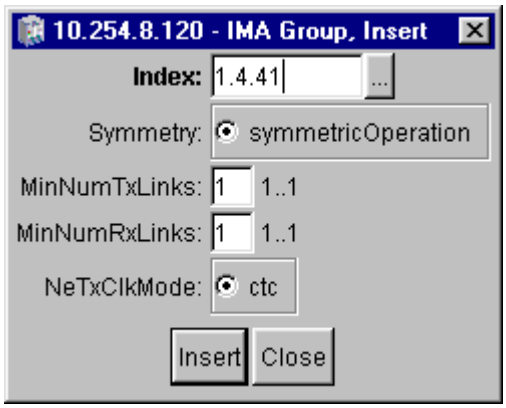
TestProcStatus: This field displays the status of the Test Pattern Procedure as *enabled*, *disabled*, or *linkFail* (indicating that at least one link failed the test). Test Patterns are not supported in this release; value displayed in this field is *disabled*.

TxOamLabelValue: This field displays the IMA OAM Label value transmitted by the near end IMA unit.

RxOamLabelValue: This field displays the IMA OAM Label value transmitted by the far end IMA unit. The value 0 typically means that the IMA unit has not received an OAM Label from the far end IMA unit at this time.

Creating an IMA Group

To create an IMA group, click on *Insert* in the *IMA Group* window. The *Insert IMA Group* window will display.



To add an IMA group to the T1/E1 IMA module, configure the following fields in the *IMA Group, Insert* window. Then click on *Insert*.

N O T E

Only one IMA group can be added to a T1/E1 IMA module.

Index: Enter the PII of the IMA group in the format *c.ss.41*, where *c* is the shelf number and *ss* is the slot number for the T1/E1 IMA module. (The port number indicating an IMA group is fixed at 41.)

Symmetry: Only symmetric operation is supported in this release.

MinNumTxLinks: Only "1" is supported in this release.

MinNumRxLinks: Only "1" is supported in this release.

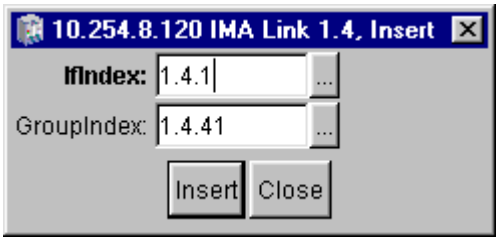
NeTxClkMode: Only the Common Transmit Clock (*ctc*) clock mode is supported in this release.

Be sure to click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

Adding Links to an IMA Group

Once an IMA group has been created on a T1/E1 IMA module, add the T1/E1 ports that comprise the group. Ports that are included in an IMA group are called IMA links.

1. In the *IMA Group* window, click on the IMA group to select it; then click on *Edit IMA Link*. The *IMA Link* window will display.
2. Click on *Insert*. The *IMA Link, Insert* window will display.
3. Enter the PII of a T1/E1 port on the T1/E1 IMA module to add that port to the IMA group.



4. Click on *Insert*. The port will appear in the *IMA Link* window.
5. Repeat steps 2 through 4 to add up to eight T1/E1 ports as links in the IMA group. Each port will appear in the *IMA Link* window as it is added.
6. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.

IMA Link Window

The *IMA Link* window displays a row of information for every T1/E1 IMA port that has been added to an IMA group. To access this window, click to select the IMA group in the *IMA Group* window; then click on *Edit IMA Link*.

The *IMA Link* window includes the following fields for each port that is included in the IMA group.

IfIndex: This field displays the PII of a T1/E1 IMA WAN port that is included in the IMA group.

GroupIndex: This field displays the PII of the IMA group which this port is a member of.

NeTxState: This field displays the current state of the near-end transmit link.

NeRxState: This field displays the current state of the near-end receive link.

FeTxState: This field displays the current state of the far-end transmit link as reported by ICP cells.

FeRxState: This field displays the current state of the far-end receive link as reported by ICP cells.

NeRxFailureStatus: This field displays the current link failure status of the near-end receive link.

FeRxFailureStatus: This field displays the current link failure status of the far-end receive link as reported by ICP cells.

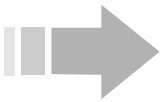
TxLid: This field displays the outgoing LID (link identification) used currently on the link by the local end.

RxLid: This field displays the incoming LID used currently on the link by the remote end as reported by ICP cells.

RelDelay: This field displays the latest measured delay on this link relative to the link, in the same IMA group, with the least delay.

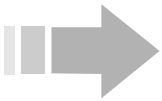
Adding Circuits to an IMA Group

1. With the *IMA Group* window displayed, click on the IMA group to select it, then click on *Edit Group*. The *IMA Group* window suite will display.



N O T E

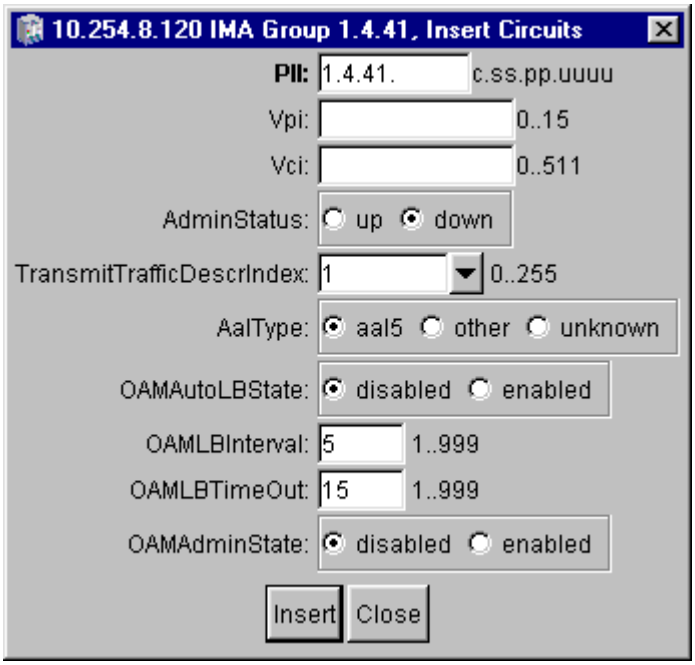
The IMA Group window suite includes the same windows that appear when you double click on a T1/E1 IMA port, except windows used to configure a port's physical interface are omitted. Double click on a T1/E1 IMA port to configure its physical interfaces and run loopback diagnostics.



C A U T I O N

Physical parameters for ports that are included in an IMA group can be individually configured in the DS1 window for each port. However, all timing sources (TransmitClockSource) in an IMA group must be set to the same value (i.e., LoopTiming or LocalTiming). Neither the EM nor the DSL concentrator will enforce this, so the user must ensure that the same clock source is configured for each port that is included in the IMA group.

2. Click on the *Circuits* tab and when the *Circuits* window displays, click on *Insert*. The *IMA Group, Insert Circuits* window will display.



3. Configure each field in the *IMA Group, Insert Circuits* window:

   ⇒ **PII:** The EM will automatically enter the *PII* of the IMA group. Append a Virtual Channel Link (VCL) to identify the circuit.

   ⇒ **Vpi:** Enter a Virtual Path Identifier for the circuit.

   ⇒ **Vci:** Enter a Virtual Channel Identifier for the circuit.

N O T E S

- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for loopback testing.*

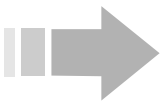
   ⇒ **AdminStatus:** Click to configure the circuit's *AdminStatus* to *up*.

   ⇒ **TransmitTrafficDescrIndex:** Every time a service category with unique *PCR*, *SCR* and *MBS* variables is created in the *Traffic Parameters* window, it is assigned a unique *Index*. Click in this field to select a service category's *Index* and assign that service category, with its *PCR*, *SCR* and *MBS* values, to the circuit you are creating. *TransmitTrafficDescrIndex* 1 always identifies the *ubr* service category.

   ⇒ **AalType:** Click to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0. With AAL5 trailer suppression, the 8-bit trailer normally appended to the end of

each AAL5 PDU is omitted, resulting in a savings of one ATM cell for each AAL5 PDU. This provides better throughput on the WAN connection. When AAL0 is selected, data is not transmitted as message- or packet-based data. Instead, it is transmitted as single raw ATM cells.

⇒ **OAMAutoLBState:** Click to *enable* periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

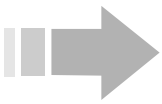
Click on the OAM tab in the IMA Group window to access the OAM window and view or change an IMA group's OAM configuration.

⇒ **OAMLBInterval:** Enter a value to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ **OAMLBTimeout:** Enter a value to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

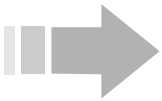
⇒ **OAMAdminState:** Click to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to add the circuit to the IMA group and return to the *Circuits* window; then click on *Refresh*.
5. Repeat steps 2 through 4 for each circuit to be added to the IMA group.
6. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to nonvolatile memory.



N O T E

Once ports have been added to an IMA group, circuits that are added though the IMA group window also display if you double click on a T1/E1 IMA port that is included in the IMA group, and click to access the Circuits window. You can also add circuits to the IMA group by double clicking on a port that is included in the IMA group, accessing that port's Circuits window and adding the circuit.



N O T E

When applying ATM traffic parameters to an IMA group, remember that the bandwidth associated with IMA groups is dynamic in nature, and can be reduced as a consequence of link failure.

Deleting IMA Groups

To delete an IMA group:

1. Delete all circuits from the IMA group.
2. Delete all IMA links from the IMA group.
3. Delete the IMA group.

Chapter 5
Adding Subscribers

DSL concentrators are primarily data forwarding and multiplexing devices which connect DSL subscribers to Network Service Providers (NSPs). The DSL concentrator forwards user data between subscribers and their NSPs.

Although the DSL concentrator can forward data between any two interfaces, most applications involve aggregating upstream traffic from multiple DSL subscribers onto multiplexed WAN interfaces, and demultiplexing downstream traffic from the multiplexed WAN interfaces to multiple DSL subscribers. A multiplexed interface is typically a high-speed frame relay or ATM interface with multiple independent virtual circuits. Each virtual circuit is a logical point-to-point link to an upstream termination point, typically an NSP. In some configurations, a DSL concentrator's Ethernet port may be used as the WAN interface.

Add subscribers by linking the subscriber ports that support those subscribers to virtual circuits on a WAN port using the appropriate *NetModel*. The following table shows networking functions that the DSL concentrator performs in each *NetModel*.

Purpose	NetModel
Provide a high-speed connect-point to the public network.	"Full IP Routing" on page 145
Aggregate multiple subscriber ports together onto a single WAN port virtual circuit.	"Policy IP Routing to a WAN Port Virtual Circuit" on page 148, "Policy IP Routing to an Ethernet Port" on page 151
	"VWAN NetModel" on page 152
	"CopperVPN NetModel" on page 115
Link two virtual circuits on a subscriber port with two virtual circuits on a WAN port to communicate voice and data through a single subscriber port.	"CopperVPN NetModel" on page 115
	"Cross-Connect NetModel, Voice and Data" on page 134
	"Dual NetModel" on page 144
	"HDIA NetModel" on page 156 (Release 6.0 and earlier)
Transport frame relay traffic from a subscriber port over an ATM backbone and restore it to frame relay at its destination.	"Cross-Connect NetModel, FRF.5 Translation" on page 121
Transport frame relay traffic from a subscriber port over an ATM backbone to an ATM destination.	"Cross-Connect NetModel, FRF.8 Translation" on page 125
Map a single subscriber port to a single WAN port virtual circuit.	"Cross-Connect NetModel, PPP-HDLC-1973 Forwarding Mode" on page 137; "Cross-Connect NetModel, HDLC-VC-Payload Forwarding Mode" on page 139
Connect multiple virtual circuits on a subscriber port to an equal number of virtual circuits on a WAN port.	"Cross-Connect NetModel, Transparent Virtual Circuit Frame Forwarding" on page 128
Subtend a DSL concentrator to a CE200.	"Cross-Connect NetModel, WAN to WAN (Subtending)" on page 141

NetModels

The DSL concentrator supports four *NetModels*, *CopperVPN*, *Cross-Connect*, *IP*, and *VWAN*. All four *NetModels* can simultaneously operate on a single DSL concentrator, and when a subscriber port is configured for the *Dual NetModel*, it will support two separate *NetModels*.

A subscriber port's *Interface* window will indicate *none* if the port's *NetModel* has not been configured. You can also reset a configured port's forwarding mode (*FwdMode*) by first setting its *NetModel* to *none* and clicking on *Apply*.

A subscriber port's configured *NetModel* is combined with additional configured parameters to determine its forwarding mode (*FwdMode*). Parameters that determine the forwarding mode vary by *NetModel* as described in the following paragraphs.

CopperVPN Netmodel

The *CopperVPN NetModel* performs transparent virtual routing, aggregating many subscribers onto a single WAN interface. In Release 7.0, the *CopperVPN NetModel* has been enhanced to combine *CopperVPN NetModel* capabilities from Release 6.0 and earlier with *HDIA NetModel* capabilities in a new, easy-to-configure Layer 3 *NetModel*. *CopperVPN* is backward compatible and adds the following enhancements:

Up to Five WAN Uplinks Supported: *CopperVPN* groups are configured with one default WAN uplink, and up to four additional WAN uplinks that can be selected for packet forwarding, based on *CopperVPN* group filters.

Auto-Learned IP Forwarding Capability: When IP encapsulation is employed on the WAN side, a *CopperVPN* group can be configured to learn the IP address of its upstream gateway either by Inverse ARP or by DHCP snooping (monitoring communication between hosts and a DHCP server). When MAC encapsulation is employed on the WAN side, a *CopperVPN* group can be configured to ARP upstream for a host's IP address or to forward IP datagrams to an upstream router for disposition.

Source IP Validation: A *CopperVPN* group can be configured to perform IP source address validation as datagrams ingress the DSL concentrator. Additionally, when this feature is enabled, the group will only send ARP requests to the subscriber interface that is associated with the ARPed IP address.

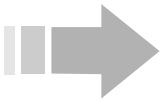
Peer-To-Peer Communication: *CopperVPN* groups can be configured to *enable* or *disable* packet forwarding between group members.

CopperVPN Group Filtering: Filters can be added to *CopperVPN* groups to redirect packets to secondary WAN uplinks based on packet headers.

CopperVPN Group Diagnostic Capabilities: An IP address can be reserved in each *CopperVPN* group for 'Ping' and

'TraceRoute' diagnostics. You can also view the *subnet* table and *route* table for a *CopperVPN* group, and flush *CopperVPN* route table entries. Counters keep track of packets discarded by the *CopperVPN* group and packets that match *CopperVPN* group filter criteria.

CopperVPN Support for Ethernet Ports: Ethernet ports can be configured with the *CopperVPN NetModel*, and can function as either a subscriber or WAN interface in a *CopperVPN* group.



N O T E

CopperVPN+ is the marketing name for the new CopperVPN NetModel described in this document.

The *CopperVPN NetModel* allows IP encapsulation (*ip-1483* or *ip-1490*) or MAC encapsulation (*mac-1483* or *mac-1490*). The forwarding mode is always *copperVPN*.

Cross-Connect NetModel

When the *Cross-Connect NetModel* is selected, the forwarding mode is determined by the combined *EncapsulationTypes* of the subscriber port and the WAN port virtual circuit. If the subscriber and WAN encapsulations are the same, packet forwarding will be performed in a transparent mode. If the subscriber and WAN encapsulations differ, packet forwarding is performed in a translation mode. If the WAN encapsulation is not specified (*none*), the packet forwarding mode will be *vc-vc-payload*.

Two ATM WAN port virtual circuits can also be cross-connected; this allows subtending of a DSL concentrator to a "master" CE200.

Dual NetModel

The *Dual NetModel* feature allows you to configure a subscriber port with one *NetModel*, and configure a virtual circuit on that port (VCID 22) with a different *NetModel* to carry delay-sensitive, high-priority traffic, such as voice and video. While this capability is not an actual *NetModel*, configuring subscriber ports with dual *NetModels* is described in this document as a *NetModel*.

The subscriber port can be configured with any supported *NetModel* using the applicable configuration procedure described in this chapter. The VCID 22 circuit on the subscriber port is configured in the *DSL VC* window, accessed by clicking on the *Voice Circuit* button at the bottom of the subscriber port's *Interface* window. The VCID 22 "voice" circuit can be configured with any supported *NetModel* except *VWAN*. However, you cannot configure both the subscriber port and its VCID 22 circuit with the *IP NetModel*.

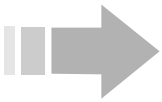
IP NetModel

With the *IP NetModel* selected, the forwarding mode is determined by the *DestPII* field. If the *DestPII* is 0, the *IP NetModel* and *DestPII* result in the *fullIP* forwarding mode. If a PII for a WAN port VC or an Ethernet port is entered in the *DestPII* field, the resulting forwarding mode will be *policyIP*.

VWAN NetModel

When the *VWAN* (Virtual Wide Area Network) *NetModel* is selected, the forwarding mode is determined by the number of subscriber ports connected to the destination WAN port circuit. If only one subscriber port is connected to the WAN port circuit, the resulting forwarding mode will be VWAN point-to-point (*vwan-pp*). When more than one subscriber port is connected to the destination WAN port circuit, the resulting forwarding mode will be VWAN Bridge (*vwan-bridge*). However, if the subscriber port is connected to an Ethernet port, the forwarding mode will be *vwan-bridge* regardless of the number of subscriber ports connected to the Ethernet port.

HDIA NetModel



N O T E

In Release 7.0, the HDIA NetModel has been superseded by the CopperVPN NetModel. The functionality provided by the HDIA NetModel is supported for backward compatibility, and the configuration procedure is described in this chapter. However, HDIA configurations, when saved, are automatically upgraded to the new CopperVPN format.

High Density IP Access (*hdia*) is an aggregated IP networking model that supports operation with an Interactive Access Device (IAD) to provide the security and peer-peer connectivity required for commercial internet and IP-voice access.

To meet requirements of aggregated voice and data, *hdia* configures two separate circuits on each subscriber port:

Data Circuit: The data circuit uses an existing virtual circuit (VCID 528) and *rfc1483* encapsulation.

Voice Circuit: The voice circuit uses VCID 22 and *ip-1490* encapsulation. The DSL concentrator automatically gives voice traffic higher priority than data traffic for DSL transmission.

Configure data circuits and voice circuits on different subnets to isolate data from voice. Configure the default router, the WAN port data circuit, subscriber port data circuits, and hosts on the data subnet. Configure the voice gateway, the WAN port voice circuit and subscriber port voice circuits on the voice subnet.

Changing a Configured Port's Forwarding Mode

Once you link a subscriber port with a WAN port virtual circuit by configuring their respective *FwdModes* (*NetModels* and *EncapsulationTypes*), you cannot change those forwarding modes until you disable that connection. To disable a connection, set the *NetModel* of each subscriber port that references the WAN port virtual circuit to *none* and click on *Apply*. Then set the WAN port *NetModel* to *none* (click in the *NetModels* field of the *All Interfaces* window and select *none*), then click on *Apply*. The subscriber

ports and the WAN port virtual circuit can then be configured to different forwarding modes.

Configuring NetModels and Forwarding Modes

CopperVPN NetModel

In the *CopperVPN NetModel*, you configure groups of subscriber interfaces, with each group aggregated onto a common WAN VC or Ethernet port for transport. These groups function as *transparent virtual routers*; they perform the same basic functions as an IP router, but are invisible to the external network.

A *CopperVPN* group is created when a WAN circuit or Ethernet port is configured with the *CopperVPN NetModel*. Subscriber interfaces can then be linked with the *CopperVPN* group, and if desired, additional WAN uplink circuits (secondary WAN uplinks) can be assigned to the *CopperVPN* group.

An Ethernet port can be configured either as a subscriber interface or a WAN uplink in a *CopperVPN* group. However, an Ethernet port that is configured with the *CopperVPN NetModel* cannot be used for system management.

Overview

Manual configuration of a *CopperVPN* group consists of the following steps:

1. Create virtual circuits on a WAN port and set their *NetModel* to *copperVPN*. One circuit is required as *WanUplink1*. You can create up to four additional WAN circuits (*WanUplink2* through *WanUplink5*) for use as secondary WAN uplinks.
2. Add subscriber ports to the *CopperVPN* group.
3. In the *VPNGroup* window, add secondary WAN uplinks to the *CopperVPN* group.
4. In the *Subnet for VPN Group* window, manually configure the WAN side of the subnet by adding an upstream gateway IP address and netmask for each subnet.
5. In the *Route for VPN Group* window, add a route for each subscriber-side destination.
6. In the *VPNGroup* window, configure the *CopperVPN* group attributes.
7. In the *Group Filters for VPN Group* window, create filters to redirect selected packets as required.
8. You can include an Ethernet port in a *CopperVPN* group. You can configure the Ethernet port as *WanUplink1*, or add it to an existing *CopperVPN* group as a subscriber interface or secondary WAN uplink.
9. Click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Create a Virtual Circuit on a WAN Port

1. Double click on a WAN port in the Shelf View. When the WAN port window suite appears, click on the *Circuits* tab.
2. Click on *Insert* in the *Circuits* window. The *Insert Circuits* window will appear with the selected WAN port's PII automatically entered in the *IfIndex* field (frame relay WAN port) or *PII* field (ATM WAN port).
3. For a frame relay WAN port:

   ⇒ Enter a DLCI for the new circuit in the *Dlci* field.

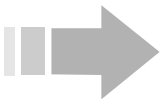
   ⇒ Change the *CommittedBurst*, *ExcessBurst* and *Throughput* values as required.

   For an ATM WAN port:

   ⇒ Append a Virtual Channel Link (VCL) for the new circuit to the end of the index in the *PII* field.

   ⇒ Enter a Virtual Path Identifier for the circuit in the *Vpi* field.

   ⇒ Enter a Virtual Channel Identifier for the circuit in the *Vci* field.



N O T E S

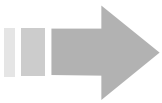
- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so different Virtual Paths may use the same Vci without conflict.*

  ⇒ Click to set the circuit's *AdminStatus* to *up*.

  ⇒ Select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.

  ⇒ Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

  ⇒ Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

⇒ Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

⇒ Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to add the circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.
5. Click on the *All Interfaces* tab and when that window appears, click on the *Insert* button.
6. Configure an interface for the WAN port circuit by completing the following fields in the *Insert All Interfaces* window:

⇒ Enter the PII of the WAN port circuit created in steps 2 through 4 in the *PII* field.

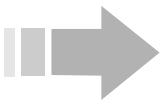
⇒ Click to set *NetModel* to *copperVPN*.

⇒ Click to select the desired *EncapsulationType* for your network (*ip-1483*, *ip-1490*, *mac-1483*, or *mac-1490*).

7. Click on *Insert* to add the interface to the WAN port and return to the *All Interfaces* window; then click on *Refresh*.
8. Repeat steps 1 through 7 to create secondary uplink WAN circuits.

Add Subscriber Ports

1. Double click on a subscriber port to access its window suite. The *Interface* window will display.



N O T E

Instead of configuring the subscriber port with the CopperVPN NetModel, you can click on the Voice Circuit button and configure the parameters described in step 2 below in the DSL VC window to add VCID 22 on the subscriber port to a CopperVPN group.

2. To configure the port as part of the *CopperVPN* group:

   ⇒ Click to select *copperVPN* in the *NetModel* field.

   ⇒ Enter the PII of the *CopperVPN* group's *WanUplink1* circuit in the *DestPII* field.

   ⇒ Click in the *EncapsulationType* field to select IP encapsulation (*ip-1483* or *ip-1490*) or MAC encapsulation (*mac-1483* or *mac-1490*).

3. Click on *Apply*.

4. Repeat steps 1 through 3 for additional subscriber ports to add them to the *CopperVPN* group.

Configure the WAN Side of a CopperVPN Group

1. Click on the *Protocols* menu in the EM menu bar and select *VPN Group*.

2. Click on the *CopperVPN* group in the *VPNGroup* window; then click on *Subnet*.

3. Click on *Insert* in the *Subnet for VPN Group* window.

4. Enter the following in the *Subnet for VPN Group, Insert VPNSubnet* window to create a subnet:

   ⇒ **Number field:** Enter an index to identify the subnet in the *CopperVPN* group. Up to eight subnets are supported in each *CopperVPN* group.

   ⇒ **GatewayIpAddr field:** Enter the IP address of the upstream gateway.

   ⇒ **NetMask field:** Enter a NetMask for the *CopperVPN* group (applies to WAN and subscriber side).

   ⇒ **DiagnosticIpAddr field:** If desired, enter an IP address for supporting 'Ping' and 'TraceRoute' diagnostic functions in the subnet.

5. Click on *Insert* to add the subnet to the *CopperVPN* group; then click on *Refresh*.

6. Repeat steps 3 through 5 for each subnet you are adding to the *CopperVPN* group.

Add Secondary Wan Uplink Circuits to the CopperVPN Group

1. In the *VPNGroup* window, enter the PII of a circuit created for use as a secondary WAN uplink in one of the applicable WAN uplink fields (*WanUplink2*, *WanUplink3*, *WanUplink4* or *WanUplink5*.)

2. Click on *Apply*.

3. Repeat steps 1 and 2 as required to create required secondary WAN uplinks.

Configure the Subscriber Side of a VPN Group

1. In the *VPNGroup* window, click to select a *CopperVPN* group; then click on *Route*.

2. Click on *Insert* in the *Route for VPN Group* window.
3. Configure the following fields in the *Route for VPN Group, Insert VPNRoute* window.
   - ⇒ **Destination field:** Enter the IP address of a downstream destination.
   - ⇒ **Interface field:** Enter the PII of a subscriber interface to associate it with the IP address in the *Destination* field.
4. Click on *Insert*; then click on *Refresh*.
5. Repeat steps 2 though 4 for each remaining subscriber destination to be included in the *CopperVPN* group.

Configure CopperVPN Group Attributes

1. In the *VPNGroup* window, configure the following *CopperVPN* group attributes:
   - ⇒ **PeerToPeer:** *Enable* or *disable* subscriber-to-subscriber communication in the *CopperVPN* group.
   - ⇒ **IPValidation:** *Enable* or *disable* IP address validation on ingress traffic and restricted MAC address resolution on egress traffic.
   - ⇒ **GatewayByInArp:** *Enable* or *disable* learning the IP address of the *CopperVPN* group's upstream gateway by means of Inverse ARP.
   - ⇒ **DHCPSnooping:** *Enable* or *disable* learning the IP address of the *CopperVPN* group's upstream gateway by means of DHCP snooping (i.e., monitoring communication between hosts and a DHCP server).
   - ⇒ **WanArpPeerHosts:** *Enable* or *disable* ARP for peer hosts over MAC encapsulated WAN interfaces.
   - ⇒ **DefaultTTL:** If required, configure the time to live value for MAC addresses that are obtained by means of ARP.
2. Click on *Apply*.

Configure Group Filters for CopperVPN Group

Use Group Filters to reroute packets that meet filter criteria to secondary WAN uplinks in the *CopperVPN* group:

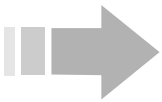
1. In the *VPNGroup* window, select the *CopperVPN* group and click on *Group Filter*.
2. In the *Group Filters for VPN Group* window, click on *Insert*.
3. Configure applicable fields in the *Group Filters for VPN Group, Insert Group Filter* window. (See "Configuring IP Filters" on page 65 for more information.)
4. Click on *Insert* to return to the *Group Filters for VPN Group* window; then click on *Refresh*.

5. Repeat steps 2 through 4 to create additional Group Filters as required.

Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Using an Ethernet Port in a CopperVPN Group

You can include Ethernet ports in *CopperVPN* groups. An Ethernet port can be configured either as a WAN uplink or as a subscriber interface.

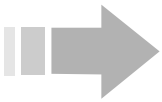


N O T E

An Ethernet port that is configured as a member of a CopperVPN group cannot be used for system management.

To configure an Ethernet port for use as a WAN uplink in a *CopperVPN* group:

1. Double click on the Ethernet port to display its *Interface* window.
2. Select *copperVPN* in the *NetModel* field; then click on *Apply*. (An encapsulation type of *none* will be set automatically by the EM.)



N O T E

When an Ethernet port serves as a CopperVPN WAN interface, it must be configured with the CopperVPN NetModel before any subscriber interfaces are configured to link with it. The WAN virtual circuit will not be created automatically when a subscriber interface is configured with the Ethernet port's PII as its DestPII.

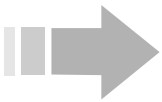
3. The Ethernet port can serve either as *WanUplink1* or as a secondary WAN uplink in an existing *CopperVPN* group:
   - ⇒ If the Ethernet port is to function as *WanUplink1* in the *CopperVPN* group, add subscriber ports by configuring them with the *CopperVPN NetModel* and entering the Ethernet port's PII in their *DestPII* fields (see "Add Subscriber Ports" on page 117).
   - ⇒ If the Ethernet port is to function as a secondary WAN uplink, enter its PII in one of the applicable WAN uplink fields (*WanUplink2*, *WanUplink3*, *WanUplink4* or *WanUplink5*) in the *VPNGroup* window in the *Protocols* menu (see "Add Secondary Wan Uplink Circuits to the CopperVPN Group" on page 118).

To configure an Ethernet port for use as a subscriber interface in a *CopperVPN* group:

1. Double click on the Ethernet port to display its *Interface* window.

2. Select *copperVPN* in the *NetModel* field; then click on *Apply*. (An encapsulation type of *none* will be set automatically by the EM.)
3. Enter the PII of the *CopperVPN* group's *WanUplink1* circuit in the *DestPII* field; then click on *Apply*.

Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.



W A R N I N G

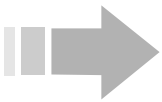
In this release, redundant operation is not supported for Ethernet ports that have been configured as interfaces in a CopperVPN group; these ports will not resume user traffic after a system failover.

Cross-Connect NetModel

The *Cross-Connect NetModel* allows conversion of various frame formats between subscriber and WAN interfaces. When the *Cross-Connect NetModel* is selected, the forwarding mode is determined by the combined *EncapsulationTypes* of the subscriber port and the WAN port virtual circuit. In addition to cross-connecting subscriber and WAN interfaces, this *NetModel* can be used to connect two ATM WAN interfaces on the same CE200. One of these WAN interfaces functions as an inter-shelf trunk (IST) and connects to a subtended DSL concentrator; the other connects to the network.

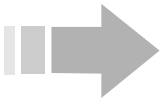
There are two types of *Cross-Connect* forwarding modes: per-port and *per-vc*. Selecting a subscriber port encapsulation that does not support virtual circuits on the subscriber port results in a per-port forwarding mode. Selecting a subscriber port encapsulation that allows multiple virtual circuits on the subscriber port results in a *per-vc* forwarding mode. Local Management Interface (LMI) attributes are available on subscriber interfaces with *per-vc* forwarding modes.

Ethernet ports do not support the *Cross-Connect NetModel*.



N O T E

G.shdsl modules currently support a maximum of 8 VCs per port; all other DSL modules support a maximum of 64 VCs per port.



N O T E

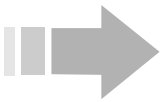
To rate limit the amount of traffic on an individual subscriber's VC in the Cross-Connect NetModel, configure rate-limiting parameters on the WAN port rather than the subscriber port.

Cross-Connect NetModel, FRF.5 Translation

Use this *NetModel* to transport frame relay-configured traffic from a subscriber port or bundle over an ATM backbone to a frame relay destination. When the *Cross-Connect NetModel* with *frf5* for-

warding mode is applied, frame relay characteristics are retained and the data can be restored to frame relay format at its destination. Additionally, LMI attributes will be transported between the two frame-relay networks over the ATM backbone (see "LMI Attributes" on page 124).

The *frf5* forwarding mode takes complete Q.922 HDLC frames and translates them to ATM AAL5 PDUs, per the FRF.5 specification.

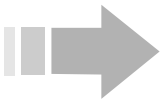


N O T E

When the Cross-Connect NetModel is applied to a subscriber port, circuits with FRF.5 and FRF.8 forwarding modes can both be configured on that subscriber port. This allows for transporting frame relay data from circuits on a subscriber port over an ATM backbone to separate frame relay and ATM destinations.

Configure the WAN Side

1. Double click on a DS3 ATM, OC-3c/STM-1, or T1/E1 IMA WAN port in the Shelf View. When the WAN port window suite appears, click on the *Circuits* tab.
2. Click on *Insert* in the *Circuits* window. The *Insert Circuits* window will appear with the selected ATM WAN port's PII automatically entered in the *PII* field.
3. Identify the circuit being added to the port by:
   - ⇒ Appending a Virtual Channel Link (VCL) for the new circuit to the end of the index in the *PII* field.
   - ⇒ Entering a Virtual Path Identifier for the circuit in the *Vpi* field.
   - ⇒ Entering a Virtual Channel Identifier for the circuit in the *Vci* field.

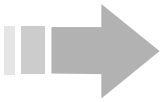


N O T E S

- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so different Virtual Paths may use the same Vci without conflict.*

4. Click to set the circuit's *AdminStatus* to *up*.
5. Select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.
6. Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

7. Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

8. Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.
9. Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.
10. Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.
11. Click on *Insert* to add the circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.
12. Click on the *All Interfaces* tab and when that window appears, click on the *Insert* button.
13. Configure an interface for the WAN port circuit by completing the following fields in the *Insert All Interfaces* window:
    - ⇒ Enter the PII of the WAN port circuit created in steps 2 through 11 in the *PII* field.
    - ⇒ Click to set *NetModel* to *cross-connect*.
    - ⇒ Click to set *EncapsulationType* to *frf5*.
14. Click on *Insert* to add the interface to the WAN port and return to the *All Interfaces* window; then click on *Refresh*.

Configure the Subscriber Side

15. To configure:
    - ⇒ A subscriber port, double click on the subscriber port in the Shelf View to access its *Interface* window.
    - ⇒ A bundle, double click on a subscriber port that is part of that bundle to access its *Interface* window; then click on *Bundle*.
16. Set the following values for the subscriber port or bundle:
    - ⇒ Click to set *NetModel* to *cross-connect*.

⇒ Click to set *EncapsulationType* to *q922* or *q922-1490*.

⇒ Click to set *AdminStatus* to *up*.

17. Click on *Apply* to apply the configuration to the subscriber port or bundle. *per-vc* will appear in the *FwdMode* field.
18. Click on the *Sub Interface* tab to access that window.
19. Click on *Insert* in the *Sub Interface* window to display the *Insert Sub Interface* window. Complete the following fields:

    ⇒ The EM automatically enters the PII of the subscriber port or bundle in the *PII* field. Append a VCID to identify the subscriber port circuit being created. Range: 16 to 991, excluding 528 and 529.

    ⇒ Enter the PII of the WAN port circuit created in steps 2 through 11 in the *DestPII* field.

    ⇒ Enter a name to identify the connection in the *Name* field (optional).

    ⇒ If the circuit will carry voice traffic, click to set *Priority* to *high*. Otherwise, leave *Priority low* (default).

20. Click on *Insert* to link the subscriber port circuit with the WAN port circuit; then click on *Refresh*.
21. Return to the *All Interfaces* window for the WAN port and click on *Refresh* to check the interface. Ensure that the *FwdMode* field displays *frf5* and the *DestPII* field displays the PII of the subscriber port circuit created in steps 15 through 20.
22. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

LMI Attributes

When data is transported between two frame relay end-points over an ATM backbone using the *Cross-Connect NetModel* and *frf5* encapsulation, LMI attributes are also passed transparently across the backbone. LMI control and statistical parameters associated with running LMI over an ATM WAN virtual circuit as defined in FRF.5 can be accessed in the *LMI* window of the ATM WAN port's window suite. (See "*CopperView EM: Introduction*" for a detailed description of the fields in this window.)

To activate Q.933 Annex-A Bi-directional LMI procedures over an ATM WAN VC with *frf5* encapsulation:

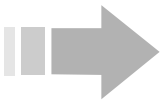
1. Click on the *LMI* tab in a DS3 ATM, OC-3c/STM-1, or T1/E1 IMA WAN port window suite to display the *LMI* window. A row of LMI data will display for each virtual circuit configured with *frf5* encapsulation.
2. In the *State* field for the VC, click to select *Q.933 Annex-A Bi-directional LMI* to activate LMI procedures over the circuit.

Cross-Connect NetModel, FRF.8 Translation

Use this *NetModel* to transport frame relay-configured traffic from a subscriber port or bundle over an ATM backbone to an ATM destination. When FRF.8 translation is applied with the *Cross-Connect NetModel*, frame relay data is converted to ATM format, but the data cannot be converted back to frame relay at its destination.

Three types of FRF.8 translation can be configured:

- RFC 1490 to RFC 1483 encapsulation (*frf8-1490-1483* forwarding mode)
- RFC 1973 to RFC 2364-null encapsulation (*ppp-translation* forwarding mode)
- RFC 1973 to RFC 2364-LLC encapsulation (*ppp-translation* forwarding mode)

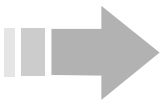


N O T E

When the Cross-Connect NetModel is applied to a subscriber port, circuits with FRF.5 and FRF.8 forwarding modes can both be configured on that subscriber port. This allows for transporting frame relay data from circuits on a subscriber port over an ATM backbone to separate frame relay and ATM destinations.

Configure the WAN Side

1. Double click on a DS3 ATM, OC-3c/STM-1, or T1/E1 IMA WAN port in the Shelf View. When the WAN port window suite appears, click on the *Circuits* tab.
2. Click on *Insert* in the *Circuits* window. The *Insert Circuits* window will appear with the selected ATM WAN port's PII automatically entered in the *PII* field.
3. Identify the circuit being added to the port by:
   - ⇒ Appending a Virtual Channel Link (VCL) for the new circuit to the end of the index in the *PII* field.
   - ⇒ Entering a Virtual Path Identifier for the circuit in the *Vpi* field.
   - ⇒ Entering a Virtual Channel Identifier for the circuit in the *Vci* field.

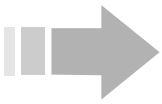


N O T E S

- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so dif-*

ferent Virtual Paths may use the same Vci without conflict.

4. Click to set the circuit's *AdminStatus* to *up*.
5. Select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.
6. Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.
7. Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

8. Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.
9. Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.
10. Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.
11. Click on *Insert* to add the circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.
12. Click on the *All Interfaces* tab and when that window appears, click on the *Insert* button.
13. Configure an interface for the WAN port circuit by completing the following fields in the *Insert All Interfaces* window:

    ⇒ Enter the PII of the WAN port circuit created in steps 2 through 11 in the *PII* field.

    ⇒ Click to set *NetModel* to *cross-connect*.

    Click to set the WAN port circuit's *EncapsulationType* to perform the required type of FRF.8 translation:

    ⇒ *rfc1483* for RFC 1490 to RFC 1483 translation

    ⇒ *rfc2364-null* for RFC 1973 to RFC 2364-null translation

⇒ *rfc2364-llc* for RFC 1973 to RFC 2364-LLC translation.

14. Click on *Insert* to add the interface to the WAN port and return to the *All Interfaces* window; then click on *Refresh*.

Configure the Subscriber Side

15. To configure:

    ⇒ A subscriber port, double click on the subscriber port in the Shelf View to access its *Interface* window.

    ⇒ A bundle, double click on a subscriber port that is part of that bundle to access its *Interface* window; then click on *Bundle*.

16. Set the following values for the subscriber port or bundle:

    ⇒ Click to set *NetModel* to *cross-connect*.

    ⇒ Click to set *AdminStatus* to *up*.

    Click to set the subscriber port or bundle's *EncapsulationType* to perform the required type of FRF.8 translation:

    ⇒ *q922-1490* for RFC 1490 to RFC 1483 translation

    ⇒ *rfc1973* for RFC 1973 to RFC 2364-null translation

    ⇒ *rfc1973* for RFC 1973 to RFC 2364-LLC translation.

17. Click on *Apply* to apply the configuration to the subscriber port or bundle. *per-vc* will appear in the *FwdMode* field.

18. Click on the *Sub Interface* tab to access that window.

19. Click on *Insert* in the *Sub Interface* window to display the *Insert Sub Interface* window. Complete the following fields:

    ⇒ The EM automatically enters the PII of the subscriber port or bundle in the *PII* field. Append a VCID to identify the subscriber port circuit being created. Range: 16 to 991, excluding 528 and 529.

    ⇒ Enter the PII of the WAN port circuit created in steps 2 through 11 in the *DestPII* field.

    ⇒ Enter a name to identify the connection in the *Name* field (optional).

    ⇒ If the circuit will carry voice traffic, click to set *Priority* to *high*. Otherwise, leave *Priority low* (default).

20. Click on *Insert* to link the subscriber port circuit with the WAN port circuit; then click on *Refresh*.

21. Return to the *All Interfaces* window for the WAN port and click on *Refresh* to check the interface. Ensure that the *DestPII* field displays the PII of the subscriber port circuit created in steps 15 through 20, and that the *FwdMode* field displays:

⇒ *frf8-1490-1483* for RFC 1490 to RFC 1483 translation

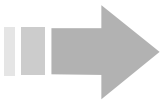
⇒ *ppp-translation* for RFC 1973 to RFC 2364-null translation

⇒ *ppp-translation* for RFC 1973 to RFC 2364-LLC translation.

22. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Cross-Connect NetModel, Transparent Virtual Circuit Frame Forwarding

The DSL concentrator will link circuits on a subscriber port or IMUX bundle with an equal number of circuits on a WAN port (one WAN port circuit for each subscriber port or bundle circuit). The payload is transparently forwarded from the subscriber port or bundle circuit to the WAN port circuit, whose *EncapsulationType* is *none*. Forwarding mode is *vc-vc-payload*.



N O T E

Assign subscriber port circuits sequential VCID numbers.

Configure the WAN Side

1. Double click on the destination WAN port in the Shelf View to access that port's window suite; then click on the *Circuits* tab.
2. Click on the *Insert* button in the *Circuits* window. The *Insert Circuits* window will appear with the selected WAN port's PII automatically entered in the *IfIndex* field (frame relay WAN port) or *PII* field (ATM WAN port).
3. For a frame relay WAN port:

   ⇒ Enter a DLCI for the new circuit in the *Dlci* field.

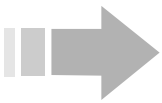
   ⇒ Change the *CommittedBurst*, *ExcessBurst* and *Throughput* values as required.

   For an ATM WAN port:

   ⇒ Append a Virtual Channel Link (VCL) for the new circuit to the end of the index in the *PII* field.

   ⇒ Enter a Virtual Path Identifier for the circuit in the *Vpi* field.

   ⇒ Enter a Virtual Channel Identifier for the circuit in the *Vci* field.



N O T E S

- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*

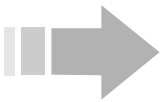
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so different Virtual Paths may use the same Vci without conflict.*

  ⇒ Click to set the circuit's *AdminStatus* to *up*.

  ⇒ Select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.

  ⇒ Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

  ⇒ Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

  ⇒ Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

  ⇒ Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

  ⇒ Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to add the circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.

Configure the Subscriber Side

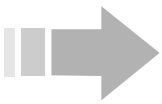
5. To configure:

  ⇒ A subscriber port, double click on the port in the Shelf View to access its *Interface* window.

  ⇒ A bundle, double click on a subscriber port that is part of that bundle to access its *Interface* window; then click on *Bundle*.

6. Click to set *NetModel* to *cross-connect*.
7. Click to set *EncapsulationType*:
   ⇒ *q922, q922-1490* or *rfc1973* for an IDSL, SDSL, or T1 Line port.
   ⇒ *atm* for an ADSL, G.lite, or G.shdsl port.
8. Click on *Apply*. *per-vc* will appear in the *FwdMode* field.
9. If configuring an IDSL, SDSL, or T1 Line port, click on the *FR DLC* tab to configure the LMI mode for the port:
   ⇒ Click to select *disable* in the *AdminState* field; then click on *Apply*.
   ⇒ Select an LMI mode for the subscriber port or bundle by clicking in the *State* field; then click on *Apply*.
   ⇒ To re-enable the circuit, click on *enable* in the *AdminState* field; then click on *Apply*.

   For more information on the fields in this window, see *FR DLC* Window in "*CopperView EM: Introduction*".

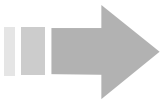


N O T E

Click on the Circuits tab to display frame relay circuits that have already been configured on the subscriber port or bundle.

10. In the subscriber port or bundle window suite, click on the *Sub Interface* tab. For each virtual circuit you add to the subscriber port or bundle:
    ⇒ Click on the *Insert* button. The *Insert Sub Interface* window will display.
    ⇒ Append the VCID of the new subscriber port circuit to the end of the index in the *PII* field. Range: 16 to 991, excluding 528 and 529.
    ⇒ Enter the PII of the target WAN port circuit (added in steps 2 through 4) in the *DestPII* field.
    ⇒ Enter a name to identify the connection in the *Name* field (optional).
    ⇒ If the circuit will carry voice traffic, click to set *Priority* to *high*. Otherwise, leave *Priority low* (default).
    ⇒ Click on *Insert* to add the circuit to the subscriber port or bundle and link it with the selected WAN port circuit.
11. Return to the WAN port window suite and click on the *All Interfaces* tab to display the *All Interfaces* window for the WAN port. Click on *Refresh* to check the interface. Ensure that the *FwdMode* field indicates *vc-vc-payload* and the PII of the sub-

scriber port or bundle circuit created in step 10 displays in the *DestPII* field.



N O T E

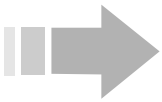
The WAN circuit interface is automatically created when the WAN port circuit is linked with a circuit on a subscriber port or bundle.

12. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Cross-Connect NetModel, PPP Transparent Frame Forwarding

The DSL concentrator will link circuits on a subscriber port or IMUX bundle with an equal number of circuits on a WAN port (one WAN port circuit for each subscriber port or bundle circuit). The packets are transparently forwarded from the subscriber port or bundle circuit to the WAN port circuit after encapsulation verification is performed. The encapsulation type for both the subscriber port circuit and the WAN port circuit is set to *rfc1973*, and the forwarding mode is *ppp-transparent*.

This forwarding mode is similar to *vc-vc-payload*, the difference being that any packet that does not conform to the provisioned encapsulation is discarded.



N O T E

Assign subscriber port circuits sequential VCID numbers.

Configure the WAN Side

1. Double click on the destination WAN port in the Shelf View to access that port's window suite; then click on the *Circuits* tab.
2. Click on the *Insert* button in the *Circuits* window. The *Insert Circuits* window will appear with the selected WAN port's PII automatically entered in the *IfIndex* field (frame relay WAN port) or *PII* field (ATM WAN port).
3. For a frame relay WAN port:

   ⇒ Enter a DLCI for the new circuit in the *Dlci* field.

   ⇒ Change the *CommittedBurst*, *ExcessBurst* and *Throughput* values as required.

   For an ATM WAN port:

   ⇒ Append a Virtual Channel Link (VCL) for the new circuit to the end of the index in the *PII* field.

   ⇒ Enter a Virtual Path Identifier for the circuit in the *Vpi* field.

   ⇒ Enter a Virtual Channel Identifier for the circuit in the *Vci* field.

N O T E S

- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so different Virtual Paths may use the same Vci without conflict.*

⇒ Click to set the circuit's *AdminStatus* to *up*.

⇒ Select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.

⇒ Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

⇒ Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.

N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

⇒ Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

⇒ Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

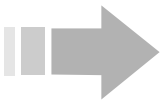
4. Click on *Insert* to add the circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.

5. Click on the *All Interfaces* tab and when that window appears, click on the *Insert* button.
6. Configure an interface for the WAN port circuit by completing the following fields in the *Insert All Interfaces* window:
   - ⇒ Enter the PII of the WAN port circuit created in steps 2 through 4 in the *PII* field.
   - ⇒ Click to set *NetModel* to *cross-connect*.
   - ⇒ Click to set *EncapsulationType* to *rfc1973*.
7. Click on *Insert* to add the interface to the WAN port and return to the *All Interfaces* window; then click on *Refresh*.

Configure the Subscriber Side

8. To configure:
   - ⇒ A subscriber port, double click on the port in the Shelf View to access its *Interface* window.
   - ⇒ A bundle, double click on a subscriber port that is part of that bundle to access its *Interface* window; then click on *Bundle*.
9. Click to set *NetModel* to *cross-connect*.
10. Click to set *EncapsulationType* to *rfc1973*.
11. Click on *Apply*. *per-vc* will appear in the *FwdMode* field.
12. If configuring an IDSL, SDSL, or T1 Line port, click on the *FR DLC* tab to configure the LMI mode for the port:
    - ⇒ Click to select *disable* in the *AdminState* field; then click on *Apply*.
    - ⇒ Select an LMI mode for the subscriber port or bundle by clicking in the *State* field; then click on *Apply*.
    - ⇒ To re-enable the circuit, click on *enable* in the *AdminState* field; then click on *Apply*.

    For more information on the fields in this window, see *FR DLC* Window in "*CopperView EM: Introduction*".



N O T E

Click on the Circuits tab to display frame relay circuits that have already been configured on the subscriber port or bundle.

13. In the subscriber port or bundle window suite, click on the *Sub Interface* tab. For each virtual circuit you add to the subscriber port or bundle:
    - ⇒ Click on the *Insert* button. The *Insert Sub Interface* window will display.
    - ⇒ Append the VCID of the new subscriber port circuit to the end of the index in the *PII* field. Range: 16 to 991, excluding 528 and 529.

⇒ Enter the PII of the target WAN port circuit (added in steps 2 through 4) in the *DestPII* field.

⇒ Enter a name to identify the connection in the *Name* field (optional).

⇒ If the circuit will carry voice traffic, click to set *Priority* to *high*. Otherwise, leave *Priority low* (default).

⇒ Click on *Insert* to add the circuit to the subscriber port or bundle and link it with the selected WAN port circuit.

14. Return to the WAN port window suite and click on the *All Interfaces* tab to display the *All Interfaces* window for the WAN port. Click on *Refresh* to check the interface. Ensure that the *FwdMode* field indicates *ppp-transparent* and the PII of the subscriber port or bundle circuit created in step 13 displays in the *DestPII* field.

15. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Cross-Connect NetModel, Voice and Data

Select the *Cross-Connect NetModel* to communicate voice and data through a subscriber port. The *Cross-Connect NetModel* creates two circuits on the subscriber port, one for data and another (VCID 22) for voice, and links them with two circuits on a selected WAN port.

Configure the WAN Side

1. Double click on the destination WAN port in the Shelf View to access that port's window suite; then click on the *Circuits* tab.

2. Click on the *Insert* button in the *Circuits* window. The *Insert Circuits* window will appear with the selected WAN port's PII automatically entered in the *IfIndex* field (frame relay WAN port) or *PII* field (ATM WAN port).

3. For a frame relay WAN port:

   ⇒ Enter a DLCI for the new circuit in the *Dlci* field.

   ⇒ Change the *CommittedBurst*, *ExcessBurst* and *Throughput* values as required.

   For an ATM WAN port:

   ⇒ Append a Virtual Channel Link (VCL) for the new circuit to the end of the index in the *PII* field.

   ⇒ Enter a Virtual Path Identifier for the circuit in the *Vpi* field.

   ⇒ Enter a Virtual Channel Identifier for the circuit in the *Vci* field.

N O T E S

- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so different Virtual Paths may use the same Vci without conflict.*

⇒ Click to set the circuit's *AdminStatus* to *up*.

⇒ Select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.

⇒ Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

⇒ Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.

N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

⇒ Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

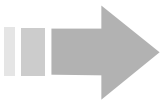
⇒ Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to add the circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.

5. Repeat steps 2 through 4 to create a circuit on the WAN port for voice communication.

Configure the Subscriber Side

6. Double click on a subscriber port in the Shelf View to access that port's window suite with the *Interface* window displayed.
7. Click in the *NetModel* field to select *cross-connect*; click in the *EncapsulationType* field to configure encapsulation for the subscriber port, and then click on *Apply*.
8. Click on the *Sub Interface* tab; when that window displays, click on *Insert* to add a data circuit to the subscriber port.
9. When the *Insert Sub Interface* window appears:
   - ⇒ Append the VCID of the data circuit that is being added to the subscriber port to the value in the *PII* field.
   - ⇒ Enter the PII of the target WAN port data circuit created in steps 2 through 4 in the *DestPII* field.
   - ⇒ Enter a name to identify the connection in the *Name* field (optional).
   - ⇒ Click on *Insert* to add the data circuit to the subscriber port and link that circuit with the WAN port data circuit.
10. Click on the *Interface* tab and when that window appears, click on the *Voice Circuit* button.
11. When the *DSL VC* window appears:
    - ⇒ Click in the *NetModel* field to select *cross-connect*.
    - ⇒ Enter a PII to select the target WAN port voice circuit created in step 5 in the *DestPII* field.
    - ⇒ Click in the *EncapsulationType* field to configure encapsulation on the voice circuit.
    - ⇒ Click on *Apply* to create the voice circuit on the subscriber port and link it with the WAN port voice circuit.
    - ⇒ Click on *Close* to exit the *DSL VC* window.

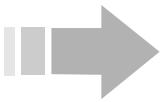


N O T E

The EM automatically configures the voice circuit as DLCI 22.

12. Return to the WAN port window suite and click on the *All Interfaces* tab to display the *All Interfaces* window for the WAN port. Click on *Refresh* to check the interfaces. Ensure that:
    - ⇒ The *FwdMode* field of both interfaces indicates *vc-vc-payload*.
    - ⇒ The *DestPII* field of the data circuit's interface displays the PII of the circuit configured in step 9.

⇒ The *DestPII* field of the voice circuit's interface displays the PII of the subscriber port selected in step 6, and DLCI 22.



N O T E

The WAN circuit interface is automatically created when the WAN port circuit is linked with a circuit on a subscriber port.

13. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Cross-Connect NetModel, PPP-HDLC-1973 Forwarding Mode

In this per-port forwarding mode, the DSL concentrator links each subscriber port or bundle with a virtual circuit on a WAN port (one WAN port virtual circuit for each subscriber port or bundle). The subscriber port is defined as a single logical interface that does not support virtual circuits. PPP-HDLC frames on the DSL link are converted to PPP-RFC1973 format on the WAN port circuit.

Configure the WAN Side

1. Double click on a WAN port in the Shelf View. When the WAN port window suite appears, click on the *Circuits* tab.
2. Click on *Insert* in the *Circuits* window. The *Insert Circuits* window will appear with the selected WAN port's PII automatically entered in the *IfIndex* field (frame relay WAN port) or *PII* field (ATM WAN port).
3. For a frame relay WAN port:

   ⇒ Enter a DLCI for the new circuit in the *Dlci* field.

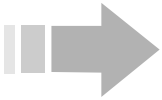
   ⇒ Change the *CommittedBurst*, *ExcessBurst* and *Throughput* values as required.

   For an ATM WAN port:

   ⇒ Append a Virtual Channel Link (VCL) for the new circuit to the end of the index in the *PII* field.

   ⇒ Enter a Virtual Path Identifier for the circuit in the *Vpi* field.

   ⇒ Enter a Virtual Channel Identifier for the circuit in the *Vci* field.



N O T E S

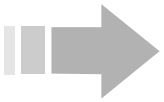
- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so different Virtual Paths may use the same Vci without conflict.*

⇒ Click to set the circuit's *AdminStatus* to *up*.

⇒ Select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.

⇒ Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

⇒ Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

⇒ Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

⇒ Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to add the circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.
5. Click on the *All Interfaces* tab and when that window appears, click on the *Insert* button.
6. Configure an interface for the WAN port circuit by completing the following fields in the *Insert All Interfaces* window:

   ⇒ Enter the PII of the WAN port circuit created in steps 2 through 4 in the *PII* field.

   ⇒ Click to set *NetModel* to *cross-connect*.

   ⇒ Click to set *EncapsulationType* to *rfc1973*.
7. Click on *Insert* to add the interface to the WAN port and return to the *All Interfaces* window; then click on *Refresh*.

Configure the Subscriber Side

8. To configure:

   ⇒ A subscriber port, double click on the subscriber port in the Shelf View to access its *Interface* window.

   ⇒ A bundle, double click on a subscriber port that is part of that bundle to access its *Interface* window; then click on *Bundle*.

9. Click to set *NetModel* to *cross-connect*.

10. Click to set *EncapsulationType* to *ppp-hdlc*.

11. Enter the PII of the destination WAN port circuit created in steps 2 through 4 in the *DestPII* field.

12. Click on *no* in the *CMCPCompatible* field.

13. Click on *Apply*. *ppp-hdlc-1973* will appear in the *FwdMode* field.

14. Return to the WAN port window suite and click on the *All Interfaces* tab to display the *All Interfaces* window for the WAN port. Click on *Refresh* to check the interface. Ensure that the *FwdMode* field indicates *ppp-hdlc-1973* and the *DestPII* field displays the PII of the subscriber port or bundle configured in steps 8 through 13.

15. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Cross-Connect NetModel, HDLC-VC-Payload Forwarding Mode

In this per-port forwarding mode, the DSL concentrator links each subscriber port or bundle with a virtual circuit on a WAN port (one WAN port virtual circuit for each subscriber port or bundle). The subscriber port is defined as a single logical interface that does not support virtual circuits. To configure *hdlc-vc-payload* forwarding mode, set encapsulation type to *none* on the WAN port interface, and to either *hdlc* or *ppp-hdlc* on the subscriber port or bundle. To convert PPP-HDLC frames (PPP (RFC1662) + PPP payload) on the DSL link to Cisco-PPP format on the WAN port circuit, select *hdlc*. To transparently forward PPP-HDLC frames, select *ppp-hdlc*.

Configure the WAN Side

1. Double click on a WAN port in the Shelf View. When the WAN port window suite appears, click on the *Circuits* tab.

2. Click on *Insert* in the *Circuits* window. The *Insert Circuits* window will appear with the selected WAN port's PII automatically entered in the *IfIndex* field (frame relay WAN port) or *PII* field (ATM WAN port).

3. For a frame relay WAN port:

   ⇒ Enter a DLCI for the new circuit in the *Dlci* field.

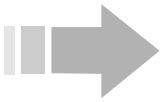
   ⇒ Change the *CommittedBurst*, *ExcessBurst* and *Throughput* values as required.

For an ATM WAN port:

⇒ Append a Virtual Channel Link (VCL) for the new circuit to the end of the index in the *PII* field.

⇒ Enter a Virtual Path Identifier for the circuit in the *Vpi* field.

⇒ Enter a Virtual Channel Identifier for the circuit in the *Vci* field.



N O T E S

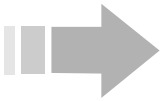
- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so different Virtual Paths may use the same Vci without conflict.*

⇒ Click to set the circuit's *AdminStatus* to *up*.

⇒ Select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.

⇒ Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

⇒ Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

⇒ Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

⇒ Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to add the circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.

Configure the Subscriber Side

5. To configure:

   ⇒ A subscriber port, double click on the subscriber port in the Shelf View to access its *Interface* window.

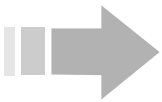
   ⇒ A bundle, double click on a subscriber port that is part of that bundle to access its *Interface* window; then click on *Bundle*.

6. Click to set *NetModel* to *cross-connect*.
7. Click to set *EncapsulationType* to:

   ⇒ *hdlc* (to translate PPP-HDLC frames arriving at the subscriber port to Cisco-PPP-ATM), or

   ⇒ *ppp-hdlc* (to forward PPP-HDLC frames without translation).

8. Enter the PII of the destination WAN port circuit created in steps 2 through 4 in the *DestPII* field.
9. Click on *no* in the *CMCPCompatible* field.
10. Click on *Apply*. *hdlc-vc-payload* will appear in the *FwdMode* field.
11. Return to the WAN port window suite and click on the *All Interfaces* tab to display the *All Interfaces* window for the WAN port. Click on *Refresh* to check the interface. Ensure that the *FwdMode* field indicates *hdlc-vc-payload* and the *DestPII* field displays the PII of the subscriber port or bundle configured in steps 6 through 10.



N O T E

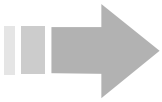
The WAN circuit interface is automatically created when the WAN port circuit is linked with a circuit on a subscriber port or bundle.

12. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Cross-Connect NetModel, WAN to WAN (Subtending)

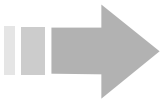
The WAN to WAN cross-connect *NetModel* allows you to use a CE200 DSL Concentrator to subtend another *CopperEdge* DSL Concentrator or a third-party ATM device that uses ATM traffic classes and AAL types that are supported on the CE200. The subscriber interfaces from both the master CE200 and the subtended device are aggregated onto a single ATM facility (DS3 ATM, T1/E1

IMA or OC-3c/STM-1) for transmission over the network. In this configuration, the master CE200 is transparent to the subtended device and has no provisioning or management function. The master CE200 treats the subtended device as if it were a subscriber interface, and the ATM WAN circuit on the CE200 used to connect to the subtended device is configured as if it were a subscriber interface.



N O T E

The SCM-1 system control module does not support WAN to WAN cross-connect due to memory constraints.



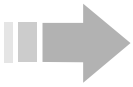
W A R N I N G

The EM will allow you to cross-connect any two WAN port virtual circuits on a CE200 DSL Concentrator, but this feature is only supported on ATM WAN ports.

Create the Two WAN Port Circuits

First, create two WAN port circuits, one to function as the inter-shelf trunk (IST) and connect to the subtended device, the other to connect to the upstream network:

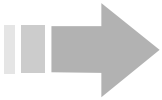
1. In the CE200 Shelf View, double click on the DS3 ATM, OC-3c/STM-1, or T1/E1 IMA WAN port that will connect to the subtended device.
2. Click on the *Circuits* tab and when that window appears, click on *Insert*.
3. In the *Insert Circuits* window, configure the following fields for the IST virtual circuit being added to the WAN port:
   - ⇒ The EM will automatically enter the PII of the selected ATM WAN port in the *PII* field. Append a VCL to identify the IST circuit.
   - ⇒ Enter a Virtual Path Identifier for the circuit in the *Vpi* field.
   - ⇒ Enter a Virtual Channel Identifier for the circuit in the *Vci* field.



N O T E S

- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so different Virtual Paths may use the same Vci without conflict.*

4. Click to set the circuit's *AdminStatus* to *up*.
5. Click to select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.
6. Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.
7. Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

8. Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.
9. Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.
10. Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.
11. Click on *Insert* to add the IST circuit to the ATM WAN port and return to the *Circuits* window; then click on *Refresh*.
12. Return to the CE200 Shelf View and double click on the DS3 ATM, OC-3c/STM-1, or T1/E1 IMA WAN port that will serve as the connection to the upstream network. Insert a circuit on this port to function as the "WAN side" circuit by repeating the procedure described in steps 2 through 11.

Cross-Connect the WAN Port Circuits

13. In the CE200 Shelf View, double click on the DS3 ATM, OC-3c/STM-1, or T1/E1 IMA WAN port on which you inserted the IST circuit that will connect to the subtended device.
14. Click on the *All Interfaces* tab and when that window appears, click on the *Insert* button.
15. Configure an interface between the IST circuit on the selected ATM WAN port and the "WAN side" circuit on the ATM WAN port that will connect to the network by completing the fields in the *Insert All Interfaces* window:

⇒ The EM will automatically enter the PII of the selected ATM WAN port in the *PII* field. Append the Virtual Channel Link (VCL) of the IST circuit created in steps 2 through 11.

⇒ Click in the *NetModel* field to select *cross-connect*.

⇒ Click in the *EncapsulationType* field to select *none*.

⇒ In the *DestPII* field, enter the PII of the ATM WAN port circuit created in step 12 that will connect to the upstream network (i.e., that will function as the "WAN side" of the interface).

16. Click on *Insert* to create the interface and return to the *All Interfaces* window.

17. Click on *Refresh* to check the interface created in steps 14 through 16. Ensure that the *FwdMode* field indicates *vc-vc-payload*, *EncapsulationType* is *none*, and the *DestPII* field displays the PII of the WAN port virtual circuit that is functioning as the "WAN side" of the interface.

18. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Dual NetModel

Dual NetModel is actually a feature that lets you use two different *NetModels* on a single subscriber port, rather than a *NetModel* in its own right. The *Dual NetModel* feature allows you to configure a subscriber port with one *NetModel*, and configure a virtual circuit on that port (VCID 22) with a different *NetModel* to carry delay-sensitive, high-priority traffic, such as voice and video.

Configure the subscriber port in its *Interface* window with any supported *NetModel*, then click on the *Voice Circuit* button at the bottom of the window to display the *DSL VC* window for the VCID 22 "voice" circuit. This circuit can be configured with any supported *NetModel* except *VWAN*. However, the *IP NetModel* is mutually exclusive on a subscriber port and its VCID 22 voice circuit. The EM will display an error message if you attempt to configure both the subscriber port and the voice circuit with the *IP NetModel*.

To configure a subscriber port for *Dual NetModel*:

1. Double click on a subscriber port in the Shelf View. The window suite for that port will open with its *Interface* window displayed.

2. Enter data in the required fields in the *Interface* window to configure the port to a desired *NetModel*. Refer to the applicable procedure in this chapter for *NetModel* configuration. Note that the *hdlc* and *ppp-hdlc EncapsulationTypes* are not supported by *Dual NetModel*, because they define the subscriber port as a single logical interface that does not support virtual circuits.

3. Click on the *Voice Circuit* button in the subscriber port's *Interface* window to access the *DSL VC* window for the VCID 22 circuit.
4. Configure the following fields in the *DSL VC* window to configure circuit VCID 22:
   - ⇒ **NetModel:** Click to select the desired *NetModel*.
   - ⇒ **IpAddr:** Enter an IP address to assign it to the circuit if the selected *NetModel* is *ip*.
   - ⇒ **NetMask:** Enter a *NetMask* to assign it to the circuit if the selected *NetModel* is *ip*.
   - ⇒ **DestPII:** If the circuit is being configured for the *Policy IP*, *Cross-Connect*, or *CopperVPN NetModel*, enter the PII of the destination WAN port circuit.
   - ⇒ **EncapsulationType:** Click to select the appropriate encapsulation type for the circuit.
5. Click on *Apply*; then click on *Close*.
6. Click on *Save to NVRAM* in the EM tool bar to save the configuration file to the DSL concentrator's nonvolatile memory.

IP NetModel

There are two types of *IP NetModel*: Full IP routing and Policy IP routing. With the *IP NetModel* and *fullIP* forwarding mode, the DSL concentrator routes both inbound and outbound packets according to the IP address of their origination and destination devices. With the *IP NetModel* and *policyIP* forwarding mode, the DSL concentrator routes inbound packets according to the IP address of the origination device, but outbound packets, regardless of IP address, are forwarded to a designated interface on the DSL Concentrator. The designated interface can be a WAN port virtual circuit or an Ethernet port.

The *IP NetModel* is supported on subscriber ports, bundles of subscriber ports, Ethernet ports, and WAN port virtual circuits. However, Ethernet ports and WAN port virtual circuits only support the *fullIP* forwarding mode.

Full IP Routing

Full IP routing allows packets to be exchanged and routed over the network based on their destination IP address. Packets from WAN or Ethernet interfaces configured with the *IP NetModel* are always *fullIP* routed.

Configure a WAN port VC

To configure a WAN port VC with the *IP NetModel* and *fullIP* forwarding mode:

1. Double click on a WAN port in the Shelf View. When the WAN port window suite appears, click on the *Circuits* tab.
2. Click on *Insert* in the *Circuits* window. The *Insert Circuits* window will appear with the selected WAN port's PII automatically

entered in the *IfIndex* field (frame relay WAN port) or *PII* field (ATM WAN port).

3. For a frame relay WAN port:

   ⇒ Enter a DLCI for the new circuit in the *Dlci* field.

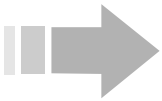
   ⇒ Change the *CommittedBurst*, *ExcessBurst* and *Throughput* values as required.

   For an ATM WAN port:

   ⇒ Append a Virtual Channel Link (VCL) for the new circuit to the end of the index in the *PII* field.

   ⇒ Enter a Virtual Path Identifier for the circuit in the *Vpi* field.

   ⇒ Enter a Virtual Channel Identifier for the circuit in the *Vci* field.



N O T E S

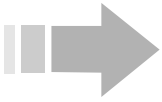
- *Do not use Vci values 0-31. These values are reserved for path management functions. [Take this note out if they change the software so you can't set Vci to 0-31]*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so different Virtual Paths may use the same Vci without conflict.*

   ⇒ Click to set the circuit's *AdminStatus* to *up*.

   ⇒ Select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.

   ⇒ Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

   ⇒ Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

   ⇒ Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a

response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

⇒ Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to add the circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.
5. Click on the *All Interfaces* tab and when that window appears, click on the *Insert* button.
6. Configure an interface for the WAN port circuit by completing the following fields in the *Insert All Interfaces* window:

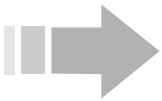
⇒ Enter the PII of the WAN port circuit created in steps 2 through 4 in the *PII* field.

⇒ Click to set *NetModel* to *ip*.

⇒ Enter the IP address for the device at the far (upstream) end of the circuit in the *FarEndAddr* field.

⇒ Click to set the circuit's *EncapsulationType* to *rfc1483* for ATM WAN modules, or to *rfc1490* for frame relay WAN modules.

7. Click on *Insert* to add the interface to the WAN port and return to the *All Interfaces* window; then click on *Refresh*. *fullIP* will appear in the *FwdMode* field for the interface, and its *NetMask* will be 255.255.255.255.
8. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.



N O T E

You can add an IP route to the DSL concentrator's routing table, with NextHop equal to the FarEndAddr of the WAN port interface, or simply use the default IP route (see "Viewing and Configuring IP Routes" on page 58*).*

Configure a Subscriber Port

To configure a subscriber port or bundle with the *IP NetModel* and *fullIP* forwarding mode:

1. To configure:

⇒ A subscriber port, double click on the port in the Shelf View to access its *Interface* window.

⇒ A bundle of subscriber ports, double click on a port that is part of that bundle to access its *Interface* window; then click on *Bundle* in the port's *Interface* window.

2. Click to set *NetModel* to *ip*.
3. Enter an IP address for the port or bundle in the *IpAddr* field.
4. Enter a subnet mask for the port or bundle in the *NetMask* field.
5. Click to select an *EncapsulationType* of *rfc1483* or *rfc1490*.
6. Click on *Apply*. *fullIP* will appear in the *FwdMode* field.
7. Return to the WAN port window suite and click on the *All Interfaces* tab to display the *All Interfaces* window for the WAN port. Click on *Refresh* to check the interface. *fullIP* will appear in the *FwdMode* field for the WAN port interface. Click in the *Aggregated PIIs* field to check that the PII of the subscriber port or bundle configured in steps 5 through 10 is displayed.
8. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Configure an Ethernet Port

To configure an Ethernet port with the *IP NetModel* and *fullIP* forwarding mode:

1. Double click on an Ethernet port in the Shelf View. The *Ethernet Port* window suite will appear with the *Interface* window displayed.
2. Click to select *ip* in the *NetModel* field.
3. If required, enter the IP address for the Ethernet port in the *IpAddr* field.
4. If required, enter a subnet mask for the Ethernet port in the *NetMask* field.
5. The EM automatically sets an *EncapsulationType* of *none*. Click on *Apply*. *fullIP* will appear in the *FwdMode* field.

Policy IP Routing to a WAN Port Virtual Circuit

Use the *policyIP* forwarding mode to link subscriber ports, or bundles of subscriber ports, with a specific virtual circuit on a WAN port. During policy-based IP routing, the DSL concentrator will not consult a routing table to forward received packets. Instead, all inbound packets that have not been specifically addressed to the subscriber port or bundle's own IP address will be forwarded to the WAN port virtual circuit identified in the *DestPII* field of the subscriber port or bundle's *Interface* window.

Configure the WAN Side

1. Double click on a WAN port in the Shelf View. When the WAN port window suite appears, click on the *Circuits* tab.

2. Click on *Insert* in the *Circuits* window. The *Insert Circuits* window will appear with the selected WAN port's PII automatically entered in the *IfIndex* field (frame relay WAN port) or *PII* field (ATM WAN port).
3. For a frame relay WAN port:

   ⇒ Enter a DLCI for the new circuit in the *Dlci* field.

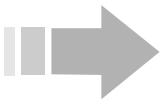
   ⇒ Change the *CommittedBurst*, *ExcessBurst* and *Throughput* values as required.

   For an ATM WAN port:

   ⇒ Append a Virtual Channel Link (VCL) for the new circuit to the end of the index in the *PII* field.

   ⇒ Enter a Virtual Path Identifier for the circuit in the *Vpi* field.

   ⇒ Enter a Virtual Channel Identifier for the circuit in the *Vci* field.



N O T E S

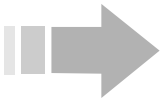
- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so different Virtual Paths may use the same Vci without conflict.*

   ⇒ Click to set the circuit's *AdminStatus* to *up*.

   ⇒ Select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.

   ⇒ Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

   ⇒ Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

⇒ Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

⇒ Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to add the circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.

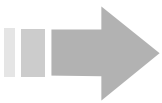
Configure the Subscriber Side

5. To configure:

   ⇒ A subscriber port, double click on the port in the Shelf View to access its *Interface* window.

   ⇒ A bundle of subscriber ports, double click on a port that is part of that bundle to access its *Interface* window; then click on *Bundle* in the port's *Interface* window.

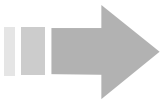
6. Click to set the *NetModel* to *ip*.
7. Enter an IP address for the port or bundle in the *IpAddr* field.
8. Enter a subnet mask for the port or bundle in the *NetMask* field.
9. Enter the PII of the destination WAN port virtual circuit created in steps 2 through 4 in the *DestPII* field.
10. Click to set the port or bundle's *EncapsulationType* to *rfc1483* or *rfc1490*.
11. Click on *Apply*. *policyIP* will appear in the *FwdMode* field.
12. Return to the WAN port window suite and click on the *All Interfaces* tab to display the *All Interfaces* window for the WAN port. Click on *Refresh* and check the WAN interface. *fullIP* will appear in the *FwdMode* field. Click in the *Aggregated PIIs* field to check that the PII of the subscriber port or bundle configured in steps 5 through 11 is displayed.



N O T E

The WAN interface is created automatically when the subscriber port or bundle is configured with the WAN circuit's PII as its destination in the DestPII field.

13. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.



N O T E

You can assign IP addresses to either end of a WAN port virtual circuit configured with the IP NetModel, if desired. Double click on the WAN port and select the Circuits tab. Click on the circuit to select it; then click on Edit Interface to display the Circuit window. In the FarEndAddr field, enter an IP address for the device at the far (upstream) end of the circuit. You can also enter an IP address for the DSL concentrator end of the WAN port virtual circuit in the IpAddr field, though this is normally not necessary.

Policy IP Routing to an Ethernet Port

You can configure subscriber ports for Policy IP routing to an Ethernet port on the DSL concentrator, and link each subscriber port to a different far end address on the Ethernet interface. In this mode, the DSL concentrator forwards all inbound subscriber packets that have not been addressed to the subscriber port's own IP address to the Ethernet port and from there, to the next hop IP address specified in the *FarEndAddr* field of the port's *Interface* window.

Configure the Ethernet Port

To configure an Ethernet port for Policy IP over Ethernet:

1. Double click on an Ethernet port in the Shelf View. The *Ethernet Port* window suite will appear with the *Interface* window displayed.
2. Click to select *ip* in the *NetModel* field.
3. If required, enter the IP address for the Ethernet port in the *IpAddr* field.
4. If required, enter a subnet mask for the Ethernet port in the *NetMask* field.
5. Click on *Apply*. *fullIP* will appear in the *FwdMode* field.

Configure the Subscriber Side

6. To configure:

   ⇒ A subscriber port for *policyIP* routing to an Ethernet port, double click on the subscriber port in the Shelf View to access its *Interface* window.

   ⇒ A bundle of subscriber ports for *policyIP* routing to an Ethernet port, double click on a subscriber port that is part of that bundle to access its *Interface* window; then click on *Bundle* in the port's *Interface* window.

7. Click to set *NetModel* to *ip*.
8. Enter an IP address for the port or bundle in the *IpAddr* field.

9. Enter a subnet mask for the port or bundle in the *NetMask* field.
10. Enter the IP address of the next hop on the Ethernet subnet in the *FarEndAddr* field.
11. Enter the PII of the Ethernet port configured in steps 2 through 5 in the *DestPII* field.
12. Click to set *EncapsulationType* to *rfc1483* or *rfc1490*.
13. Click on *Apply*. *policyIP* will appear in the *FwdMode* field.
14. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

VWAN NetModel

The VWAN *NetModel* allows you to link a single subscriber port to a single WAN port virtual circuit or Ethernet port in point-to-point mode, or aggregate many subscriber ports into a single virtual bridge, all with the same WAN port virtual circuit or Ethernet port as the destination PII. VWAN links require that an IRB-capable router with a compatible operating system (IOS) be installed at the far end of the upstream link.

VWAN over Ethernet functions as a point-to-point link to a single router, and there can be no other device on the LAN. When an Ethernet port is configured for VWAN, you cannot specify an IP address for the router; instead, the DSL concentrator learns the MAC address of the router from the received packet stream.

VWAN Point-to-Point

VWAN Point-to-Point Over WAN

To set up a VWAN point-to-point link between a subscriber port and a WAN port virtual circuit, follow these steps:

Configure the WAN side:

1. Double click on a WAN port in the Shelf View. When the WAN port window suite appears, click on the *Circuits* tab.
2. Click on *Insert* in the *Circuits* window. The *Insert Circuits* window will appear with the selected WAN port's PII automatically entered in the *IfIndex* field (frame relay WAN port) or *PII* field (ATM WAN port).
3. For a frame relay WAN port:

   ⇒ Enter a DLCI for the new circuit in the *Dlci* field.

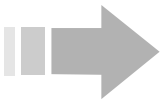
   ⇒ Change the *CommittedBurst*, *ExcessBurst* and *Throughput* values as required.

   For an ATM WAN port:

   ⇒ Append a Virtual Channel Link (VCL) for the new circuit to the end of the index in the *PII* field.

   ⇒ Enter a Virtual Path Identifier for the circuit in the *Vpi* field.

⇒ Enter a Virtual Channel Identifier for the circuit in the *Vci* field.



N O T E S

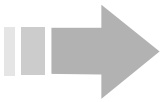
- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*
- *The ATM cell address mechanism uses both the Virtual Path Identifier and the Virtual Channel Identifier, so different Virtual Paths may use the same Vci without conflict.*

⇒ Click to set the circuit's *AdminStatus* to *up*.

⇒ Select a *TransmitTrafficDescrIndex* to determine the circuit's ATM traffic parameters.

⇒ Click in the *AalType* field to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

⇒ Click in the *OAMAutoLBState* field to enable periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection. When this feature is *enabled*, the DSL concentrator sends *F5End2End* loopback requests after each *OAMLBInterval*. If no response is received within *OAMLBTimeOut*, *OAMState* changes to *loopbackFailure*.



N O T E

Click on the OAM tab to access the OAM window and view or change a port or circuit's OAM configuration.

⇒ Enter a value in the *OAMLBInterval* field to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ Enter a value in the *OAMTimeout* field to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

⇒ Click in the *OAMAdminState* field to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

4. Click on *Insert* to add the circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.

Configure the subscriber side:

5. To configure:

   ⇒ A subscriber port, double click on the port in the Shelf View to access its *Interface* window.

   ⇒ A bundle of subscriber ports, double click on a subscriber port that is part of that bundle to access its *Interface* window; then click on *Bundle* in the port's *Interface* window.

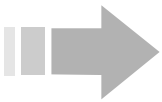
6. Click to set *NetModel* to *vwan*.

7. Click to set *EncapsulationType* to *rfc1483* or *rfc1490*.

8. Enter the PII of the destination WAN port virtual circuit created in steps 2 through 4 in the *DestPII* field.

9. Click on *Apply*. *vwan-pp* will appear in the *FwdMode* field.

10. Return to the WAN port window suite and click on the *All Interfaces* tab to display the *All Interfaces* window for the WAN port. Click on *Refresh* to check the interface. Ensure that the *FwdMode* field indicates *vwan-pp* and the *DestPII* field displays the PII of the subscriber port or bundle configured in steps 5 through 9.



N O T E

The WAN circuit interface is automatically created when the WAN port circuit is linked with a circuit on a subscriber port or bundle.

11. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

VWAN Point-to-Point Over Ethernet

To set up a VWAN point-to-point link between a subscriber port and an Ethernet port, follow these steps:

Configure the Ethernet port side:

1. Double click on an Ethernet port in the Shelf View. The *Ethernet Port* window suite will appear with the *Interface* window displayed.

2. Click to select *vwan* in the *NetModel* field.

3. If the Ethernet port will also be used for system management, enter its IP address in the *IpAddr* field.

4. If the Ethernet port will also be used for system management, enter its subnet mask in the *NetMask* field.

5. Click on *Apply*. Note that *vwan-bridge* will appear in the *FwdMode* field, even when there is only one subscriber port linked with the Ethernet port.

Configure the subscriber side:

6. To configure:

   ⇒ A subscriber port, double click on the port in the Shelf View to access its *Interface* window.

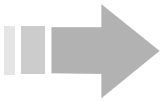
   ⇒ A bundle of subscriber ports, double click on a subscriber port that is part of that bundle to access its *Interface* window; then click on *Bundle* in the port's *Interface* window.

7. Click to set *NetModel* to *vwan*.

8. Click to set *EncapsulationType* to *rfc1483* or *rfc1490*.

9. Enter the PII of the Ethernet port configured in steps 2 through 5 in the *DestPII* field.

10. Click on *Apply*. Note that *vwan-bridge* will appear in the *FwdMode* field, even when there is only one subscriber port linked with the Ethernet port.



N O T E

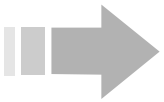
The WAN circuit interface is automatically created when the WAN port circuit is linked with a circuit on a subscriber port or bundle.

11. Click on *Save to NVRAM* to save the updated configuration file to the DSL concentrator's nonvolatile memory.

VWAN Bridge

To link multiple subscriber ports with a single WAN port virtual circuit or Ethernet port, first create a VWAN point-to-point connection as described in "VWAN Point-to-Point" on page 152. Configure one or more additional subscriber ports with the *vwan NetModel* and the same *DestPII* to create a VWAN bridge. The *FwdMode* of all subscriber ports or bundles linked with the WAN port virtual circuit or Ethernet port will indicate *vwan-bridge*, as will the *FwdMode* of the destination interface.

To display the PIIs of all subscriber ports or bundles that have been linked with a selected WAN port virtual circuit in the *VWAN Bridge NetModel*, go to the *All Interfaces* window for the WAN port and click in the circuit's *Aggregated PIIs* field.



N O T E

In Release 7.0, the HDIA NetModel has been superseded by the CopperVPN NetModel. The functionality provided by the HDIA NetModel is supported for backward compatibility, and the configuration procedure is described below. However, HDIA configurations, when saved, are automatically upgraded to the new CopperVPN format.

Use *hdia* to create subnets in your network, and divide those subnets into smaller groups (subordinate level subnets) by assigning groups of IP addresses to the subscriber ports in your subnets. The *HDIA NetModel* supports Interactive Access Devices (IADs) by enabling operation of a separate data circuit (VCID 528) and voice circuit (VCID 22) on your subscriber ports. The DSL concentrator will forward packets between WAN port circuits and subscriber port circuits.

The following restrictions apply when configuring the *HDIA NetModel*:

- Isolate *hdia* data circuits from voice circuits by configuring them on different subnets. Configure data subnet to include the default router, the WAN port data circuit, subscriber port data circuits, and hosts. Configure the voice subnet to include the voice gateway, the WAN port voice circuit, subscriber port voice circuits, and an Ethernet port and Local Trunk Gateway if they are included.
- Configure WAN port circuits before configuring subscriber port circuits.
- On a DS3 ATM or OC-3c/STM-1 port, configure *EncapsulationType* for both data circuit and voice circuit to *rfc1483*.
- Configure data port circuits before configuring voice port circuits.
- If an Ethernet port is included, its *EncapsulationType* will be *none*.
- Subscriber port data circuits are automatically configured on VCID 528. Configure their *EncapsulationType* to *rfc1483*.
- Subscriber port voice circuits are automatically configured on VCID 22. Configure their *EncapsulationType* to *ip-1490*.

The procedure for configuring the *HDIA NetModel* consists of:

1. Configuring WAN port circuits:

   ⇒ Configure the data circuit.

⇒ Configure the voice circuit.

⇒ Configure the WAN port voice gateway type and voice gateway IP address.

2. Configuring an Ethernet port (if a Local Trunk Gateway is included in your network).
3. Configuring subscriber port circuits:

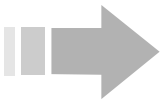
⇒ Configure the data circuit.

⇒ Configure the voice circuit.

⇒ Configure *JitterSpeedTradeoff* and voice channels.

⇒ Select voice ports on the IAD.

4. Configuring DHCP *PlugAndPlay* values to download an IP address and NetMask to the IAD in response to a DHCP request; if required, delete IP addresses currently stored in the IAD to ensure that the IAD will request the new addresses.
5. Restarting the IAD.



N O T E

An example of how to configure an HDIA NetModel is provided in "Example" on page 165.

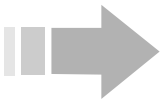
Configure WAN Port Circuits

1. Double click on a DS3 ATM port or an OC-3c/STM-1 port to access the WAN port's window suite; then click on the *Circuits* tab.
2. Click on the *Insert* button in the *Circuits* window and configure each field of the *Insert Circuits* window:

⇒ **PII:** The PII of the WAN port will be automatically entered by the EM. Append a Virtual Channel Link to identify the data circuit.

⇒ **Vpi:** Enter a Virtual Path Identifier for the circuit.

⇒ **Vci:** Enter a Virtual Channel Identifier for the circuit.



N O T E S

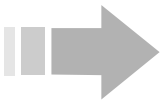
- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*

⇒ **AdminStatus:** Click to configure the circuit's *AdminStatus* to *up*.

⇒ **TransmitTrafficDescrIndex:** Click on the arrow to the right of this field to select the *Index* for the set of ATM traffic parameters to assign to the circuit.

⇒ **AalType:** Click to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

⇒ **OAMAutoLBState:** Click to *enable* periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection.



N O T E

Access the OAM window to view or change a port or circuit's OAM configuration.

⇒ **OAMLBInterval:** Enter a value to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

⇒ **OAMTimeout:** Enter a value to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

⇒ **OAMAdminState:** Click to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

3. Click on *Insert* to add the data circuit to the WAN port and return to the WAN port's *Circuits* window; then click on *Refresh*.
4. Click on the *All Interfaces* tab and when that window appears, click on the *Insert* button.
5. Configure the following *Insert All Interfaces* window fields:

   ⇒ **PII:** Enter the same PII and Virtual Channel Link used in step 2.

   ⇒ **NetModel:** Select *hdia*.

   ⇒ **IpAddr:** Enter the IP address of the data subnetwork (host=0).

   ⇒ **NetMask:** Enter a *NetMask* that is appropriate to the data subnet. (See "Configuring HDIA NetMasks" on page 163 for more information.)

   ⇒ **FarEndAddr:** Enter the IP address of the default router. The IP address you enter in the *FarEndAddr* field must be part of the same subnet as the IP address entered in the *IpAddr* field.

   ⇒ **EncapsulationType:** Select *rfc1483*.

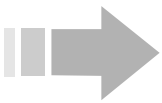
6. Click on *Insert* to add the interface to the WAN port and return to the *All Interfaces* window; then click on *Refresh*.

7. Click on the *Circuit* tab and when that window appears, click on the *Insert* button. The *Insert Circuits* window will appear.
8. Configure each field of the *Insert Circuits* window:

   ⇒ **PII:** The PII of the WAN port will be automatically entered by the EM. Append a Virtual Channel Link to identify the voice circuit.

   ⇒ **Vpi:** Enter a Virtual Path Identifier for the circuit.

   ⇒ **Vci:** Enter a Virtual Channel Identifier for the circuit.



N O T E S

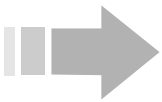
- *Do not use Vci values 0-31. These values are reserved for path management functions.*
- *The circuit identified as Vpi 0, Vci 511 is reserved for ATM link management and loopback testing.*

   ⇒ **AdminStatus:** Click to configure the circuit's *AdminStatus* to *up*.

   ⇒ **TransmitTrafficDescrIndex:** Click on the arrow to the right of this field to select the *Index* for the set of ATM traffic parameters to assign to the circuit.

   ⇒ **AalType:** Click to select *aal5* for standard AAL5 PDU format, *other* for AAL5 trailer suppression, or *unknown* for AAL0.

   ⇒ **OAMAutoLBState:** Click to *enable* periodic generation of loopback request cells if you wish to continuously monitor the condition of the circuit connection.



N O T E

Access the OAM window to view or change a port or circuit's OAM configuration.

   ⇒ **OAMLBInterval:** Enter a value to determine how long the DSL concentrator will wait for a response to a loopback request cell before generating another loopback request cell. Range: 1 to 999 seconds; Default: 5.

   ⇒ **OAMTimeout:** Enter a value to determine the timeout for transmitted loopback cells. This value must be greater than the value in the *OAMLBInterval* field. Range: 1 to 999 seconds; Default: 15.

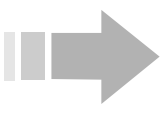
   ⇒ **OAMAdminState:** Click to *enable* or *disable* OAM for the selected circuit. When OAM is disabled, OAM cells will not be generated by the DSL concentrator and any received OAM cells will be discarded.

9. Click on *Insert* to add the voice circuit to the WAN port and return to the *Circuits* window; then click on *Refresh*.
10. Click on the *All Interfaces* tab and when that window appears, click on the *Insert* button.
11. Configure the following fields of the *Insert All Interfaces* window to add an interface for the circuit added in step 9.
    - ⇒ **PII:** Enter the same PII and Virtual Channel Link used in step 8.
    - ⇒ **NetModel:** Select *hdia*.
    - ⇒ **IpAddr:** Enter the IP address of the voice subnetwork (host=0).
    - ⇒ **NetMask:** Enter a *NetMask* that is appropriate to the voice subnet. (See "Configuring HDIA NetMasks" on page 163 for more information.)
    - ⇒ **FarEndAddr:** Enter the IP address of the voice gateway. The IP address you enter in the *FarEndAddr* field must be part of the same subnet as the IP address entered in the *IpAddr* field.
    - ⇒ **EncapsulationType:** Select *rfc1483*.
12. Click on *Insert* to add the interface to the WAN port and return to the *All Interfaces* window; then click on *Refresh*.
13. Click on the *Circuits* tab, and when that window appears, click to select the voice circuit added in step 9; then click on *Edit Voice* to access the *Wan VC* window.
14. Click in the *VoiceGatewayType* field to select the voice gateway type, and enter the IP address of the voice gateway (previously entered in the *FarEndAddr* field in step 11) in the *VoiceGatewayIpAddr* field.
15. Click on *Apply* and *Close* to return to the WAN port *Circuits* window.
16. Click on *Save to NVRAM* to save the new WAN port circuit configurations to the DSL concentrator's nonvolatile memory.

Configure an Ethernet Port

A voice subnet may include an Ethernet port as a link with a Local Trunk Gateway. Configure the Ethernet port as described in the following paragraphs.

1. Double click on an Ethernet port to access its window suite with its *Interface* window displayed.



N O T E

When an Ethernet port is included in an hdia group, it can not be used for system management.

2. Configure the following fields in the Ethernet port *Interface* window:

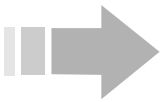
⇒ **NetModel:** Click to select *hdia*.

⇒ **IpAddr:** Enter an IP address for port that is consistent with the voice subnet.

⇒ **NetMask:** Enter a NetMask that is appropriate to the voice subnet.

⇒ **DestPII:** Enter the PII of the WAN port voice circuit.

3. Click on *Apply*.



N O T E

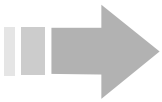
An Ethernet port can be configured as a DSL-side connection in a voice subnet or data subnet. When an Ethernet port is added to an hdia subnet, if the subnet has not been assigned to data or voice, the Ethernet port will default to voice. Then when a DSL circuit is added to the subnet, the Ethernet port will conform with whichever subnet the DSL circuit is assigned. The most common use for Ethernet ports is in the voice subnet to support a Local Trunk Gateway.

Configure Subscriber Port Circuits

1. Double click on a subscriber port that is connected to an IAD to access the subscriber port's window suite with its *Interface* window displayed.
2. Configure the following parameters in the subscriber port's *Interface* window to create a data circuit:

⇒ **NetModel:** Select *hdia*.

⇒ **IpAddr:** Enter the first IP address from the range of IP addresses assigned to the data (subordinate) subnet.



N O T E

See "Configuring HDIA NetMasks" on page 163 *for a description of hdia NetMask entries.*

⇒ **NetMask:** Enter a *NetMask* entry to determine the range of IP addresses assigned to the data (subordinate) subnet.

⇒ **DestPII:** Enter the PII of the previously created WAN port data circuit.

⇒ **EncapsulationType:** Select *rfc1483*.

3. Ensure that *AdminStatus* is configured to *up* and click on *Apply* to configure the data circuit on the subscriber port.
4. Click on the *Voice Circuit* button in the *Interface* window.
5. Configure the following parameters in the *DSL VC* window to create a voice circuit.

⇒ **NetModel:** Select *hdia*.

⇒ **IpAddr:** Enter the IP address of the IAD to be connected to the voice circuit.

⇒ **NetMask:** Enter `255.255.255.255` as the *Netmask*, since only one host (IAD) will be connected to the subscriber port voice circuit.

⇒ **DestPII:** Enter the PII of the previously created WAN port voice circuit.

⇒ **EncapsulationType:** Select *ip-1490*.

6. When all voice circuit parameters have been entered correctly, click on *Apply* to configure the voice circuit on the subscriber port. The EM will query to ascertain if you wish to configure DHCP information. Click on *Yes*.

7. When the *DHCP* window appears, configure the following values.

⇒ **DHCPIpAddress:** Enter an IP address that is consistent with the voice subnet that will be issued to the IAD when a DHCP request is received.

⇒ **DHCPNetMask:** Enter a *NetMask* appropriate to the voice subnetwork that will be issued to the IAD when a DHCP request is received.

⇒ **DHCPDefaultRouter:** Enter a Default Router IP address that will be issued to the IAD when a DHCP request is received.

⇒ **DHCPDNSServer:** Enter a DNS server IP address that will be issued to the IAD when a DHCP request is received.

8. Click on *Apply* to enter the newly configured data in the DSL concentrator's DHCP table. Then click on *Close* in the *DHCP* window to return to the *DSL VC* window.

9. Click on *Close* to exit the *DSL VC* window.

10. Click on the *CPE Configuration* tab in the subscriber port window suite.

11. Configure the following voice channel parameters in the *CPE Configuration* window:

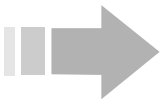
⇒ **MaxVoiceChannels:** Enter the maximum number of voice lines (0 to 255) that the CPE will allow. The value 255 indicates that there is no restriction. Default: 255.

⇒ **JitterSpeedTradeoff:** Click to determine the level of jitter control applied to the subscriber port. There is a trade-off between jitter control and DSL line efficiency; reducing jitter control allows a slightly higher effective DSL speed. *fullSpeedDataOnly* completely removes jitter control and is suitable only for ports carrying only non-real-time traffic. *maxJitterAndSpeed*,

optJitterAndSpeed and *minJitterAndSpeed* apply progressively more jitter control so each level slightly lowers the effective DSL speed.

The DSL concentrator translates the selected *JitterSpeedTradeoff* into a *CpeJitterTarget* value in milliseconds and sends that value to the CPE as a *PlugandPlay* parameter. The DSL concentrator will send the following values based on the selected *JitterSpeedTradeoff*:

JitterSpeedTradeoff	CpeJitterTarget (ms)
fullSpeedDataOnly (default)	no jitter control (specified as 0)
maxJitterAndSpeed	15
optJitterAndSpeed	10
minJitterAndSpeed	5



N O T E

Jitter control is achieved through frame fragmentation for frame-based interfaces.

12. Click on *Apply* to enter the updated values.
13. Click on the *CPE* button in the *CPE Configuration* window. A *CPE* window group will appear with the *CPE* window displayed.
14. Click on the *IAD* tab to access that window and click in the *Choose Voice Port(s)* field to select voice ports that will communicate through the subscriber port voice circuit.
15. Check the *CurrentIpAddr*, *CurrentCAIpAddr*, *SavedIpAddr* and *SavedCAIpAddr* fields and ensure that they have the indicated values. If the fields do not display the identified values, click to issue the *savedIpAddrErase* command.
    - ⇒ *CurrentIpAddr* and *SavedIpAddr* display 0.0.0.0 or they display the IP address assigned to the subscriber port voice circuit in step 5.
    - ⇒ *CurrentCAIpAddr* and *SavedCAIpAddr* fields display 0.0.0.0 or they display the IP address assigned to the voice gateway.
16. Click on *Apply*.
17. Click on the *CPE* tab of the *CPE* window suite; click on *restart* in the *Command* field and then click on *Apply* to restart the CPE and generate a DHCP request from the IAD to the DSL concentrator.
18. When the CPE restart has completed, click on *Save to NVRAM* in the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Configuring HDIA NetMasks

The *HDIA NetModel* allows you to configure a DSL concentrator so it will divide an existing subnetwork into smaller segments (subor-

dinate subnets). Thus, when you are configuring *hdia*, you are actually dealing with two levels of subnets.

Top Level Subnet: When configuring the voice and data circuit on the WAN port, apply the netmask that identifies the subnet to which the DSL concentrator's WAN interface belongs. When configuring this level of subnet, use the same netmask that you use for other devices on that subnet (upstream router, voice gateway and hosts).

Subordinate Level Subnet: The *HDIA NetModel* does not apply netmasks to subordinate level subnets the same way they are applied in traditional networks. For that reason, the subordinate level netmask is referred to as "netmask entry" instead of "netmask" in this text. The netmask entry that you apply to a subscriber port will assign a specific number of IP addresses from the top level subnet, thus creating a subordinate level subnet on that subscriber port. The IP address you assign to a subscriber port determines which block of IP addresses will be assigned to that subordinate level subnet.

Netmasks entries that you apply to the subordinate subnet level are unique to the *HDIA NetModel*. These netmask entries only apply to subscriber ports. They are not common to any other device on the subnet, or to other subscriber ports. In fact, these netmask entries may be different for each subscriber port.

When you further divide a subnet using the *HDIA NetModel*, all of the subordinate subnets that you assign to subscriber ports must be included in the subnet you identify on the WAN port (the top level subnet). If the WAN port subnet has a capacity of 128 hosts, for example, the sum of all subordinate level subnet hosts cannot exceed 128.

Subordinate Subnet Configuration

When configuring a subordinate level subnet on a subscriber port, the netmask entry you assign to a subscriber port will determine the number of hosts that can be supported on that subordinate level subnet. The IP address that you assign to the subscriber port will determine which block of IP addresses can be used on that subordinate subnet. Refer to Table 1 for the number of subordinate subnets, hosts, and the allowable blocks of IP addresses that can be used with each netmask entry.

Important Considerations

- Determine the total number of hosts that will exist on a subordinate subnet before you create that subnet; then assign a netmask entry and IP addresses to accommodate all of those hosts. If initially the subordinate subnet will only include four hosts, but eventually it will include 10 hosts, assign a 16-host netmask entry, which will support all 10 hosts (`255.255.255.240`). This will leave 6 addresses unused, but will save you from having to assign a new netmask entry in the DSL concentrator and new IP addresses to all of the hosts on that subordinate subnet as it expands.

- The IP address you enter in a subscriber port's *IpAddr* field is not assigned to that subscriber port. Instead, it identifies the first IP address of the block of IP addresses that are assigned to that subordinate subnet.
- Ensure that a block of IP addresses is not assigned to subordinate subnets on different subscriber ports. If the IP address block `[XXX.XXX.XXX.0 - XXX.XXX.XXX.3]` is assigned to one subordinate subnet, for example, you cannot assign IP address block `[XXX.XXX.XXX.0 - XXX.XXX.XXX.16]` to another subordinate subnet.
- When using *hdia* to configure voice and data circuits, voice and data circuits are independent of each other because they reside on different top-level subnets.

Example

In this example:

- The subscriber port data circuits (subordinate subnets) will connect with a top level subnet that has a capacity of 64 hosts (`/26` netmask).
- Three subordinate (data) subnets will be created. A subordinate subnet with a capacity of 4 hosts will be created. Then a second subordinate subnet to support 10 hosts will be created. Then finally, a subordinate subnet will be added to support 3 hosts.
- The subscriber port voice circuits will not be described in detail in this example. Even though multiple DSL voice circuits are likely to be linked with the WAN port voice circuit, each DSL voice circuit will only support one IAD. Subordinate subnets that support voice are not configured with multiple hosts.

1. Since the top level subnet has a capacity of 64 hosts, apply a `/26` netmask (`255.255.255.192`) to the WAN port data circuit. Note that this netmask must also be applied to the Default Router and to hosts on the subordinate subnets. This is the same netmask that would be applied to any device connected to that subnet. For this level, traditional IP networking practices apply.
2. Before configuring the subscriber port data circuit for the four-host-capacity subordinate subnet, look in the *Number of Hosts* column in Table 1 for a netmask entry that will support 4 hosts. The `/30` netmask entry (`255.255.255.252`) supports 4 hosts so enter that subnet entry in the *NetMask* field of the *Interface* window of a second subscriber port.
3. Enter an IP address in the *IpAddr* field of the subscriber port's *Interface* window to identify a block of IP addresses. Enter the first IP address in a block to identify that block. Select a block of IP addresses from the same row in Table 1 as the selected netmask entry. In this example, apply an IP address from the

first block of IP addresses [0 - 3]. If you enter the IP address 10.254.8.0, for example, it will assign 10.254.8.0 through 10.254.8.3 to this subordinate subnet.

4. If one is required, configure a voice circuit on the WAN port.
5. If one is required, configure the subscriber port voice circuit. Enter the IP address of the IAD in the *IpAddr* field of the *DSL VC* window. Only one host (IAD) will be connected to the subscriber port voice circuit, so apply a netmask entry of 255.255.255.255.
6. Before configuring the data circuit for the 10-host-capacity subordinate subnet, look in the *Number of Hosts* column in Table 1 for a netmask entry that will support 10 hosts. Since none of the available netmask entries support exactly 10 hosts, it will be necessary to select a netmask entry that creates the smallest subordinate subnet that will support 10 hosts (/28 netmask - 255.255.255.240). This subnet will be capable of supporting up to 16 hosts. Since only 10 hosts will reside on that subnet, 6 IP addresses will be unused. Enter the netmask entry in the *NetMask* field of the subscriber port's *Interface* window.
7. Enter an IP address in the *IpAddr* field of the subscriber port's *Interface* window to identify a block of IP address. Enter the first IP address in a block to identify that block. Select a block of addresses from the same row in Table 1 as the netmask entry. In this example, the first block of 16 addresses cannot be used because the first four [0 - 3] addresses have been assigned to the first subordinate subnet. Enter an IP address to assign the second block of IP addresses, [16 - 31] in Table 1 (10.254.8.16 in this example).
8. If one is required, configure the subscriber port voice circuit. Enter the IP address of the IAD in the *IpAddr* field of the *DSL VC* window. Apply a netmask entry of 255.255.255.255.
9. In the *Interface* window of a third subscriber port, enter the netmask entry for the third subordinate subnet in the *NetMask* field. Since this subordinate subnet will support three hosts, you will see in Table 1 that the four-host netmask entry (255.255.255.252) must again be used.
10. Enter an IP address in the *IpAddr* field of the subscriber port's *Interface* window to identify a block of IP addresses. Enter the first IP address in a block to identify that block. Select a block of addresses from the same row in Table 1 as the netmask entry. In this case, you have two options:

    ⇒ Enter IP address 10.254.8.32, to assign the block following block [16 - 31], which was assigned to the second subordinate subnet, or

    ⇒ Enter IP address 10.254.8.4, to assign the block following block [0 - 3], which was assigned to the first subordinate subnet.

11. If one is required, configure the subscriber port voice circuit. Enter the IP address of the IAD in the *IpAddr* field of the *DSL VC* window. Apply a netmask entry of `255.255.255.255`.

Table 1. NetMask Entries in a Subordinate Subnet

NetMask Entry	Slash Notation	Number of		Blocks of IP Addresses
		subnets	hosts	
255.255.255.000	/24	1	256	N/A
255.255.255.128	/25	2	128	[0 - 127] [128 - 255]
255.255.255.192	/26	4	64	[0 - 63] [64 - 127] [128 - 191] [192 - 255]
255.255.255.224	/27	8	32	[0 - 31] [32 - 63] [64 - 95] [96 - 127] [128 - 159] [160 - 191] [192 - 223] [224 - 255]
255.255.255.240	/28	16	16	[0 - 15] [16 - 31] [32 - 47] [48 - 63] [64 - 79] [80 - 95] [96 - 111] [112 - 127] [128 - 143] [144 - 159] [160 - 175] [176 - 191] [192 - 207] [208 - 223] [224 - 239] [240 - 255]
255.255.255.248	/29	32	8	[0 - 7] [8 - 15] [16 - 23] [24 - 31] [32 - 39] [40 - 47] [48 - 55] [56 - 63] [64 - 71] [72 - 79] [80 - 87] [88 - 95] [96 - 103] [104 - 111] [112 - 119] [120 - 127] [128 - 135] [136 - 143] [144 - 151] [152 - 159] [160 - 167] [168 - 175] [176 - 183] [184 - 191] [192 - 199] [200 - 207] [208 - 215] [216 - 223] [224 - 231] [232 - 239] [240 - 246] [248 - 255]
255.255.255.252	/30	64	4	[0 - 3] [4 - 7] [8 - 11] [12 - 15] [16 - 19] [20 - 23] [24 - 27] [28 - 31] [32 - 35] [36 - 39] [40 - 43] [44 - 47] [48 - 51] [52 - 55] [56 - 59] [60 - 63] [64 - 67] [68 - 71] [72 - 75] [76 - 79] [80 - 83] [84 - 87] [88 - 91] [92 - 95] [96 - 99] [100 - 103] [104 - 107] [108 - 111] [112 - 115] [116 - 119] [120 - 123] [124 - 127] [128 - 131] [132 - 135] [136 - 139] [140 - 143] [144 - 147] [148 - 151] [152 - 155] [156 - 159] [160 - 163] [164 - 167] [168 - 171] [172 - 175] [176 - 179] [180 - 183] [184 - 187] [188 - 191] [192 - 195] [196 - 199] [200 - 203] [204 - 207] [208 - 211] [212 - 215] [216 - 219] [220 - 223] [224 - 227] [228 - 231] [232 - 235] [236 - 239] [240 - 243] [244 - 247] [248 - 251] [252 - 255]

NetMask Entry	Slash Notation	Number of		Blocks of IP Addresses
		subnets	hosts	
255.255.255.254	/31	128	2	[0 - 1] [2 - 3] [4 - 5] [6 - 7] [8 - 9] [10 - 11] [12 - 13] [14 - 15] [16 - 17] [18 - 19] [20 - 21] [22 - 23] [24 - 25] [26 - 27] [28 - 29] [30 - 31] [32 - 33] [34 - 35] [36 - 37] [38 - 39] [40 - 41] [42 - 43] [44 - 45] [46 - 47] [48 - 49] [50 - 51] [52 - 53] [54 - 55] [56 - 57] [58 - 59] [60 - 61] [62 - 63] [64 - 65] [66 - 67] [68 - 69] [70 - 71] [72 - 73] [74 - 75] [76 - 77] [78 - 79] [80 - 81] [82 - 83] [84 - 85] [86 - 87] [88 - 89] [90 - 91] [92 - 93] [94 - 95] [96 - 97] [98 - 99] [100 - 101] [102 - 103] [104 - 105] [106 - 107] [108 - 109] [110 - 111] [112 - 113] [114 - 115] [116 - 117] [118 - 119] [120 - 121] [122 - 123] [124 - 125] [126 - 127] [128 - 129] [130 - 131] [132 - 133] [134 - 135] [136 - 137] [138 - 139] [140 - 141] [142 - 143] [144 - 145] [146 - 147] [148 - 149] [150 - 151] [152 - 153] [154 - 155] [156 - 157] [158 - 159] [160 - 161] [162 - 163] [164 - 165] [166 - 167] [168 - 169] [170 - 171] [172 - 173] [174 - 175] [176 - 177] [178 - 179] [180 - 181] [182 - 183] [184 - 185] [186 - 187] [188 - 189] [190 - 191] [192 - 193] [194 - 195] [196 - 197] [198 - 199] [200 - 201] [202 - 203] [204 - 205] [206 - 207] [208 - 209] [210 - 211] [212 - 213] [214 - 215] [216 - 217] [218 - 219] [220 - 221] [222 - 223] [224 - 225] [226 - 227] [228 - 229] [230 - 231] [232 - 233] [234 - 235] [236 - 237] [238 - 239] [240 - 241] [242 - 243] [244 - 245] [246 - 247] [248 - 249] [250 - 251] [252 - 253] [254 - 255]
255.255.255.255	/32	256	1	0 to 255

Notes for Table 1:

In this Class C network, the slash notation identifies the number of bits used for networking. A /24 netmask entry uses 24 bits (the first three characters in the netmask) to identify the network, leaving 8 bits to identify hosts. No bits are used to identify subordinate subnets, so only one subnet exists and 256 hosts can be identified.

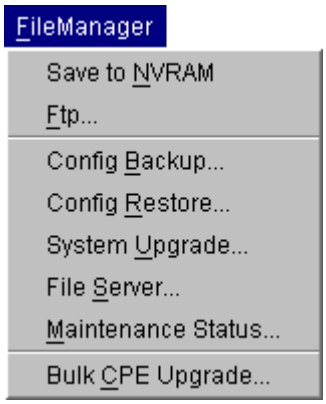
A /25 netmask entry uses the left-most 24 bits to identify the Class C network. The 128 bit can identify up to 2 subordinate subnets and bits 1, 2, 4, 8, 16, 32 and 64 identify up to 128 hosts on each subordinate subnet.

A /28 netmask entry uses the left-most 24 bits to identify the Class C network. The next 4 bits (bits 16, 32, 64 and 128) identify up to 16 subordinate subnets. This leaves bits 1, 2, 4 and 8 to identify up to 16 hosts on each subordinate subnet.

Subordinate subnets support ranges of IP host addresses determined by the netmask entry. The *Range of IP Addresses* column of Table 1 shows each range. For example, each subordinate subnet configured with a /27 netmask entry (255.255.255.224) will support up to 32 hosts. The host portion of the IP addresses must consist of one of the ranges in this column.

Chapter 6
DSL Concentrator Maintenance

The EM *FileManager* menu provides tools for maintaining DSL concentrators and CPE. These tools include a status window for observing on-going maintenance operations, tools for backup and restoration of DSL concentrator configuration files, and tools for upgrading CPE and DSL concentrator software.



Save to NVRAM

Select to save an updated configuration file to the DSL concentrator's nonvolatile memory.

I M P O R T A N T

If you use the EM to change a DSL concentrator's configuration and do not save the configuration file to nonvolatile memory, the DSL concentrator will revert to its previous configuration the next time it is restarted.

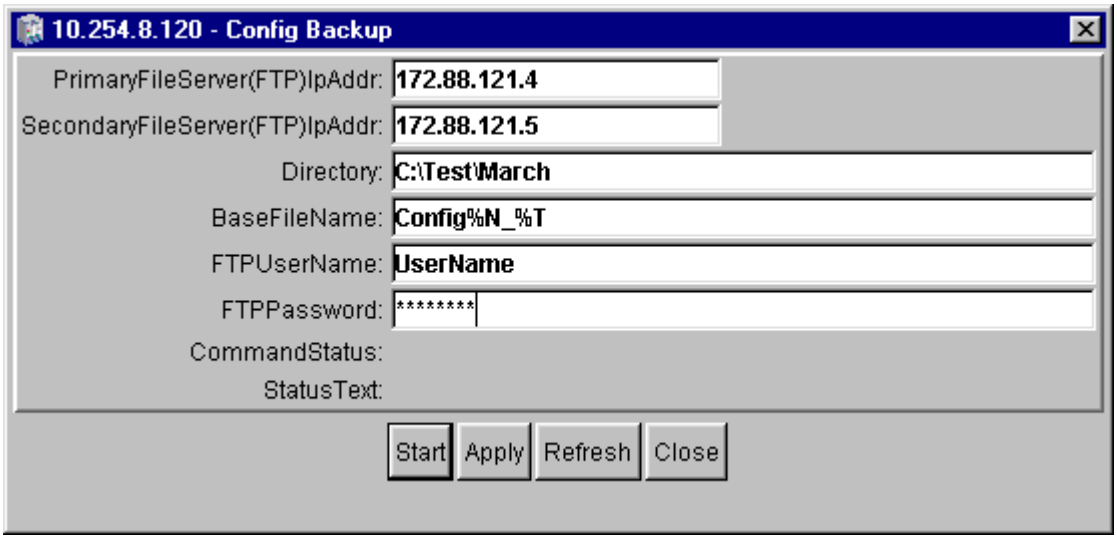
Ftp

Select *Ftp* to connect with the DSL concentrator using file transfer protocol.

Backing Up a DSL Concentrator's Configuration File

Click on *FileManager* in the EM menu bar and select the *Config Backup* option to upload a baseline of a DSL concentrator's current configuration file to a directory on a file server.

Complete the fields in the *Config Backup* window, click *Apply*, and then click on *Start*.



The following fields are included in the *Config Backup* window:

PrimaryFileServer(FTP)IpAddr: Enter the IP address of the primary file server where the configuration file will be stored. This information may be entered automatically by the EM.

SecondaryFileServer(FTP)IpAddr: Enter the IP address of an optional secondary file server where the configuration file will be stored if the primary file server fails to connect.

Directory: Identify the directory on the file server where the DSL concentrator configuration file baseline will be saved.

BaseFileName: Enter a file name to identify the saved configuration file baseline. The following options can be included in any sequence to create the file name. (This information may be entered automatically by the EM):

- **%%:** Include the percent sign (%) in the file name.
- **%I:** Include the DSL concentrator's IP address in the file name.
- **%N:** Include the DSL concentrator's system name in the file name.
- **%T:** Include the 13-character date and time in the format YYYYMMDD-HHMM.

If you enter text with none of the options listed above, the EM will append a date stamp to the end of the entered file name.

Examples

Enter the options:

```
%T_%N_%I
```

to produce the file name: [date-time]_[system]_[IP address] or

```
19990720-1145_CE200_172.24.121.3
```

Enter the file name:

```
San Diego
```

to produce the file name: [entered name]_[date] or

```
San Diego_20000720-1145
```

FTPUserName: Enter the operator's user name for the file server where the configuration file will be stored. This information may be entered automatically by the EM.

FTPPassword: Enter the operator's password for the file server where the configuration file will be stored.

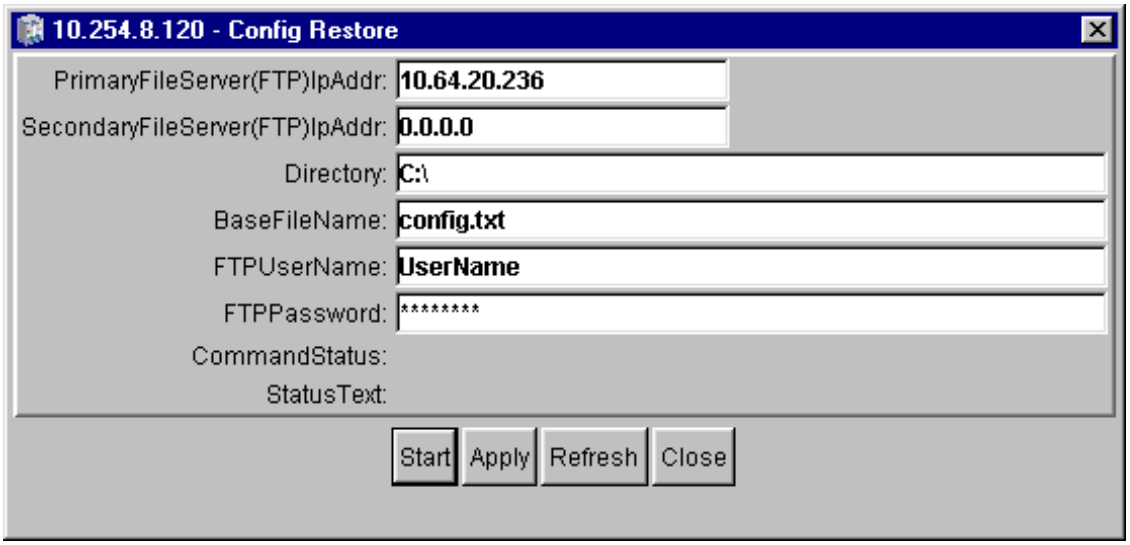
CommandStatus: Displays the status of the most recent *Config Backup* operation.

StatusText: Click on *Refresh* to see the results of a *Config Backup* operation in the *StatusText* field.

Restoring a Backed Up Configuration

Click on *FileManager* in the EM menu bar and select the *Config Restore* option to download a configuration file from a directory on a file server to a DSL concentrator.

To execute a configuration file download, complete the fields in the *Config Restore* window, click on *Apply*, and then click on *Start*.



The following fields are included in the *Config Restore* window.

PrimaryFileServer(FTP)IpAddr: The IP address of the file server where the configuration file to be downloaded is stored. This information may be entered automatically by the EM.

SecondaryFileServer(FTP)IpAddr: Enter the IP address of an optional secondary file server where the configuration file to be

downloaded is stored. The secondary file server can be used if the primary file server fails to connect.

Directory: The directory location on the file server where the configuration file to be downloaded is stored.

BaseFileName: Enter the full name (as it was specified in the *BaseFileName* field of the *Config Backup* window) of the configuration file when it was stored on the file server. The EM will automatically rename it *config.tgz* when it is downloaded.

FTPUserName: Enter the operator's user name for the file server where the configuration file is stored. This information may be entered automatically by the EM.

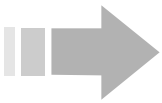
FTPPassword: Enter the operator's password for the file server where the configuration file is stored.

CommandStatus: Displays the status of the most recent *Config Restore* operation.

StatusText: Click on *Refresh* to see the results of the *Config Restore* operation in the *StatusText* field.

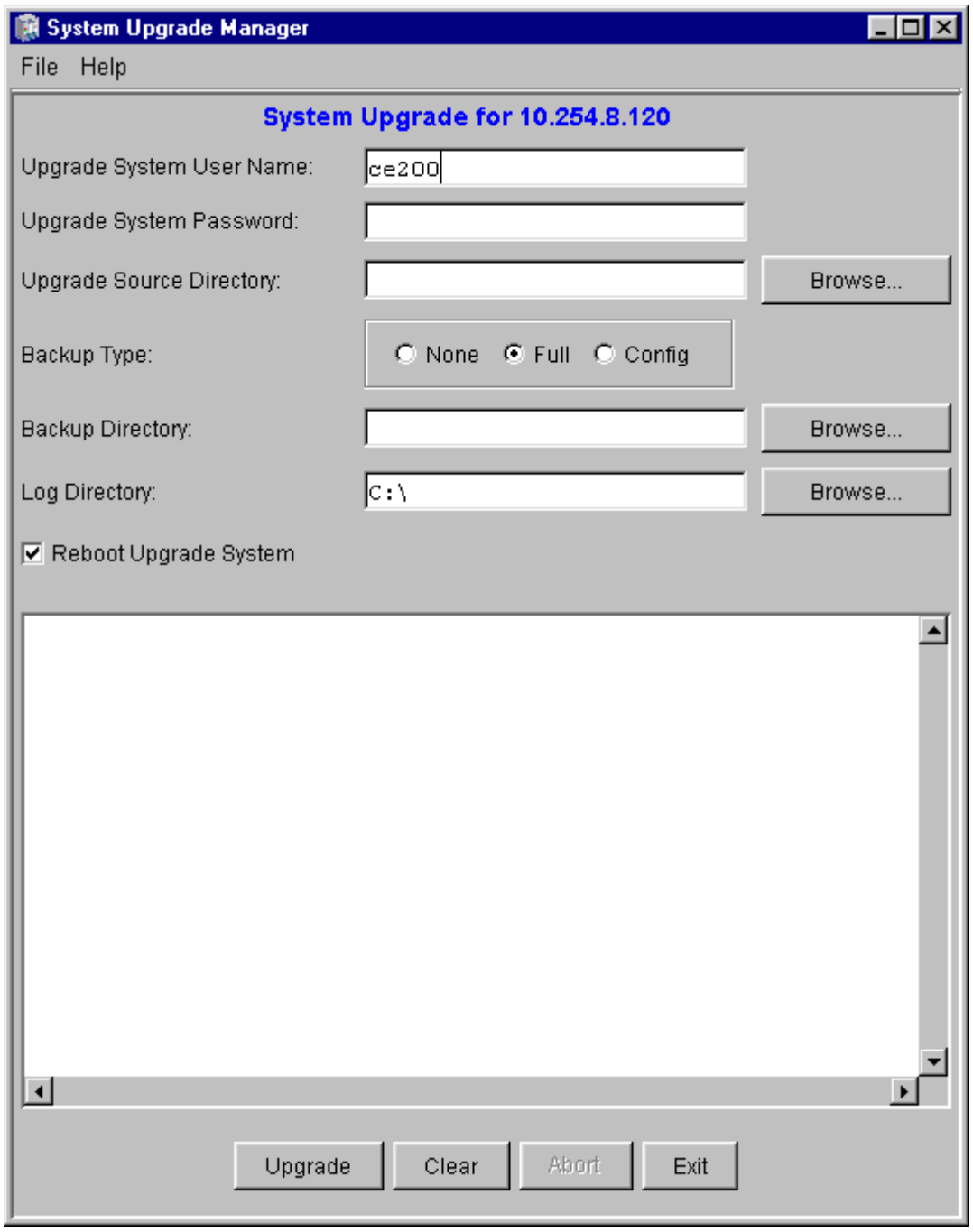
Upgrading DSL Concentrator Software

The *System Upgrade Manager* allows you to load an updated version of software into a DSL concentrator, and ensures that the version of code being loaded is newer than the DSL concentrator's currently loaded software before initiating an upgrade. Click on *FileManager* in the EM menu bar and select the *System Upgrade* option. The *System Upgrade Manager* window for the attached system will appear.



N O T E

When using the System Upgrade Manager on a Windows NT or Windows 2000 platform, it is recommended that you close all other applications so only the System Upgrade Manager is running on your platform when you download code.



System Upgrade Manager Fields

The following fields are included in the *System Upgrade Manager*:

Upgrade System User Name: The *System Upgrade Manager* will automatically enter the default user login name for the connected system.

Upgrade System Password: Enter the password for the connected system.

Upgrade Source Directory: Enter the source directory for the software file to be loaded into the DSL concentrator.

Backup Type: Click to select the type of backup to be performed, *None*, *Full*, or *Config* (for configuration file only).

Backup Directory: Enter a directory location where the current DSL concentrator system and configuration files can be saved prior to the upgrade.

Log Directory: The *Log Directory* is the location where the *System Upgrade Manager* will store the Upgrade Log that is generated during a system upgrade.

Reboot Upgrade System: Click to enable or disable automatic restart of the DSL concentrator at the completion of the code download. The DSL concentrator will not actually read in the new version files until it is restarted. By default, *Auto Restart* is enabled.

System Upgrade Manager Buttons

Button controls in the *System Upgrade Manager* include:

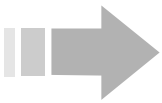
Upgrade: After the *System Upgrade Manager* has been configured, click on *Upgrade* to initiate an upgrade of DSL concentrator software.

Clear: Click on to clear all of the *System Upgrade Manager* input fields.

Abort: Click on to immediately abort an upgrade session. Abort an upgrade session if it is unable to complete the upgrade process because, for example, communication between the EM and the DSL concentrator is lost.

Exit: Click on to exit the *System Upgrade Manager*.

Upgrading a DSL Concentrator

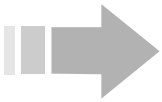


N O T E S

- *Ensure that the EM software version has been upgraded to the new upgrade version before upgrading the software version of your DSL concentrator.*
- *You must be an authorized operator of the DSL concentrator with Security Privilege Level to upgrade a DSL concentrator.*

1. Select *System Upgrade* from the *FileManager* menu in the EM menu bar.
2. Enter the required security privilege in the *Upgrade System Password* field.
3. Enter the path to the source directory in the *Upgrade Source Directory* field.

4. If desired, click to select a *Backup Type* and enter the path to the *Backup Directory*, where those files will be copied.
5. If desired, enter a path to change the *Log Directory* location.
6. Click on *Upgrade*. The EM will:
   - ⇒ Open an ftp session and poll the DSL concentrator.
   - ⇒ Ensure that sufficient memory is available in the *Backup Directory* (if backup is selected) and that sufficient DSL concentrator nonvolatile memory is available to complete the backup.
   - ⇒ Back up selected files from the DSL concentrator to the *Backup Directory* and download the code from the *Upgrade Source Directory*.
   - ⇒ Poll the DSL concentrator for its new version number after the files are transferred (if *Reboot Upgrade System* is enabled) and then display a dialog box the user can use to disable polling.



N O T E

The System Upgrade Manager adds approximately two kilobytes of data to the Log directory as each DSL concentrator is upgraded. It is a good idea to delete this residual data from time to time.

7. If *Reboot Upgrade System* is not enabled, restart the DSL concentrator:
   - ⇒ Double click on the Shelf View in the area above the circuit modules, or on an empty slot in the Shelf View to access the *System/Shelf* window suite with the *System* window displayed.
   - ⇒ Click on *restart* in the *Command* field; then click on *Apply*.

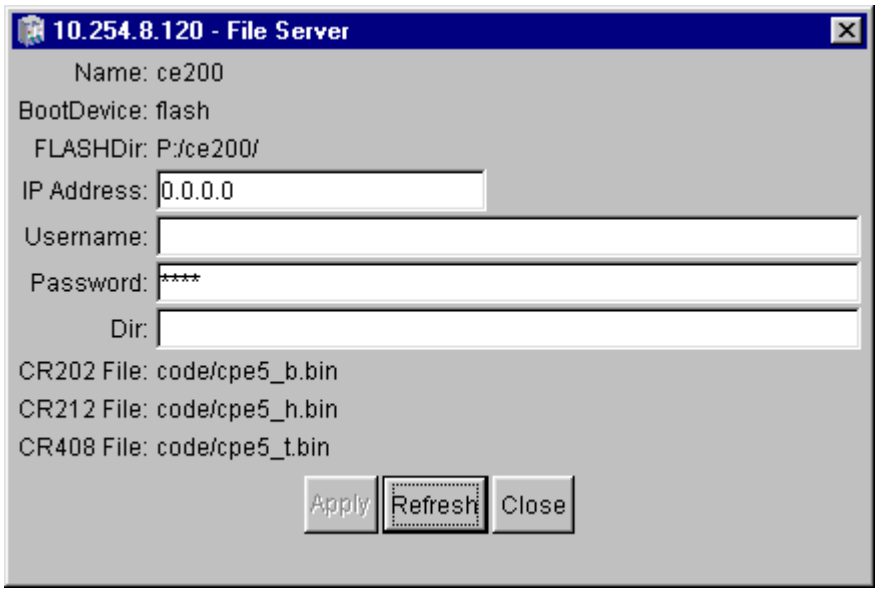
Upgrading a Redundant DSL Concentrator

Please contact Copper Mountain's Customer Service Center at (888) 661-4266 for assistance upgrading a redundant CE200.

Downloading CPE Code from a File Server

The code requirements for IMUX-capable CPE exceed allocated DSL concentrator storage capacity. In order to download code to these CPE, it is necessary to download the code from an external file server. Click on *FileManager* in the EM menu bar and select the *File Server* option to configure the DSL concentrator so it will download code to a CPE from an external file server rather than

from its own nonvolatile memory. The *File Server* window will appear.



Complete the appropriate fields in the *File Server* window:

Name: If the boot device is DSL concentrator nonvolatile memory, this field identifies the DSL concentrator (*CE150* or *CE200*). If the boot device is an external file server, this field displays the name of the server.

BootDevice: Indicates whether the default device that the DSL concentrator uses when obtaining files is *flash* (nonvolatile memory) or *fileServer*.

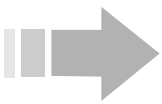
FLASHDir: Displays the directory path for DSL concentrator system files in the nonvolatile memory file system.

IP Address: Enter the IP Address of a remote file server that contains CPE software. If the DSL concentrator does not find a download file locally, it will attempt to load the specified file from this remote file server.

Username: Enter the user name that will be used on FTP requests to the remote file server specified in the *IP Address* field.

Password: Enter the password that will be used on FTP requests to the remote file server specified in the *IP Address* field.

Dir: Enter the directory path on the remote file server that contains the files for this system.



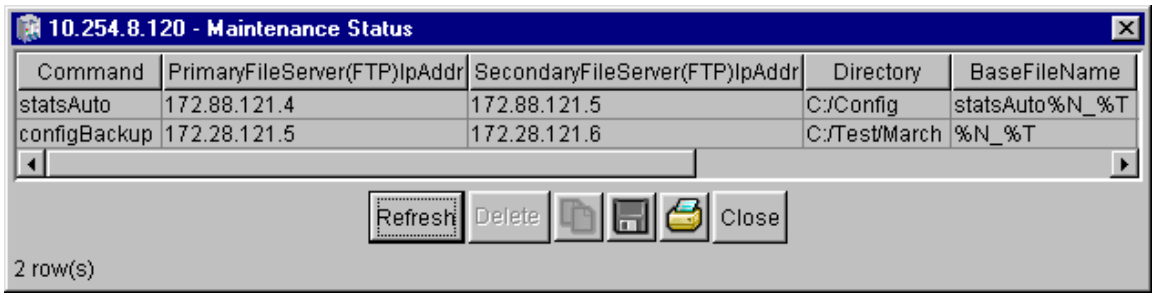
N O T E

CPE code to be downloaded from a remote file server must be in a directory named "Code."

Files that should be stored on the file server are identified under the *Dir* field (*CR202 File*, *CR212 File* and *CR408 File* in the example).

Viewing Maintenance Status

Click on *FileManager* in the EM menu bar and select the *Maintenance Status* option to view a record of ongoing DSL concentrator and CPE maintenance operations. The *Maintenance Status* window will appear.



The *Maintenance Status* window includes a row for each on-going maintenance operation that has been configured in the DSL concentrator. Each row includes the following fields:

Command: This field displays one of the following maintenance commands:

statsAuto: This command will be displayed when bulk subscriber port statistics are collected in the *Auto* mode (*BulkStats Auto*) for the *CopperView* AMS.

statsManual: This command will be displayed when bulk subscriber port statistics are collected in the *Manual* mode (*BulkStats Manual*) for the *CopperView* AMS.

configBackup: This command will be displayed when the DSL concentrator is configured to upload its configuration file to a file server (see "Backing Up a DSL Concentrator's Configuration File" on page 170).

configRestore: This command will be displayed when the DSL concentrator is configured to download a configuration file from a file server (see "Restoring a Backed Up Configuration" on page 171).

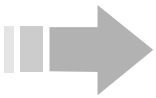
bulkCPEDownload: This command will be displayed when the DSL concentrator is configured to upgrade CPE software for multiple CPE (see "Upgrading Code in Multiple CPE" on page 179).

PrimaryFileServer(FTP)IpAddr: Displays the IP Address of the primary file server to be used when executing a command. If this field is all 0's, no save will be attempted to the primary and no event trap will be sent. This value is ignored during execution of the *bulkCPEDownload* command. Default: None; this field must be configured by the operator in the *Config Backup* window.

SecondaryFileServer(FTP)IpAddr: Displays the IP Address of a secondary file server that can be used when executing the command. If this field is all 0's, no save will be attempted to the secondary and no event trap will be sent. If a transfer to the primary fails and there is no secondary address configured, the *CommandStatus* will be *failed*. This value is ignored during execution of a *bulkCPEDownload* or *configRestore* command. Default: 0.0.0.0.

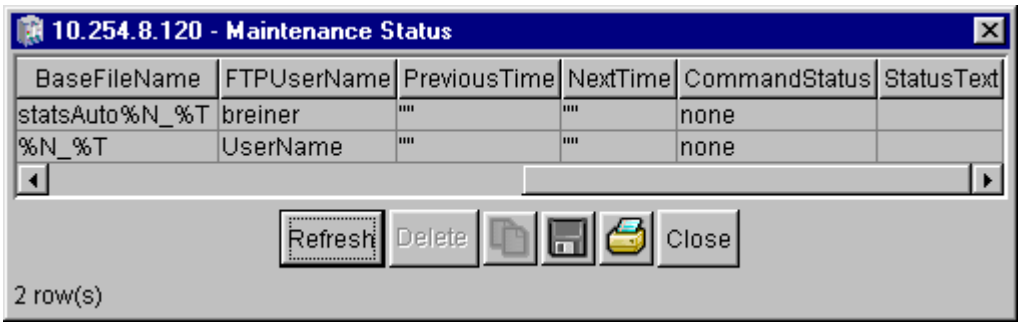
Directory: This is the file server directory where uploaded files will be stored on either the primary or secondary file server. This value is ignored during execution of the *bulkCPEDownload* command. Default: empty string ("").

BaseFileName: This field displays the base file name that the DSL concentrator will use when generating the statistics file for both *statsAuto* and *statsManual* commands and when uploading DSL concentrator configurations. In each case, the system will append the interval start time to the filename before transferring the file. For *configRestore* commands, this is the name of the saved configuration file that the system will retrieve from the file server. This value is ignored during execution of the *bulkCPEDownload* command. Default: empty string ("").



N O T E

Click on the arrow at the bottom of the Maintenance Status window to access the remaining fields.



FTPUserName: This field displays the user name that the DSL concentrator will use when initiating an FTP session with the primary or secondary file server. This value is ignored during execution of a *bulkCPEDownload* command. Default: *Anonymous*.

PreviousTime: This field displays the calendar date and time of the start of the most recent attempted execution. If the operation has not been attempted since power-up, this field will display an empty string (""). If the command is *configBackup*, this field is only updated when the upload is actually attempted (i.e., if the stored configuration has changed since the last attempt).

NextTime: This field displays the calendar date and time that this automatic operation will next be attempted. If this is not an automatic operation, or if this operation is not active, the *NextTime* field displays an empty string ("").

CommandStatus: This field indicates the status of the most recently executed command as:

none: Indicates no command has been executed since start-up.

savedToPrimary: Indicates the last upload succeeded to the primary file server.

savedToSecondary: Indicates that the last upload succeeded to the secondary file server.

succeeded: Indicates that the last restore command succeeded.

failed: Indicates that the last file transfer between the system and the file servers failed.

inProgress: Indicates the command is currently running.

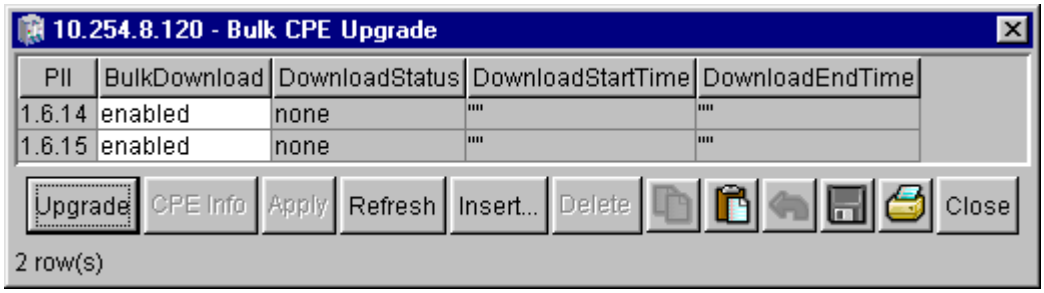
aborted: Applies to the *bulkCPEDownload* command only.

For *bulkCPEDownload*, the valid *CommandStatus* indications are: *none*, *failed*, *inProgress*, *succeeded*, and *aborted*. *failed* indicates the software download failed for one or more candidate CPE. *aborted* indicates the command was aborted before the files were downloaded to all candidate CPE.

StatusText: The system writes a more detailed status to this field to provide more information to the operator. This status may be updated while a command is in progress. For *bulkCPEDownload*, this field indicates the number of: *Pending* download operations; download *InProgress* operations; *Failed* download operations; successfully *Completed* download operations; and *NotDownloadable* CPE, i.e., CPE that do not support software download.

Upgrading Code in Multiple CPE

Click on *FileManager* in the EM menu bar and select the *Bulk CPE Upgrade* option to download software to multiple CPE. The *Bulk CPE Upgrade* window will appear.



The *Bulk CPE Upgrade* window lists the subscriber port that is connected with every CPE that has been configured for upgrade and includes the following information:

PII: Identifies by PII each subscriber port connected to a CPE that has been configured for upgrade via the *Bulk Upgrade* feature.

BulkDownload: Displays *enabled* or *disabled* to indicate whether the software version in the DSL concentrator's code directory will be downloaded to the CPE when an *Upgrade* command is issued by the operator. To reconfigure a CPE's download status, click in the *BulkDownload* field for that CPE and select *enabled* or *disabled*, as applicable; then click on *Apply*.

DownloadStatus: This field shows the status of the most recent *Upgrade* command relative to each specific CPE.

none: Indicates that no *Upgrade* command has been executed since power-up.

pending: Indicates that an *Upgrade* command has been issued, the CPE is eligible, but the download has not started.

inProgress: Indicates that the download process has started on this CPE.

failed: Indicates that a download to this CPE was attempted, but it failed.

completed: Indicates a download to this CPE was attempted and that it succeeded.

notDownloadable: Indicates that the CPE does not support software download.

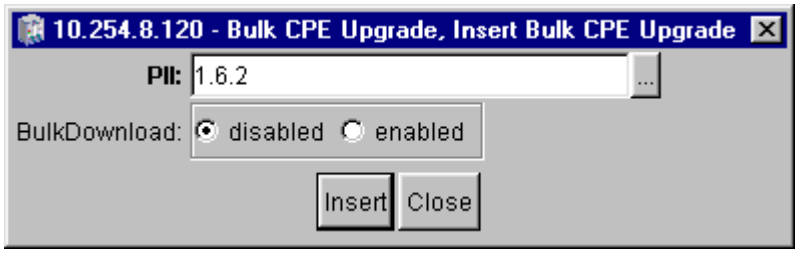
DownloadStartTime: The time the download command will be sent to the CPE. An empty string ("") indicates that no download has been configured.

DownloadEndTime: The time that a successful or failed download was detected. An empty string ("") indicates no download has occurred.

Inserting a CPE for Bulk CPE Upgrade

Every CPE that will be upgraded must be added to the *Bulk CPE Upgrade* window before an upgrade is performed.

1. Click on *Insert* in the *Bulk CPE Upgrade* window to access the *Bulk CPE Upgrade, Insert Bulk CPE Upgrade* window.

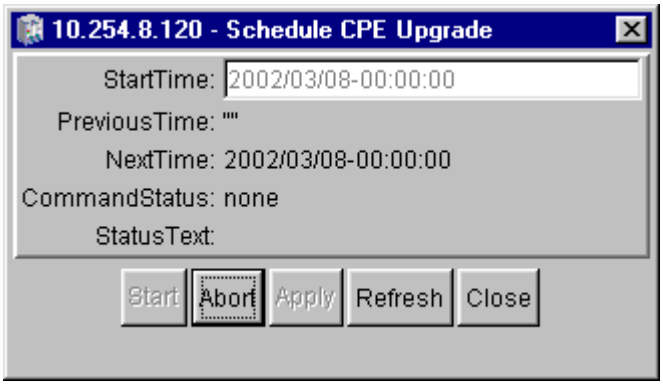


2. Enter a PII to identify the subscriber port connected to the CPE that will be upgraded in the *PII* field.
3. Click on *enabled* or *disabled* to determine whether the CPE will be included in the next upgrade command issued to the DSL concentrator.
4. Click on *Insert* to return to the *Bulk CPE Upgrade* window; then click on *Refresh*. Be sure to click on *Save to NVRAM* in

the EM tool bar to save the updated configuration file to the DSL concentrator's nonvolatile memory.

Scheduling a Bulk CPE Upgrade

To schedule a software upgrade for the multiple CPE listed in the *Bulk CPE Upgrade* window, click on the *Upgrade* button at the bottom of the window. The *Schedule CPE Upgrade* window will appear.



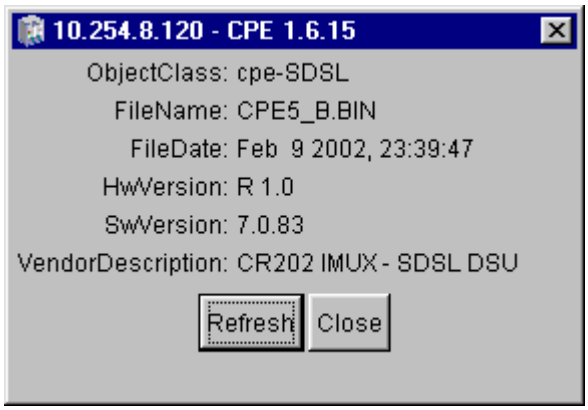
1. Enter the time the CPE upgrade will take place in YYYY/MM/DD-HH:MM:SS format in the *StartTime* field. To schedule an upgrade to begin at the instant you click on the *Start* button, enter *now* in this field.
2. Click on *Start*. A *bulkCPEDownload* command will be issued at the time entered in the *StartTime* field. If *StartTime* is in the past or *now*, the *bulkCPEDownload* command will be issued immediately and a CPE upgrade attempt will begin.
3. To stop a CPE upgrade that is in progress, click on *Abort*.

If the *BulkDownload* field in the *Bulk CPE Upgrade* window has been configured to *enabled* and the CPE is online, the system will compare the software version currently in the CPE with the version of the CPE software loaded in SCM nonvolatile memory. If the CPE software version is different from the version in the SCM, the system will initiate the download process to the CPE. If the CPE is not online when the *bulkCPEDownload* command is issued, the DSL concentrator will check the CPE software the next time it comes online.

For definitions of the *PreviousTime*, *NextTime*, *CommandStatus*, and *StatusText* fields, see "Viewing Maintenance Status" on page 177.

Viewing a CPE Configuration

Click in the *PII* field in the *Bulk CPE Upgrade* window to select a CPE; then click on *CPE Info* to access the *CPE* window for information about that CPE, including its software version.



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