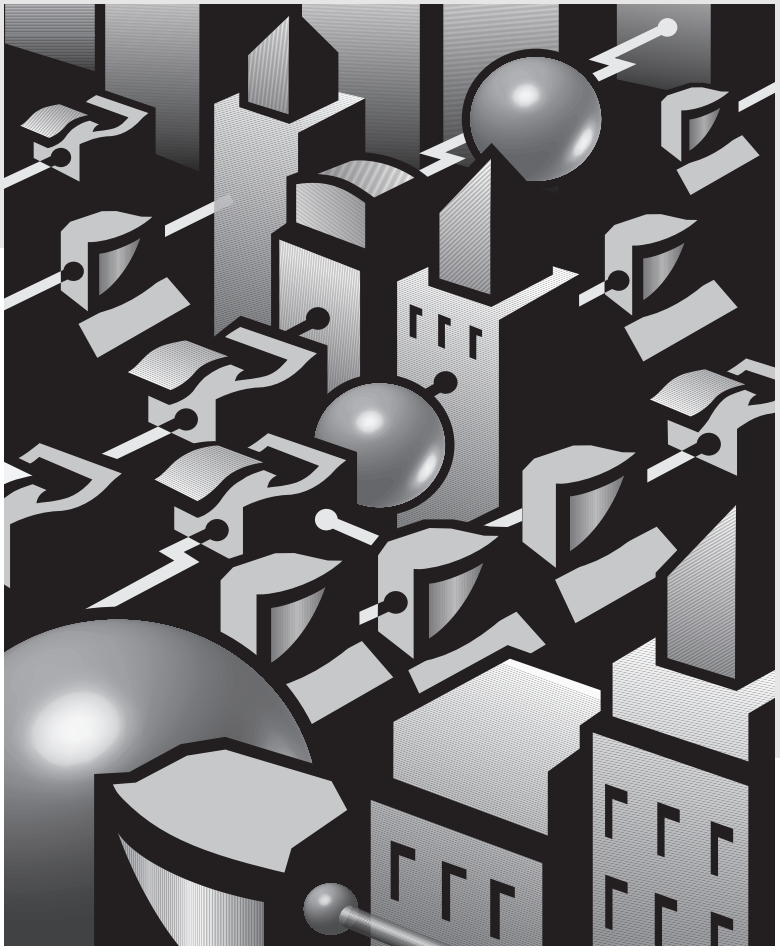

Installation and Reference Guide

HP J3246A

HP AdvanceStack ATM Uplink Module

HP Customer Support Services

How to get the latest software/agent firmware
You can download from the World Wide Web, HP FTP Library Service, CompuServe, and HP BBS a compressed file (j3246a.exe) containing the latest version of the HP AdvanceStack ATM Uplink Module software. After you download the file, **extract** the file by typing *filename* and pressing Enter.
For example, **j3246a** Enter.

World Wide Web

http://www.hp.com/go/network_city

From this web site, you can get firmware, drivers, support contacts, product information, white papers, etc.

If you are unsure how to expand your current network and need help, be sure to visit the Technology section of this web site. This section has the *Designing HP AdvanceStack Networks Guide* (Outside Europe: part number 5965-6578E, Europe: part number 5965-6441) in .pdf format. For a bound copy, call 1-800-752-0900 in the U.S. to receive a copy through the mail.

HP FTP Library Service
1. FTP to Internet IP Address — ftp ftp.hp.com.
2. Log in as anonymous and press Enter at the password prompt.
3. Enter bin to set the transfer type.
4. Enter cd /pub/networking/software.
5. Enter get *filename* to transfer the file to your computer, then quit.

CompuServe
1. Login to CompuServe.
2. Go to the "hp" service.
3. Select "HP Systems, Disks, Tapes, etc."
4. Select "Networking Products" library.
5. Download *filename* and then quit.

HP BBS
Set your modem to no parity, eight bits, 1 stop bit, set speed up to 14400 bps, and with your telecommunication program (e.g., Windows HyperTerminal) dial (208) 344-1691 in the U.S. to get the latest software for your HP networking product. For other countries, see http://www.hp.com/cposupport/eschome.html.

(over for more services)

HEWLETT® PACKARD

Obtain the latest firmware (j3246a.exe) from:

World Wide Web: http://www.hp.com/go/network_city

HP FTP Library: ftp ftp.hp.com

HP BBS: (208) 344-1691

(over)

HP NETWORK CONNECTIVITY

HP FIRST Fax Retrieval Service

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- Product information
- Troubleshooting instructions
- Technical reviews and articles
- Configuration information

To access HP FIRST, dial one of the following phone numbers:

Location	Phone Number
U.S. and Canada Only	Dial 1 (800) 333-1917 with your fax machine or touch-tone phone and press 1.
Outside the U.S. and Canada	Dial 1 (208) 344-4809 from your fax machine and press 9.

To receive a list of currently available documents, enter document number 19941. The information you requested will be sent to you by return fax. For other countries, see http://www.hp.com/cposupport/eschome.html.

Additional HP Support Services

In addition to the above services, you can purchase various HP telephone support services which provide you expert HP technical assistance:

- Network Phone-In Support provides you support at an hourly rate. In the U.S., call 1-800-790-5544. In other countries, please contact your local HP Response Center to see if this service is available in your country.
- HP SupportPack Comprehensive Network Support provides complete problem resolution for medium to large interconnected local and wide area networks. Contact your HP Authorized Reseller or the nearest HP Sales and Support Office for more information.

HP offers other hardware support services. Please contact your reseller for more information.

CompuServe:	1) "hp" service 2) "HP Systems, Disk, Tapes, etc" 3) "Networking Products" 4) Download j3246a.exe
Network Phone-In Support (hourly):	1-800-790-5544

HP AdvanceStack ATM Uplink Module

Installation and Reference Guide

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Applicable Product

HP J3100A & J3100B AdvanceStack Switch 2000
HP J3246A AdvanceStack ATM Uplink Module

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About This Manual

This manual is designed to provide users with the information necessary to install, configure, and effectively use the HP AdvanceStack ATM Uplink Module.

This manual includes information on the following topics, organized as listed below:

- **Chapter 1 - Installation**

  Provides information about the first-time installation of the Switch 2000 ATM module. Topics covered include unpacking the module, network preparation, downloading software, module installation, and hardware verification.

- **Chapter 2 - Getting Started**

  Provides information about various networking configurations of the ATM-ready Switch 2000. Topics covered include specifying an IP address and default gateway, setting up a PVC mesh, and LAN Emulation.

- **Chapter 3 - ATM Module Configuration**

  Provides information about using the Switch 2000 Console Interface to view and configure the ATM module. Topics covered include typographical conventions, ATM module subsystems, command overviews, and command examples.

- **Chapter 4 - Troubleshooting**

  Provides basic troubleshooting information that can remedy typical problems associated with installing and using the ATM module.

- **Chapter 5 - Software Upgrade Procedures**

  Provides information about the procedures used to upgrade the operational software on the HP ATM module.

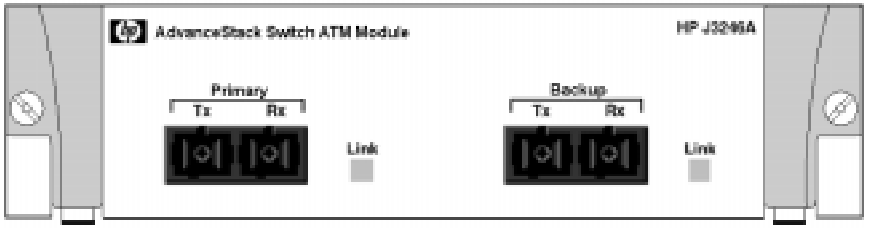
- **Chapter 6 - Specifications**

  Provides information about standards adherence, hardware specifications, and environmental specifications.

Overview

ATM Uplink Module For the HP AdvanceStack Switch 2000

The HP AdvanceStack ATM Uplink Module (HP J3246A) is an optional, hot-swappable component that you can add to an HP AdvanceStack Switch 2000. The ATM Uplink Module provides a redundant ATM link (with one PRIMARY and one BACKUP port) to another AdvanceStack Switch or to an ATM switch.



The HP AdvanceStack OC-3 ATM Uplink Module with SC Connectors

Features

The HP AdvanceStack ATM Uplink Module can enhance your Switch 2000 in the following ways:

- It provides a redundant, full-duplex, 155 Mbps connection between the AdvanceStack Switch 2000 and another ATM-ready network device (e.g., an ATM Switch, another Switch 2000, etc.). See “Configuring the Backup ATM Port” on page 1-15 for details.
- It complies with ATM Forum standards for LAN Emulation (LANE).
- It is UNI 3.0 compliant, providing support for ATM Forum SVCs when using LANE 1.0 (PVCs can be used independent of UNI 3.0/LANE 1.0).

Operating Requirements and Limitations

- Requires 62.5/125 µm fiber-optic cable with SC connectors.
- Maximum fiber cable length is 2 kilometers.

Note

The ATM Uplink Module is a "high-power" module. You can install any of the following combinations of low- and high-power modules in the Switch 2000:

- Up to six low-power modules
- Up to five low-power modules and one high-power module
- Up to four low-power modules and two high-power modules

Installing more than two high-power modules in the Switch 2000 is not supported.

Software Prerequisite: To use the ATM Uplink Module in the Switch 2000, the switch must be running software version A.03.20, B.03.20, or later (see "Verifying Current Switch Software" on page 1-5).

Standards Adherence: Refer to Chapter 6.

Diagnostic LEDs

Six LEDs line the left side of the ATM module's upper card (see below). These LEDs are used for diagnostic purposes only, and they do not affect the operation of the module. Additionally, a power LED is attached at the left rear corner of the ATM module's lower card. This LED, too, is for diagnostic purposes only and does not affect the operation of the module.

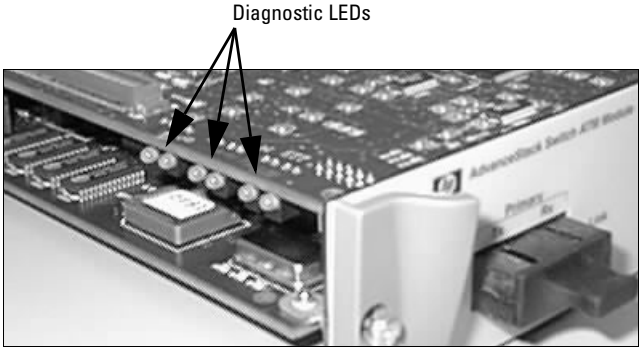


Figure 1 ATM Module Diagnostic LEDs

Typographical Conventions

The typographical conventions used in this manual are described in the following table.

Typographical Conventions

Style/Character	Indicates
AaBbCcDd	A command name. Commands are case sensitive; they should always be entered in lower case. Example: **showfile**
|	1) Separates the full and terse forms of a command or argument. The full form is shown on the left side of the |, the terse form is shown on the right side of the |. Either form of the command or argument can be used. Example: **showfile|shf** In this example, you can type **showfile** or **shf**. 2) Separates mutually exclusive command arguments. Example: **set stp enl|dis** In this example, the **set stp** command can accept either **enl** or **dis**, but not both.
[ ]	Surrounds optional arguments to a command. Example: **version [prom|p | runtime|r]** In this example, you can enter **prom** or **runtime** with the **version** command to display a specific software version, instead of both.
<AaBbCcDd>	Indicates a parameter for which a value must be supplied. Example: **showfile** *<filename>* In this example, *<filename>* is a parameter for which you must supply a value when issuing the command.
AaBbCcDd	1) Indicates a field name. Example: When the ATM module boots, the `login:` prompt is displayed. 2) Indicates a file name. Example: When the ATM module boots, the system looks for a file named `cfg`.

Virtual Ports

The HP ATM module utilizes "logical divisions" of its physical connection to ATM-ready devices, and these divisions are called virtual ports. The ATM module includes 16 virtual ports, numbered 2 through 17 (virtual port 1 is reserved for the ATM module's connection to the Switch 2000 backplane).

Virtual ports function as Permanent Virtual Circuit (PVC) identifiers, to help manage connections to multiple ATM devices. A PVC is a dedicated, logical connection between ATM devices.

The figure below demonstrates how virtual ports work.

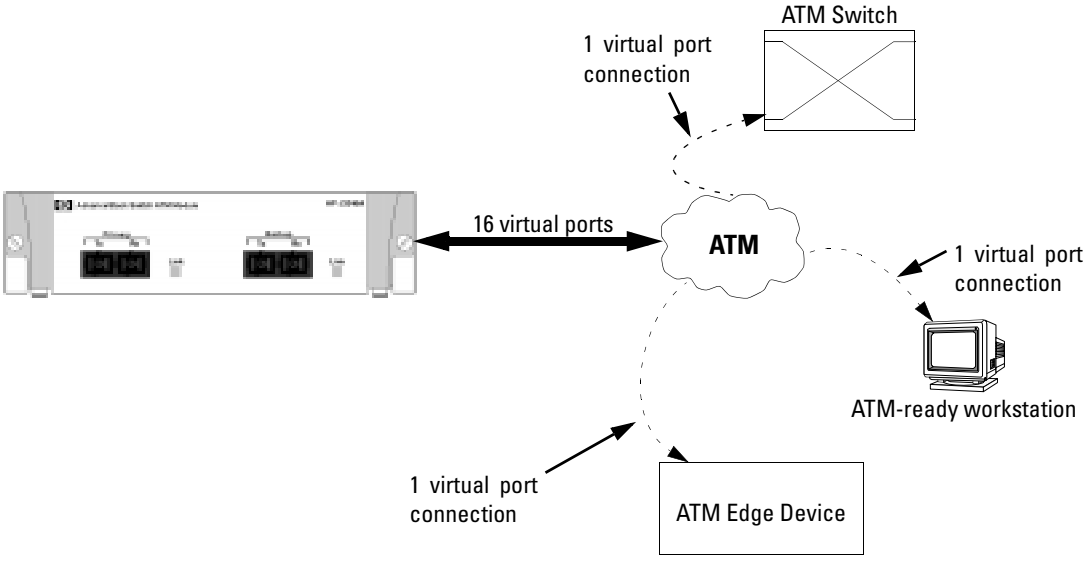


Figure 2 Demonstration of Virtual Ports

The ATM module also utilizes virtual port #2 when configured for LAN Emulation. The virtual port number, however, is not configurable and only serves as an internal identifier for the ATM module.

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  5. Verifying ATM Module Operation (page 1-13)
  6. Configuring the Backup ATM Port (page 1-15)
  7. Backing Up ATM Module Software (page 1-16)

Installation

Initial Installation Summary

This chapter describes the first-time installation procedures for the ATM Uplink Module, with a brief summary of each procedure listed below:

1. **Unpacking the ATM Module**
   a. Inspect the ATM module packaging for damage.
   b. Unpack the ATM module and ensure that the contents of the package are complete.
2. **Preparing the Network**
   a. Create or update the topology map for the network in which you are installing the ATM module.
   b. Verify that the equipment and links in the network are operational.
   c. Ensure that all necessary connections to the AdvanceStack Switch are in place.
3. **Downloading Switch 2000 Software**
   a. Verify your current version of Switch 2000 software.
   b. Download the version of switch software that is supplied with your ATM Uplink Module, if necessary.
4. **Installing the ATM Module**
   a. Remove the blank LED label strip from the slot corresponding to the switch slot in which the ATM module is to be installed.
   b. Insert the LED label strip, included with the ATM module, in the slot from which you removed the blank LED label strip.
   c. Remove the empty switch slot cover or installed module from the slot in which the ATM module is to be installed.
   d. Install the ATM module in the empty slot.
5. **Verifying ATM Module Operation**
   a. Reboot the Switch 2000.
   b. Verify that the LEDs which apply to the ATM module are operational.
6. **Backing Up ATM Module Software**
   a. Copy the ATM runtime images (if necessary).
   b. Save the copied files to a TFTP server.

Unpacking the ATM Module

Upon receipt of, and before opening your ATM module, inspect the package for any damage that may have occurred during shipping. If the package shows any signs of external damage or rough handling, notify your carrier's representative.

When unpacking your ATM module, be sure to keep all original packing materials. They may be needed for storing, transporting, or returning the product.

Inventorying the Unit

A complete inventory of the HP ATM module package should be performed before proceeding.

The following items should be included in the ATM Uplink Module package:

Hardware

- 1 HP AdvanceStack Switch ATM Uplink Module

Software

- HP AdvanceStack Switch OS software version A.03.20 or B.03.20 (or later), on diskette

Documentation

- *HP AdvanceStack ATM Uplink Module Installation and Reference Guide* (this manual, part number J3246-90001)
- 1 Warranty Card

Static electricity can cause severe damage to the sensitive electronic components on the HP AdvanceStack Switch ATM module. To avoid damage due to electrostatic discharge, leave the ATM module in its electrostatic bag until you are ready to install it.

Preparing the Network

1. Create or update the network plan, including all power sources, end-stations, links, etc. Verify that connections do not exceed their length limitations.
2. Create or update the network topology map, indicating how the network will look once the ATM Uplink Module is installed. Include information such as:
   - The physical location of each network device and end-station
   - The connections between each device and end-station
   - The network-layer addresses assigned to each network device and end-station

   For each LAN link, include the following on the map:
   - LAN type (Ethernet/802.3, Token Ring/802.5, FDDI, or ATM)
   - LAN Speed (4, 10, 16, 100, or 155 Mbps [OC-3])
   - Physical medium (cabling)

   For each WAN link, include the following on the map:
   - WAN-link type (circuit type) and WAN-link speed
   - Interface type (X.21, V.35, etc.)
   - HDLC address (DCE/DTE) for HP point-to-point links
   - X.121 address and connection ID (for X.25 links)
   - Other pertinent data, such as:
     - ISDN, switched 56, or other dial type numbers
     - Frame relay DLCI encoding type and length, and management type (ANSI Annex D, Annex D switch, LMI, or LMI switch)
     - SMDS individual address

   For ATM networks, include the following on the map:
   - ATM connections utilized (PVCs or LAN Emulation)
   - PVC identifiers used (VPI/VCI designations)

   If you use multiple protocols (routing or bridging services) in the network, you may want to make a separate map for each protocol.
3. Verify that the network equipment and links (in particular, the WAN-link-terminating equipment) are operational (your WAN-link service provider can verify that the WAN link is operating correctly). If the LAN links are not already connected to the switch, connect them now (see the Switch 2000 Installation Guide).

Downloading Switch 2000 Software

This section details the steps required to determine whether or not your current Switch 2000 OS version supports the ATM module. It also provides instructions for obtaining and downloading the proper version, if necessary.

Verifying Current Switch Software

Your Switch 2000 must be running OS version A.03.20, B.03.20, or later in order to recognize the ATM module. To determine which OS version is running in the switch, go to the Main Menu in the Switch 2000 Console Interface and perform the following (see the Switch 2000 "Installation Guide" for more information about connecting a console and using the console interface):

1. Select `Status and Counters...` to display the Status and Counters screen.
2. Select `Switch Information...` to display the Switch Information screen, as shown in Figure 1-1.

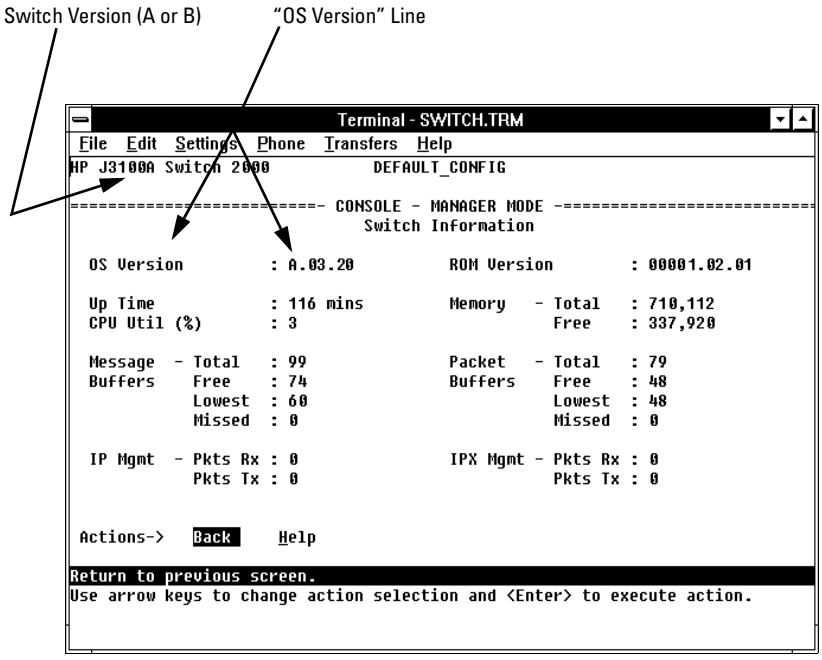

Figure 1-1. Example of the Switch Information Screen

3. Check the `"OS Version"` line in the Switch Information screen.
   - If the version number is A.03.20, B.03.20, or later, the Switch 2000 can support the ATM module. In this case, go to "Installing the ATM Module" on page 1-8.
   - If the version number is earlier than A.03.20 or B.03.20, download a new OS before installing the ATM module. In this case, continue with the instructions in this section before you install the module.

Downloading the OS

Use this procedure if you need to download a new OS to your Switch 2000. The procedure describes how to use a personal computer (PC) to download the OS (if you are using a UNIX workstation, refer to the Note on page 1-7).

1. Determine which version (A or B) of the Switch 2000 you are using:
   a. From the Main Menu of the Switch 2000 Console, select `Status and Counters...` to display the Status and Counters screen.
   b. Select `Switch Information...` to display the Switch Information screen (see Figure 1.1).
   c. In the upper, left-hand corner of the console interface screen (above `"OS Version"`), check the letter at the end of the Switch 2000 ID (either HP J3100A or HP J3100B).

      This letter indicates the version of the Switch 2000 you are using (i.e., HP J3100**A** is a Switch A and HP J3100**B** is a Switch B).
2. Choose the OS version to use in the following steps:
   - If you are using a Switch A, you will need the OS file with an "A_" preceding its name (e.g., `A_03_20.swi`).
   - If you are using a Switch B, you will need the OS file with a "B_" preceding its name (e.g., `B_03_20.swi`).
3. Do one of the following:
   - If the source of your OS file is the disk shipped with the ATM module, copy the file from the disk into the DOS directory you will use for downloading to the switch. Go on to Step 4.
   - If the source of your OS files is the self-extracting file from an electronic source, do the following:
     i. Copy the OS file into the DOS directory you will use for downloading to the switch.
     ii. Execute the file to decompress and extract its contents.

4. Download the software upgrade to your Switch 2000 using one of the following methods:
   - **TFTP download using a TFTP server and the `Download OS` option in the Switch 2000 console interface:** This is the recommended download method if you have TFTP server access to the Switch 2000. Refer to the *HP AdvanceStack Switch 2000 Console User's Guide* you received with your Switch 2000 for more information. For this option, use the form

     `filename.swi` (e.g., `B_03_20.swi`)

     for the `Remote File Name` parameter.
   - **Switch update utility:** Refer to the instructions in the `readme.txt` file provided with the update utility.
5. Proceed to "Installing the ATM Module" on page 1-8.

Note

To perform a TFTP download from a UNIX system, store the uncompressed `filename.swi` in the UNIX TFTP directory, then perform the TFTP download as described in Step 4, above. If you do not have access to a DOS system in order to execute the compressed file, use the World Wide Web or BBS services described on the card at the front of this manual to download uncompressed versions of Switch 2000 software.

Switch-to-Switch Download

If you have two or more Switch 2000s networked together, you can download the OS software from one switch to another (provided you are connecting to a Switch 2000 of the same type, A or B) by using the `Download OS` feature in the Switch 2000 console interface. To download the software from another Switch 2000, perform the following:

1. Go to the `Download OS` screen on the switch receiving the download.
2. Enter the IP or IPX address of the remote switch containing the OS you want to download.
3. Enter `"OS"` for the Remote File Name.
4. Execute the download.

Note

When installing the ATM module, you normally do not have to download any software onto the module. If the images on the module do need to be updated or replaced, please refer to "Uploading a File to the ATM Module" on page 3-16.

Installing the ATM Module

- Static electricity can cause severe damage to the sensitive electronic components on the HP AdvanceStack Switch ATM module. When handling the module, follow these procedures to avoid damage from static electricity:
  - Handle the module by its edges or faceplate at all times possible.
  - Avoid touching components or circuitry on the module.
  - Equalize any static charge difference between your body and the switch by wearing a grounding wrist strap and attaching it to the switch's metal body, or by continually touching the switch's metal body while you are installing the module.
- For proper cooling and reduction of electromagnetic emissions, ensure that a slot cover is installed on all unused slots in the Switch 2000.
- The Switch 2000 does not have to be shut down to install the ATM module. First time users, however, may turn off the Switch 2000 and remove its power cable, if preferred.

1. Slide out the blank LED label strip from the label slot corresponding to the physical slot in which you will install the module. The LED label strips have a small loop on the left end. Use your fingernail or a small implement to catch the loop and slide the label to the left and out of the label slot.

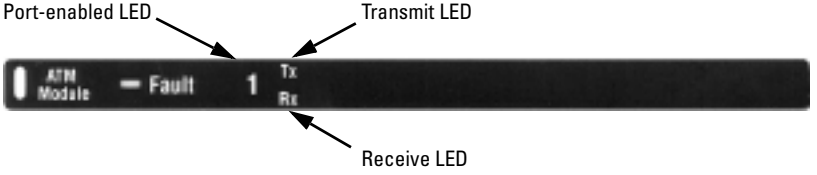

Figure 1-2. Port LEDs for the ATM Module

2. Insert the LED label strip you received with the ATM module, as shown in Figure 1-2. For example, if you are installing the module in slot "A", replace the blank LED label strip in label slot "A" with the new LED label strip for the ATM module, as shown in Figure 1-3.

   Save the blank LED label strip in case you ever want to remove the module and its LED label strip.

3. Using a Torx T-10 or slotted screw driver, unscrew the screws in the cover plate over the slot you want to use, and remove the cover. Store the cover plate with its screws for possible future use. For example, to install a module in slot A, see Figure 1-3.

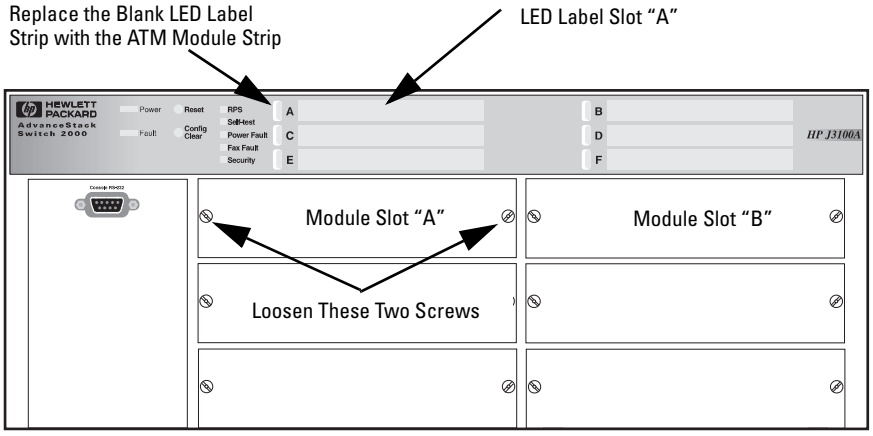

Figure 1-3. Remove the Cover Plate from an Unused Switch Port

4. Holding the module by its edges or its faceplate—taking care not to touch the metal connectors—position the module in front of the open slot on the switch by aligning the bottom edges of the module with the small grooves near the bottom of the module slot, as shown in Figure 1-4.

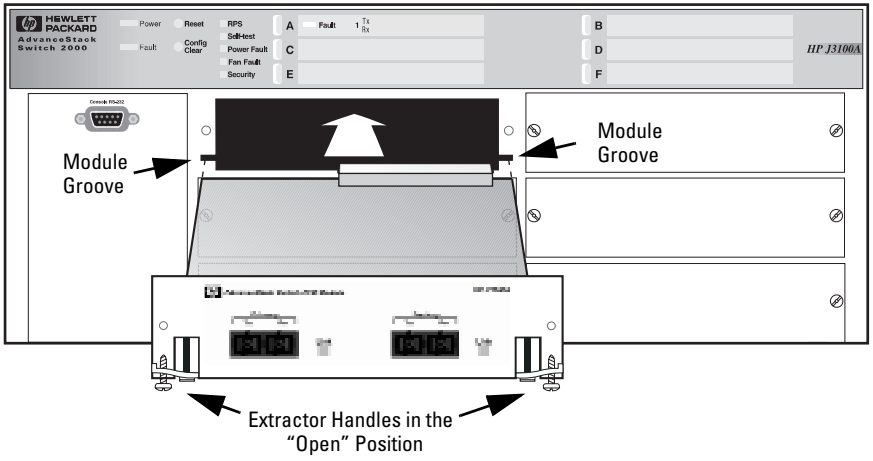

Figure 1-4. Extractor Handles in the Lowered (Open) Position

5. Make sure both extractor handles are in the open position (rotated away from the face plate), then push the module into the slot until you feel the extractor handles contact the switch chassis (the handles will move slightly upward when they contact the chassis).
6. Seat the module in the slot by simultaneously pushing in on both extractor handles until they are firmly seated against the front panel of the module (in the closed position), as shown in Figure 1-5.

   If the switch has power during module installation, the LEDs on the Switch 2000 will behave as described in Table 1-1 on page 1-14.

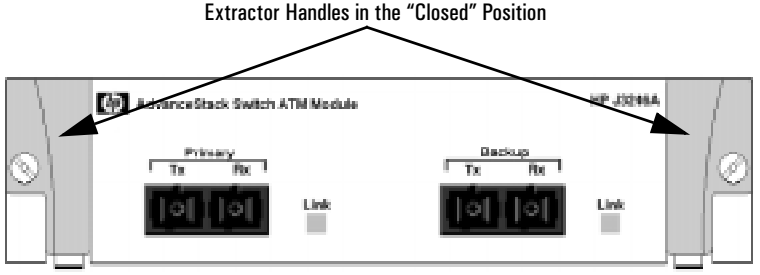

Figure 1-5. Extractor Handles in the Closed Position

7. Tighten the captured screw in each handle by using a flat-blade or Torx-10 screwdriver, as shown in Figure 1-6.

Caution Be careful not to overtighten the screws.

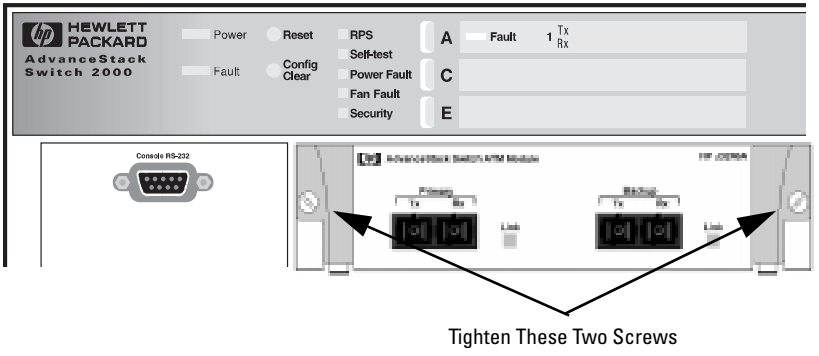

Figure 1-6. Securing the Module in the Slot

8. Connect the appropriate SC-type network cables to the module's ATM ports, using the correct Tx/Rx orientation, as shown in Figure 1-7.

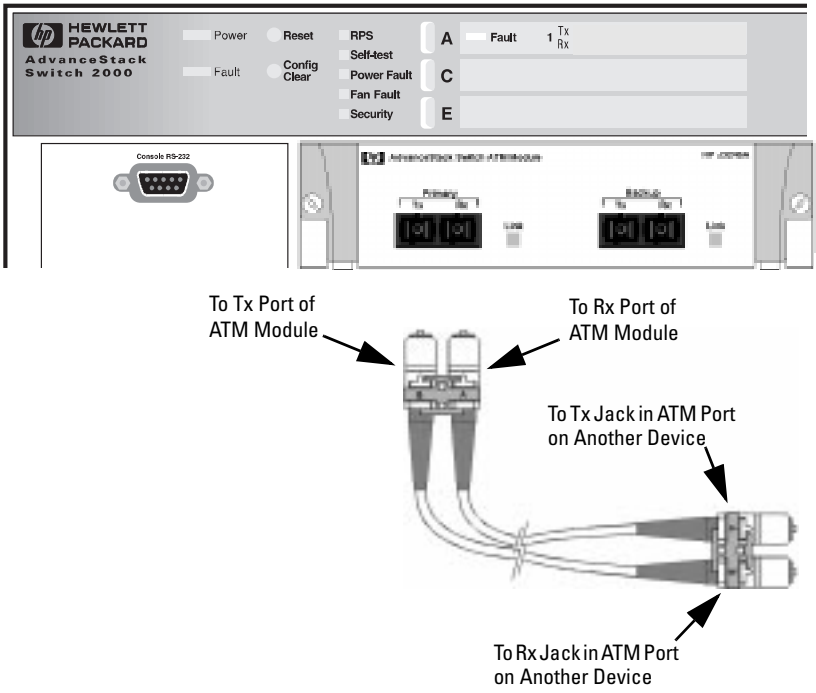

Figure 1-7. Connecting a Cable

9. If the Switch 2000 is under power, check the Port-enabled LED for the ATM module to ensure that the port is up (if you have not already done so, install the LED label strip as described in Step 1 on page page 1-8). The LED should behave as described in Table 1-1 on page 1-14.

Note

It may take 20 to 30 seconds (after the ATM module is installed or booted) before the Port-enabled LED indicates the port's status.

10. Customize the port configuration, if necessary (see "Customizing the Port Configuration" on page 1-12).

11. Reboot the switch, since this is a new module being installed (see "Rebooting the Switch" on page 1-12 for more information on when the switch must be rebooted).

Customizing the Port Configuration

If the slot in which you installed the ATM module was empty or did not contain an ATM module the last time the switch was rebooted or reset, then the module will need to be configured (see Chapter 3, "ATM Module Configuration").

Rebooting the Switch

You can reboot the switch either by using the Reboot Switch command in the console Main menu or by pressing the recessed Reset button located to the right of the Power LED.

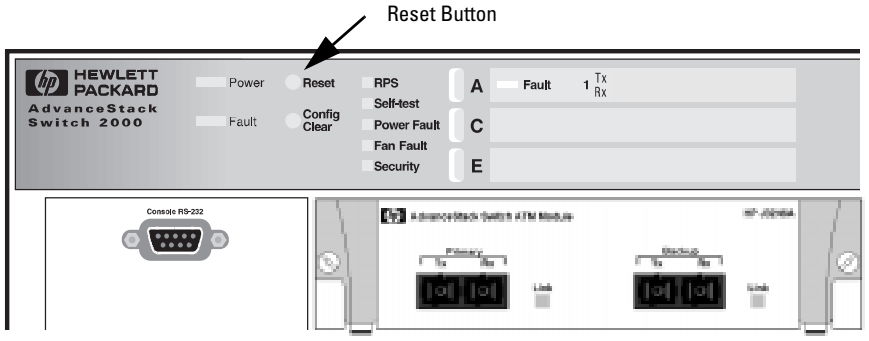

Figure 1-8. Location of the Reset Button

Generally, you only need to reboot the switch when it needs to recognize a change in its hardware or software (console) configuration. Some circumstances in which you will need to reboot the switch are:

- Installing a module in a slot that was previously occupied by a different type of module—for example, installing an ATM module in a slot that was previously used for a 100VG Module.
- Changing certain switch configuration parameters through the console interface (the console provides messages indicating when the switch must be rebooted to activate the configuration change).

You do not need to reboot the switch when:

- Replacing a module with the same type of module.
- Adding or changing a recessed transceiver in a switch module designed to accept such transceivers. (The module must be removed from the Switch 2000 for this procedure. Note that the ATM module is not designed for adding or changing transceivers.)
- Enabling or disabling the ATM module port.

Verifying ATM Module Operation

Once you have finished installing the ATM module and rebooted the switch, check the following to ensure the module is working properly:

- LED behavior (see below)
- The ATM module can be viewed in the Switch 2000 console

Note

You will need to have access to the Switch 2000 Console Interface to verify the second item above. You can either connect a console directly to the RS-232 serial port of the Switch 2000, or access the switch via Telnet from another device on the network (see the *HP AdvanceStack Switch 2000 Console User's Guide* for more information about connecting a console).

LED Behavior

Three different sets of LEDs can indicate proper or improper operation of the ATM module: the slot fault LED, the port-enabled LED, and the Transmit/Receive (Tx/Rx) LEDs (on the LED strip that corresponds to the slot in which the ATM module is installed); the self-test LED on the Switch 2000; and the link LEDs on the faceplate of the ATM module.

If the ATM module has been properly installed and connected to an ATM network, the Port-enabled and Link LEDs should be illuminated.

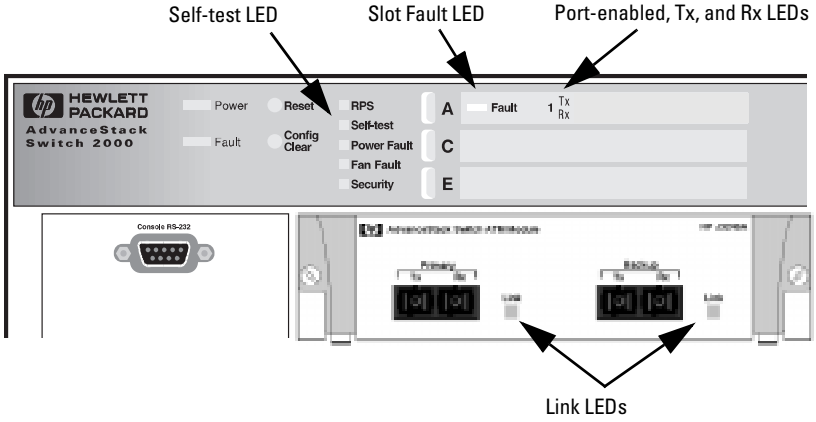

Figure 1-9. Self-Test, Fault, and Link LEDs

Table 1-1. LED Behavior

LED	Pattern
Self-test	1. ON for less than 1 second once the module is properly seated following a hot-insertion 2. ON until the Switch 2000 completes its power-on self-test following power-up or a reboot (up to 30 or more seconds) 3. OFF during normal switching operation 4. FLASHING simultaneously with Slot Fault LED if the slot has failed self-test. Check the event log.
Slot Fault	1. FLASHING RAPIDLY if the module is not properly seated 2. ON for less than 1 second once the module is properly seated following a hot-insertion 3. OFF during normal switching operation 4. ON until the Switch 2000 completes its power-on self-test following power-up or a reboot (up to 30 or more seconds) 5. ON for more than 1 second if there is a self-test failure. Check the event log. **NOTE:** If the Fault LED for the module slot continues flashing rapidly, the module may not be completely seated in the slot. Ensure that the handles on the module are fully in the "closed" position and the screws in the handles are tightened. If the module slot Fault LED continues flashing, unscrew the screws, open the handles, remove the module, and re-install it. If the Fault LED continues flashing, remove the module and contact your HP-authorized LAN dealer or HP networking support representative. If a module is not installed properly, and the module slot Fault LED continues rapid flashing, other modules in the switch will continue to forward packets normally, but other switch functions will be suspended until the module is removed or properly installed.
Port-enabled	ON if port is operational, otherwise OFF (NOTE: It may take 20 to 30 seconds (after the ATM module is installed or booted) before the Port-enabled LED indicates the port's status.)
Transmit (Tx)	ON when cells are being transmitted, otherwise OFF
Receive (Rx)	ON when cells are being received, otherwise OFF
Link	1. ON when the link to the port is good 2. BLINKING if the port is disabled (via the Switch 2000 console) 3. OFF if the link to the port is bad or if the module has no power

Configuring the Backup ATM Port

After installing the ATM module, you should connect and verify the module's backup port to protect against a failure on the primary port.

Note

For more information about command syntax and accessing the ATM module's command interface, see "Typographical Conventions" on page vi and "Console Interface Overview" on page 3-2.

Connecting the Port

To ensure the backup port is connected properly, perform the following steps:

1. Connect the ATM module's backup port to a port on the target device, using the same technique that is shown in Figure 1-7.

Note

If the target device is another ATM module (HP J3246A), both backup ports should be connected by the same fiber. If the target device is a different ATM device (e.g., an ATM switch), ensure that the port on the device is enabled.

2. Use the **`ama-set`** command (see "PHY (AMA) Selection Commands" on page 3-67 for more information) to switch to the backup port.

   Enter the command as follows:

   ```
   1:ATM-C1:atm: ama-set backup
   ```

3. Confirm the link between the ports (via the Link LED on the ATM module's backup port) to verify the connection.
4. Switch back to the primary port using the **`ama-set`** command.

   Enter the command as follows:

   ```
   2:ATM-C1:atm: ama-set primary
   ```

Verifying Failover

If there is a failure the ATM module will automatically switch over to the backup port. To verify that the port's failover mechanism is working properly, follow the procedure below:

1. Configure a PVC or ELAN and verify the link (as described in Chapter 2).
2. Manually remove the fiber connection to the ATM module's primary port.
3. Confirm the failover to the backup port by checking the port's Link LED. Additionally, you can:
   a. Issue the AMA, PVC, or ELAN status commands described in Table 3-14 on page 3-66 (specifically, **`ama-showcfg`**, **`br-encap-showcfg`**, and **`elan-stats`**).
   b. Use the **`ping`** command to verify the reachability of a connected ATM-ready device.

Backing Up ATM Module Software

After you have successfully installed the ATM module, you should make a copy of the operational software images (`hpmain` and `hpatm`) that reside in the module's Flash memory.

To make backup copies of these files, refer to the following sections of this manual for more information:

- "Copying a File" on page 3-24
- "Uploading a File" on page 3-58

2

- Configuration Overview
  - LAN Emulation (page 2-3)
  - PVC Mesh (page 2-14)
  - IP Configuration (page 2-17)
- Summary
- Saving the Configuration

Getting Started

Configuration Overview

This chapter describes how to configure the following on the ATM module for the AdvanceStack Switch 2000:

- LAN Emulation
- A PVC Mesh
- IP Configuration

Examples of each of these configurations are shown in this chapter, as well as details about the commands used to configure them.

Note

See "Console Interface Overview" on page 3-2 for information about the user interface and command usage. See "About This Manual" on page iii for information about text conventions.

The procedures listed in this chapter for configuring PVCs and LAN Emulation highlight the minimum configuration necessary before the ATM module will send and receive traffic. To achieve basic functionality, no further configuration of the ATM module is necessary after the procedures listed here have been carried out.

LAN Emulation

If you are already familiar with LAN Emulation (LANE), you can follow the steps listed below to begin configuring the ATM module. If you need further explanation on any or all of the concepts of LANE, skip these steps and read the entire section.

Quick Setup

Note

The following steps assume that the network to which the ATM module is connected has already been prepared for LANE (see "Configuring Other ATM Hardware for LANE 1.0" on page 2-8).

The minimum configuration to enable LANE on the ATM module is as follows:

1. Access the ATM module console (see "Accessing the ATM Module" on page 3-2).
2. Access the ATM subsystem:

   ```
   1:ATM-C1:mgmt: atm
   ```

3. Add the ELAN (named "elan1," for example) to the ATM module:

   ```
   2:ATM-C1:atm: elan-add|eadd elan1
   ```

4. Enable the ATM module to use a LANE Configuration Server (LECS):

   ```
   3:ATM-C1:atm: lec-set lecs-usage enabled
   ```

5. Enable the ATM module as a LANE Client (LEC):

   ```
   4:ATM-C1:atm: lec-set state enl
   ```

Overview

A likely configuration of the ATM-ready Switch 2000 utilizes LAN Emulation, or LANE. The LANE configuration is straightforward, and it is effective in both large and small networks.

LANE is a method of bridging legacy LAN (i.e., Ethernet or Token Ring) traffic over ATM. The term "LAN Emulation" stems from its main function—to make the ATM network look like a bridged legacy LAN environment.

One of the problems LANE solves is the dynamic and heavy bandwidth requirements of corporate servers, bandwidth than can not be provided by a legacy LAN. Using LANE, the server can be moved to an ATM LAN to satisfy its bandwidth requirements while the clients remain on the legacy LAN.

The ATM module software supports the ATM Forum's LANE 1.0 and UNI (User-Network Interface) 3.0, ATM standard protocols that let you associate the ATM module with an ELAN (Emulated LAN). An ELAN is a group of ATM stations that appear to the Switch 2000 as a broadcast domain. From the ATM module's perspective, ATM stations grouped into an ELAN appear to be nodes on a single Ethernet segment. The ATM module supports inclusion in one ELAN.

LANE 1.0 overlays your Ethernet and FDDI LANs on top of an ATM network. The ATM module can be used to overlay non-ATM networks (e.g., Ethernet or FDDI), managed by your Switch 2000 system, onto ATM. The ATM module is associated with an ELAN that is configured on the attached ATM switch. LANE permits any combination of ATM clients (i.e., ATM-ready PCs, workstations, switches, etc.).

Ethernet LAN Characteristics Emulated by LANE 1.0

LANE 1.0 emulates the following characteristics of Ethernet LANs:

Connectionless service	LANE establishes VCs (virtual circuits) to bridge traffic between the Ethernet LAN and ATM, but the VCs are transparent to the Ethernet LAN equipment.
Broadcast and multicast service	The BUS (Broadcast and Unknown Server) is a component of LANE that emulates broadcast and multicast services. When the ATM module needs to forward broadcast or multicast traffic from the Ethernet network, the module sends the traffic to the BUS, which in turn sends the traffic to each of the destination nodes in the ATM network.

An example of a typical ATM network is shown in Figure 2-1. The same ATM network, using LANE 1.0, is shown in Figure 2-2. Notice that each ATM station is a member of the ELAN. In this example, the stations are grouped into the ELAN named "Pubs."

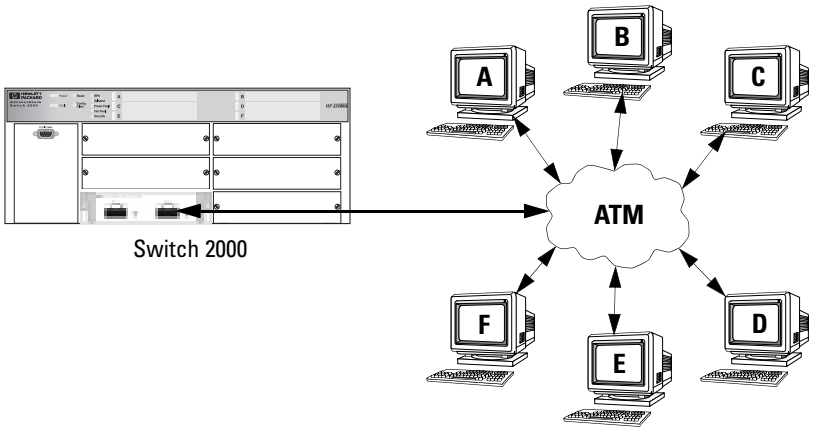

Figure 2-1. Typical ATM Network

The figure below shows the same ATM network, utilizing LANE 1.0, from the Switch 2000's perspective. Notice how the Switch 2000 regards the ELAN as a single broadcast domain.

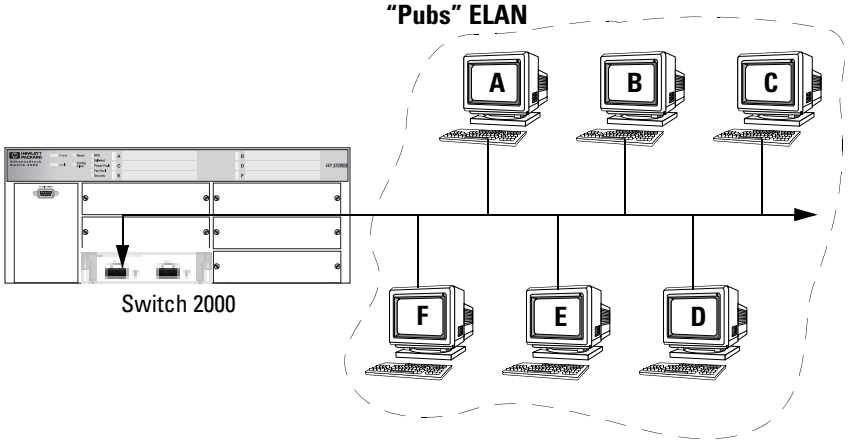

Figure 2-2. ATM Module's View of ATM LANE 1.0 Network

Because ATM stations grouped in the ELAN appear to the Switch 2000 software as members of a single broadcast domain, all the configuration features and management features available on the Switch 2000 system for Ethernet or FDDI segments also are available for ELANs (e.g., Spanning Tree, bridging). See the *HP AdvanceStack Switch 2000 Console User's Guide* for an overview of the Switch 2000 software features.

The ATM Module and LANE 1.0

The following sections describe the LANE 1.0 components and the role the ATM module plays in a LANE 1.0 network.

LANE 1.0 Components

LANE 1.0 networks consist of four major components:

LEC (LAN Emulation Client)	The LEC is the component in an end system that performs data forwarding, address resolution, and other functions when communicating with other components of the ELAN.
LECS (LAN Emulation Configuration Server)	The LECS is responsible for the initial configuration of a LEC. The LECS provides the LEC information about the ELANs that the LEC can join. The LECS also provides the LEC the address of the LES (see below) associated with each ELAN.
LES (LAN Emulation Server)	The LES is an LE_ARP (LAN Emulation ARP) server and contains address resolution information for the ELAN. The LES contains a table that maps the MAC address of each device in the ELAN to its corresponding ATM address.
BUS (Broadcast and Unknown Server)	The BUS emulates the multicast and broadcast functions of an Ethernet segment. When the LEC needs to send a broadcast or multicast packet, or does not know the destination of a unicast packet, the LEC sends the packet to the BUS. The BUS then sends the packet to the appropriate end system(s).

You can configure the ATM module to function as a LEC, allowing it to perform data forwarding, address resolution, and other control functions when communicating with other components of the ELAN.

Traffic sent from the Switch 2000 system's Ethernet or FDDI segments to devices in the ELAN are translated by the ATM module from Ethernet packets into ATM cells, then sent to the ELAN. Traffic sent by the ELAN to an Ethernet or FDDI segment is translated by the ATM module into Ethernet packets, then sent to the appropriate Switch 2000 segments (Ethernet or FDDI).

LANE 1.0 Configuration Example

Depending upon your ATM hardware and software, LANE components can be configured on the ATM switch, on a workstation, or they might be distributed between the two. For example, you might install the LECS on a UNIX workstation and the LES and BUS on the ATM switch, as shown in Figure 2-3.

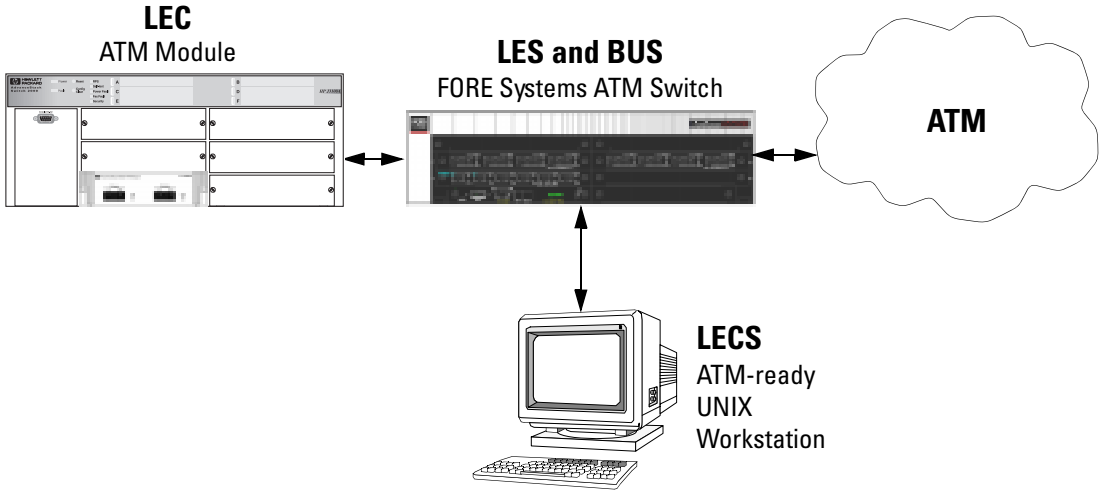

Figure 2-3. Example of LANE 1.0 Configuration

Table 2-1 lists the hardware used for each LANE 1.0 component shown in Figure 2-3.

Table 2-1. LANE 1.0 Components

LANE 1.0 Component	Hardware	Software
LEC	ATM Module	ELAN names. If no LECS is configured, the ATM address of the LES is specified with each ELAN name.
LES and BUS	FORE ATM Switch	ATM addresses of the LES and BUS. In this example, the LES and BUS are colocated (located on the same machine).
LECS	ATM Adapter Card (installed on a UNIX workstation). The LECS can also be run on the FORE ATM switch.	LECS configuration file. Contains the ATM addresses of the ELANs. Also contains filters for accepting or discarding specific ATM addresses.

Configuring LAN Emulation

To use the ATM module for bridging in a LANE 1.0 ATM network, you must perform the following configuration tasks:

- Prepare your other ATM hardware for LANE 1.0 (i.e., configure a LECS, LES, and BUS).
- Add the ELAN to the ATM module. The ELAN name must match the one specified when you configured the LECS on the ATM switch. (Use the **`elan-add`** command.)
- Instruct the ATM module to get configuration information from the LECS. (If you do not use the LECS, you must specify the LES address when you add the ELAN to the LEC.)
- Enable the ATM module as a LEC.

The following sections describe how to perform these tasks.

Configuring Other ATM Hardware for LANE 1.0

If you plan to use the ATM module as a LEC for LANE 1.0, you must first configure the LES and the BUS.

In addition, you can configure the LECS, which supplies the LES address to the LEC (ATM module). If you do not configure the LECS, you must supply the LES address manually when you add the ELAN to the ATM module.

Note

LANE services (the LES, BUS, and LECS) are not supported on the ATM module. Therefore, these LANE components must be configured on alternative ATM devices (i.e., an ATM switch or adapter). After you configure the adapter cards and ATM switch for LANE 1.0, use the commands described in the following pages to configure the ATM module for LANE 1.0.

An example LANE 1.0 configuration is shown in Figure 2-3. The example includes a LES, BUS, LECS, and LEC.

Configuring the ATM Module for LANE 1.0

The following sections describe the commands you use to configure the ATM module for LANE 1.0.

The ELAN commands are in the ATM subsystem. After reaching the ATM console (see "Accessing the ATM Module" on page 3-2), the ATM subsystem can be reached by entering **atm** at the prompt, as shown below:

```
1:ATM-C1:mgmt: atm
```

Adding the ELAN. To add the ELAN to the ATM module, issue the following command:

elan-add|eadd *<elan-name>* **[***<les-atm-address>***]**

where:

<elan-name>	A name from 1 to 32 characters in length. You can use alphabetic characters, numerals, and special characters in the name, but you cannot use blank spaces. ELAN names are case-sensitive.
<les-atm-address>	Specifies the LES address of the ELAN you are adding to the ATM module. If you do not specify the LES address, the ATM module software will try to get the LES address from the LECS.

Below is an example of how to add the ELAN to the ATM module. In this example, an ELAN named `elan1` is added.

```
5:ATM-C1:atm: elan-add elan1
```

You can add only one ELAN to an ATM module in a single Switch 2000 chassis. In addition, the ELAN name you specify must match the ELAN name you configured on the ATM switch.

If you did not configure the LECS, you must specify the LES address when you add the ELAN to the ATM module. The following example demonstrates how to specify the LES address with the **elan-add** command.

```
6:ATM-C1:atm: elan-add elan1
47:0079:0000:0000:0000:0000:0000:00a03e000001:00
```

Determining Which LES and BUS Are in Use. At any time, you can determine which LES and BUS the ELAN is using by issuing the **elan-showcfg** command (see "Displaying ELAN Parameters" on page 3-77).

Enabling the ATM Module to be a LEC. To configure the ATM module as a LEC, issue the following command:

lec-set|lse *<param> <value>* **[***<param> <value>...***[***<param> <value>***]]**

where:

<param> <value> Specifies the LEC parameter and the value you are assigning to the parameter. You can specify one of the following parameters:

lecs-usage|lu enl|dis [*<lecs-atm-address>***]**
Enables or disables the use of the LECS by the LEC.

If you specify the LECS address, separate each portion of the address with a period (.), a colon (:), or a hyphen (-).

If you do not specify the LECS ATM address, the well-known address is used. If you specify **dis** (disabled), the LECS is not used.

NOTE: To specify the well-known LECS address, enter the following: 47:0079:0000:0000:0000:0000:0000:00a03e000001:00

state|s enl|dis
Starts or stops the LEC of the specified slot.

Here is an example of how to enable the ATM module to use a LECS and to function as a LEC.

```
6:ATM-C1:atm: lec-set lecs-usage enl

7:ATM-C1:atm: lec-set state enl
```

In this example, the first command enables the ATM module to use the LECS. The second command enables the ATM module as a LEC (i.e., it starts the LEC).

Verifying the ATM Module as a LEC

After you configure the ATM module as a LEC, it is ready to operate using LANE 1.0. To display configuration information for the ATM module, issue the **lec-showcfg** command. The "LE Client" is the LEC (ATM module).

```
8:ATM-C1:atm: lec-showcfg
LEC Configuration:
------------------------------------------------------------------------
LE Client State : Enabled
LE Client ATM Address :
47:0005:80ff:e100:0000:f21a:1e3c:0000ef0282d0:00
LECS ATM Address : 47:0079:0000:0000:0000:0000:0000:00a03e000001:00
```

Verifying the ATM Module's LANE 1.0 Operation

After you set configuration parameters for the ELAN, you can verify the parameters by issuing the **elan-showcfg** command:

elan-showcfg|escf *<elan-name>*

where:

<elan-name>	Specifies the name of the ELAN for which you want to display ELAN parameters.

The following is an example of the information displayed by this command. In this example, configuration information is displayed for the ELAN named elan1.

```
10:ATM-C1:atm: escf elan1
Configuration For ELAN: elan1

-------------------------------------------------------
Virtual Port    :     2
Max ARP Retry   :     2
ARP Aging Time  :     300 (sec)
Control Timeout:      120 (sec)
Flush Timeout   :     6 (sec)
Forward Delay   :     15 (sec)
VCC Timeout     :     20 (min)
BUS Rate        :     1 (pps)

LES Address     : 47:0005:80ff:e100:0000:f21a:1e3c:0020481a1e3c:01
BUS Address     : 47:0005:80ff:e100:0000:f21a:1e3c:0020481a1e3c:02
```

In addition to the LES address and the BUS address, this command displays the settings for various ATM parameters. For information about the parameters shown by this command, see the corresponding descriptions for the **elan-showcfg** command ("Displaying ELAN Parameters" on page 3-77).

LEC Failover Support

The ATM module supports LEC failover, providing redundancy by letting you associate the ELAN with more than one LES. The ELAN uses only one LES for ELAN traffic, but if that LES fails, the software automatically uses another LES. You can specify up to two backup LESes for the ELAN.

To implement the failover mechanism for the ELAN, add a separate instance of the ELAN for each LES address to the ATM module. Use a vertical bar (|) to separate the ELAN name from the LES instance. All three instances of the ELAN name exist on the ATM module, but only one instance is active. To add the ELAN to the ATM module, use the **elan-add** command.

Note

The failover configuration on the ATM module must match the configuration on the ATM switch.

The implementation of the failover mechanism is transparent to ATM module bridging. The ATM module bridging software operates the same way all the time, regardless of the LES instance that is active.

An example of how the failover mechanism is used on the ATM module is shown in Figure 2-4.

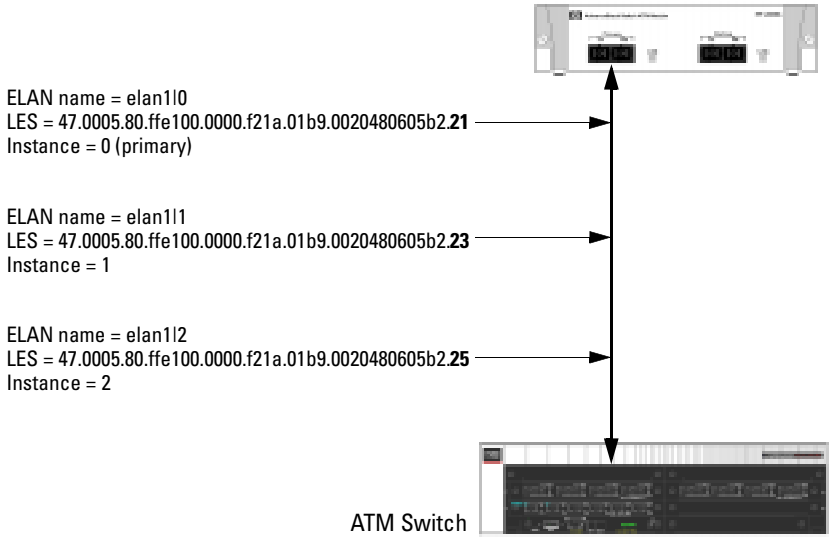

Figure 2-4. Failover Mechanism on the ATM Module

In this example, three instances of `elan1` have been added to the ATM module as three distinct ELANs: `elan1|0`, `elan1|1`, and `elan1|2`. A LES address has been specified for each instance, either using the **`elan-add`** command or using entries in the LECS configuration file (the administrator of the ATM network can assist with this).

Each LES in this example is distinguished by the selector byte (21, 23, and 25). You specify the LES address, including the selector byte, when you add the ELAN to the ATM module. You must specify the same LES addresses when you add the ELANs to the ATM module. However, you do not need to specify the LES addresses on the ATM module if you are using a LECS and have specified the LES addresses (and failover instances) in the LECS configuration file.

In this example, LES 21 is the primary LES (instance 0) and is always used unless it fails. If the primary LES fails, the software attempts to use instance 1 of the LES (LES 23). If instance 1 also fails, the software uses instance 2 (LES 25). Note that LES addresses do not in themselves have any hierarchy or priority. A hierarchy is established among the LES addresses when associated with instance numbers (i.e., 0, 1, and 2).

If the failover mechanism switches to LES instance 1 (the backup LES), the software periodically attempts to re-establish its connection to the primary LES (instance 0).

When a LES fails or when the failover mechanism attempts re-establish connection to the primary LES, traffic on the ATM module is momentarily interrupted while the software establishes VCs (Virtual Circuits) to the new LES and flushes the LE_ARP and bridge caches on the ATM module.

Preparing the LECS for the Failover Mechanism. Before adding the ELAN to the ATM module, implement the failover mechanism in the LECS configuration file. The ATM module software uses the LES instance (0, 1, or 2) to determine which LES address to use. In the examples that follow, the LECS configuration file contains the LES addresses shown in Figure 2-4. The following ATM module command instructs the ATM module software to use LES 21 (instance 0) as the primary LES for elan1:

```
7:ATM-C1:atm: elan-add "elan1|0"
```

If LES 21 fails, the LES address for instance 1 (23) is used, provided the second instance is added as follows:

```
8:ATM-C1:atm: elan-add "elan1|1"
```

To add the third instance of the LES (25), issue the following command:

```
9:ATM-C1:atm: elan-add "elan1|2"
```

Notice that the LES addresses are not specified. The ATM module software determines the LES address for an instance based upon the address associated with that instance in the LECS configuration file. The software assumes that you want to use the LES address associated with instance 0 in the LECS configuration file as the LES address for instance 0, and so on.

If you specify the LES addresses when you add the ELAN instances to the ATM module, make sure the addresses match the addresses you specified in the LECS configuration file.

PVC Mesh

If you are already familiar with PVCs and virtual ports, you can follow the steps listed below to begin configuring the ATM module. If you need further explanation on any or all of the concepts of PVCs and virtual ports, skip these steps and read the entire section.

Quick Setup

The minimum configuration to enable PVCs and RFC 1394 encapsulation on the ATM module is as follows:

1. Access the ATM module console (see "Accessing the ATM Module" on page 3-2).
2. Access the ATM subsystem:

   ```
   1:ATM-C1:mgmt: atm
   ```

3. Create a PVC on the Switch 2000:

   ```
   2:ATM-C1:atm: br-encap-set 2 in-pvc 50 out-pvc 100 state enabled
   ```

4. Create a PVC on the ATM switch (according to the instructions that apply to your particular ATM switch) using the same incoming and outgoing VCI values.
5. Repeat Steps 3 and 4 for as many PVCs as you need to create.

Overview

Another configuration that utilizes the ATM Module is the PVC mesh. In this configuration, Switch 2000s are connected to an ATM network containing various ATM-ready devices (which support RFC 1394 encapsulation).

The PVC mesh provides a connection between the Switch 2000s and each device within the ATM network. An example of a PVC mesh is demonstrated in Figure 2-5.

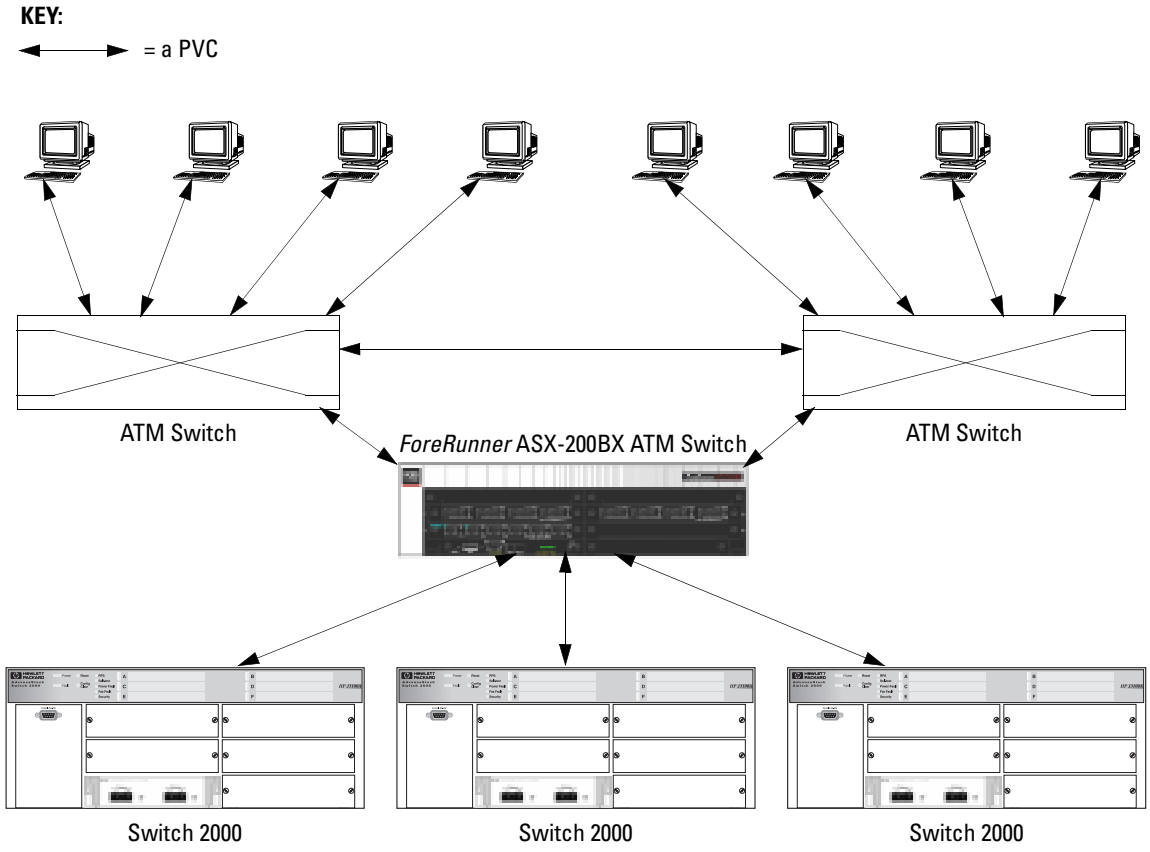

Figure 2-5. Switch 2000s Connected with a PVC Mesh

Creating a Switch-to-Switch PVC

To create a PVC from a Switch 2000, use the **br-encap-set** command in the ATM subsystem. After reaching the ATM console (see "Accessing the ATM Module" on page 3-2), the ATM subsystem can be reached by entering **atm** at the prompt, as shown below:

```
1:ATM-C1:mgmt: atm
```

Once inside the ATM subsystem, the **br-encap-set** command is used as follows:

br-encap-set|bse *<vport> <param> <value>* **[***<param> <value>...***]**

where:

<vport>	Indicates the virtual port on which the PVC is to be created.
<param> <value>	Represent the following: **in-pvc|ip** *<vci>* - Indicates the incoming Virtual Circuit Identifier (VCI) of the PVC. **out-pvc|op** *<vci>* - Indicates the outgoing VCI of the PVC. **state|s enl|dis** - Indicates whether the PVC is to be created (**enl**) or torn down (**dis**).

The following sections demonstrate how to create a bi-directional PVC between a Switch 2000 and an ATM-ready device (e.g., an ATM switch), as shown in Figure 2-5.

Create a PVC on Both Switches

To create a bi-directional PVC between a Switch 2000 and an ATM switch, you must create a PVC on each device. In the console interface of the Switch 2000, access the **atm** subsystem of the ATM module and enter the following:

```
br-encap-set 2 in-pvc 50 out-pvc 100 state enl
```

This enables a PVC on virtual port 2, with an incoming VCI of 50, and an outgoing VCI of 100.

Next, create a PVC on the ATM switch (according to the instructions that apply to your particular ATM switch) using an incoming VCI of 100 and an outgoing VCI of 50.

IP Configuration

An IP and gateway address enable the ATM module to be managed or accessed (via SNMP, TFTP, or PING) from another device. The IP and gateway addresses ARE NOT necessary for the ATM module to pass network data from the ATM network to the Switch 2000.

Note

- The commands in this section are only useful for modifying how SNMP, TFTP, or other IP packets are handled by the ATM module. Although "routes" to other subnets can be added to the ATM module, the module itself does not *perform* any routing.
- The ATM module DOES NOT use the IP address of the Switch 2000. It operates as a logically separate network device, and therefore it must be assigned a unique IP address.

Configuring an IP Address

Before the ATM module can be managed or accessed (via TFTP or SNMP, for example) over the network, it must be assigned an IP address.

Note

The considerations and restrictions listed in the following subsections should be understood before moving on.

Considerations

The following considerations apply to assigning an IP address:

- An IP address must be specified in dotted-decimal notation, and it must be a valid IP host address. A valid IP address contains a host number that is non-zero and non-broadcast (broadcast IDs are all binary 1s).
- When an IP address is added, a subnet mask specific to your environment should be specified.
- An IP address must be assigned to the ATM module in order to allow management or access via TFTP or SNMP.

Restrictions

The following restrictions apply when assigning an IP address. These restrictions ensure reliable system operation; invalid configurations can bring down an entire network.

- A parent network address can not be configured when a subnet of that address has been configured on the ATM module.
- A subnet address can not be configured if its parent network address has been configured on the ATM module. The parent network is the overall network on which subnetworks are configured. For example, network 147.128.0.0 is the parent network of subnetworks 147.128.1.0 and 147.128.2.0. These two subnetworks are referred to as children networks of the parent network.
- Different IP host addresses can not be assigned to one interface on the same network or subnet.
- Subnet addresses should normally all have the same binary length (i.e., they should all use the same subnet mask).

How the ATM Module Handles Broadcast Packets

- The ATM module discards unexpected IP broadcast packets. This feature is particularly beneficial for large networks that experience high volumes of broadcast traffic.
- The ATM module discards IP broadcast packets that have been bridged back to it. Some workstations bridge broadcast packets back to their source. The ATM module checks the IP source address of incoming traffic and discards any such packets.

Operation in Multinetted Networks

Multinetting is the use of multiple IP subnets on a single bridged or switched LAN. To communicate with the ATM module via TFTP or SNMP in such a network, one of the two steps below must be performed. This is a prerequisite to SNMP MIB browsing or performing a firmware upgrade of the ATM module:

- Configure the ATM module with an IP address on the same subnet as the SNMP MIB browser and TFTP server.

or

- Use a router to route between subnets and configure that router as the default gateway on both the ATM module and on the node running the SNMP MIB browser or TFTP server.

Note The ATM module can not be configured as its own default gateway in any type of network.

Adding an IP Interface

The **add-interface** command in the IP subsystem is used to assign an IP address to the ATM module. When an address is added, the software makes an entry into the IP route table to show that the corresponding network is connected; the software then creates the interface.

Note *Only one* IP interface can be assigned to the ATM module.

After reaching the ATM console (see "Accessing the ATM Module" on page 3-2), access the IP subsystem by entering **ip** at the prompt, as shown below:

```
1:ATM-C1:mgmt: ip
```

Once inside the IP subsystem, the **add-interface** command is used as follows:

add-interface|ai *<IP-addr>* **[***<subnet-mask>* **[br0|br1] [cost** *<cost>***] [allsubnets|as]]**

where:

<IP-addr>	Specifies the IP address to be assigned to the ATM module.
<subnet-mask>	Allows a standard IP subnet mask to be used. If a particular network uses IP subnet addressing, the subnet mask should be specified here. Otherwise, the system uses a default subnet mask equal to the "natural" subnet mask for the particular class of address.
br0|br1	Specifies the style of broadcast address: - Specifying `br0` forces the ATM module to send an "all-0s" broadcast (i.e., all bits in the host segment of the address are 0s). The `br0` argument is useful when the ATM module interoperates with workstations that use the old style of IP broadcast address, with all 0s as the host number. - Specifying `br1` forces the ATM module to send a standard "all-1s" broadcast (i.e., all bits in the host segment of the address are 1s). The default is `br1`.
<cost>	Specifies the cost of using the interface, equal to the number of extra hops to the destination, ranging from 1 to 14. (An IP packet's time-to-live field is reduced by one at each hop.) The default is zero.
allsubnets|as	Allows the addition of an IP interface having all 0s or all 1s as the subnet part of its address.

The following example assigns an IP address to the ATM module:

```
3:ATM-C1:ip: ai 10.0.8.191 255.255.248.0

Net 10.0.8.0: added
Addr 10.0.8.191, Subnet mask 255.255.248.0, mtu 1500, cost 0, added
```

Before adding the interface address, the software makes an entry into the route table to show that the corresponding network (10.0.8.0) is directly connected to the ATM module.

This example uses a non-natural subnet mask. 10.0.8.191 is a Class A IP address, which has a natural subnet mask of 255.0.0.0. The subnet mask specified in the command (255.255.255.0) indicates that subnetting is being used.

Verifying the Interface

To verify that an interface has been configured correctly, "ping" the address, as shown below:

```
4:ATM-C1:ip: ping 10.0.8.191

10.0.8.191 is alive
```

Configuring the Default Route

You can use the **`add-route net default`** command to assign the default route to the ATM module. The default route is used by the ATM module to send response SNMP and TFTP packets to nodes that reside on a different subnet. Commonly, the default route is the address of an enterprise router.

The **add-route net default** command is used as follows:

add-route|ar net|n default *<subnet-mask> <gw-addr> <vport> <metric>* **[strict]**

where:

<subnet-mask>	Specifies the subnet mask value for the network. If the network does not use a subnet mask, then specify the natural subnet mask here. The natural subnet mask depends upon the class of the IP address (A, B, or C). **NOTE:** Specifying `default` requires that 255.255.255.255 be used as the subnet mask.
<gw-addr>	Specifies the IP address of the gateway (router) to which packets destined for the specified subnet are forwarded. **NOTE:** The ATM module can not be configured as its own default gateway.
<vport>	Specifies the virtual port onto which a packet is forwarded to reach the specified gateway.
<metric>	Indicates the cost of the route (number of hops to the destination). Generally, the route with the lowest cost is used.
strict	Indicates that the route is to be used, even if its cost is greater than that of another route, unless the route is unavailable.

The following example shows how to add the default route to the ATM module:

```
61:ATM-C1:ip: add-route net default 255.255.255.255 147.128.128.62 3 4

default, 255.0.0.0, 147.128.128.62, 3, 4: added
Currently active
```

SNMP and TFTP response packets with unknown destinations are sent to a default gateway with address 147.128.128.62. Packets will require 4 hops to reach the destination net.

Verifying the Default Route

To verify the default route, "ping" an address that is on a different subnet, as shown below:

```
62:ATM-C1:ip: ping 44.29.16.105

44.29.16.105 is alive
```

For more information about IP interfaces and the default route (i.e., displaying and deleting), see "The IP Subsystem" in Chapter 3.

Summary

No other configuration of the ATM module is necessary to achieve minimal functionality. For information about further, custom configuration, see Chapter 3 for additional ATM commands.

Saving the Configuration

After performing the configurations in this chapter, the configuration of the ATM module should be saved. To save the current configuration (at any time), access the Management subsystem and enter the **savecfg** command.

If you are already in the ATM console, enter **mgmt** at the prompt to reach the Management subsystem. If you are not in the ATM console, access it according to "Accessing the ATM Module" on page 3-2. When the ATM console appears, you will be in the Management subsystem.

To save the current configuration, enter the **savecfg** command as follows:

```
1:ATM-C1:mgmt: savecfg cfg
```

See "Saving Configuration Changes" on page 3-29 for more information.

3

ATM Module Configuration

Console Interface Overview

This section describes how to reach the ATM module interface, the command-line interface, and how to issue commands. In addition, this section describes the global commands, which you can use to access a subsystem, get on-line help, or display the command history.

Accessing the ATM Module

The ATM module's command line interface is accessed through the Console Interface of the HP Switch 2000. Specifically, it is accessed from the Configuration Menu of the Switch 2000, as shown in Figure 3-1. For more information about connecting a console to the switch and how to navigate the Console Interface, see the *HP AdvanceStack Switch 2000 Console User's Guide*.

Figure 3-1. Accessing the ATM Module Interface from the Switch 2000

Note

The `ATM Console Port x1` (where x = A,B,C,D,E, or F) option is only available if an ATM module is installed in the Switch 2000. If two ATM modules are installed, an option for each module appears in the Switch 2000 console.

Global Commands

ATM module runtime commands are grouped into subsystems. You can access the global commands from any subsystem. Table 3-1 lists and describes the global commands for the ATM module.

Table 3-1. Global Commands

Command	Description
atm	Accesses the ATM subsystem
bridge	Accesses the Bridge subsystem
exit	Ends a command-line session and returns to the Switch 2000 Console.
findcmd|fcmd [*<command>***]**	Lists the subsystem in which the specified command is located. If *<command>* is not specified, lists all commands in all subsystems.
help|h [*<command>***]**	Displays on-line help for the specified command. If no command is specified, displays on-line help for all commands within the current subsystem.
history|hi	Displays the command history (up to 32 commands) for the current session.
histchars|hch *<ch1>* **[***<ch2>***]**	Displays or changes the history-control characters.
ip	Accesses the IP subsystem.
mgmt	Accesses the Management subsystem.
snmp	Accesses the SNMP subsystem.
subsystems|ss	Displays a list of all the subsystems.
tcpstack	Accesses the TCPstack subsystem.
tftp	Accesses the TFTP subsystem

Issuing Commands

After accessing the ATM module, as described on page 3-2, commands are issued at a prompt such as the one shown in Figure 3-2.

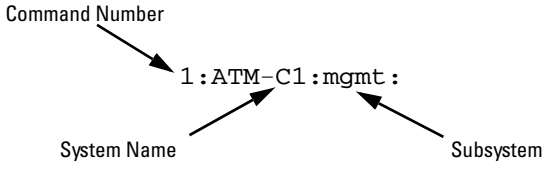

Figure 3-2. ATM Module Command Prompt

The command prompt has three components:

Command Number	The sequential number of the command in the session (similar to a command number in the UNIX C-shell). When you issue a carriage return (press Return), the ATM module attempts to execute the command you have entered at the command prompt. A message or data (if requested) is displayed, and a new command prompt is displayed.
System Name	The name assigned to this ATM module, according to its position in the Switch 2000.
Subsystem	The name of the subsystem currently in use. Commands issued at the command prompt must either be global commands or commands within the current subsystem.

Entering and Editing Command Text

All commands are typed at the command prompt using a terminal attached to the Switch 2000 or a PC that is being used as a management station. The management station must be attached to the serial port of the Switch 2000 or connected via a TELNET session.

Commands and arguments are case-sensitive and should be entered only in lowercase characters. Each command must fit on a single line and cannot exceed 128 characters in length. The keys you use to edit and issue commands are the standard keys used on most UNIX workstations.

- To issue a command, type the command name and arguments (if needed) after the command prompt, then press the Return key.
- To erase individual characters in a command, use the Backspace or Delete key, or the EraseChar assigned in your TELNET session (usually Ctrl + H).
- To cancel a full line of input, use the reassign character (usually Ctrl + U).

Terse Forms

For most commands and arguments, you can save keystrokes by using a terse form. A terse form is an abbreviation for a command or argument. You can enter either the full form or the terse form of any command or argument.

The on-line help and this manual show the terse forms of commands and arguments along with the complete forms. See “Console Interface Overview” on page 3-2 for information about how terse forms are shown.

For example, **`rename|mv`** *`<old-filename> <new-filename>`* can be entered as **`rename`** `file.nam file2.nam` or **`mv`** `file.nam file2.nam`.

Accessing a Subsystem

The ATM module runtime commands are organized into subsystems. Each subsystem contains commands that pertain to a particular aspect of ATM module configuration or management.

Table 3-2 lists and describes the ATM module subsystems. The subsystems are not organized hierarchically. You can switch the focus of the command line to any subsystem by entering its name at the command prompt as follows:

```
4:ATM-C1:atm: mgmt
5:ATM-C1:mgmt:
```

Notice that the subsystem portion of the command prompt changes to indicate the current subsystem.

Table 3-2. ATM Module Subsystems

Subsystem	Use to...
atm	Configure the ATM module and LAN Emulation (LANE).
bridge	Configure IEEE 802.1d bridging, display bridging statistics, and enable or disable virtual ports.
ip	Configure the IP protocol stack.
mgmt	Display hardware information, configure hardware parameters, use configuration files, and monitor virtual port traffic.
snmp	Configure SNMP communities and managers.
tcpstack	Display TCP and UDP tables.
tftp	Upload, download, and display files on a TFTP server.

When you begin a session, the command prompt begins in the **mgmt** subsystem.

You also can issue a command located in a particular subsystem from within another subsystem by prefacing the command with the name of its subsystem, as shown in the following example:

```
5:ATM-C1:mgmt: tcpstack showcfg
                          TCP Configuration
                          -----------------
Round Trip Algorithm:                     vanj
Min Rexmit Interval:                      1000 ms
Max Rexmit Interval:                     64000 ms
Max Connections Allowed:                     2

connection-idle-time:                       20 minutes
keep-alive-interval:                        75 seconds
Time to disconnect on idle conn:            30 minutes 0 seconds

6:ATM-C1:mgmt:
```

In this example, the ATM module's TCP configuration is displayed by the TCPstack subsystem's **showcfg** command. Note that the command prompt displayed following the output is still set to the **mgmt** subsystem.

Getting On-Line Help

The ATM module contains on-line help for each subsystem and command. At any time, you can display:

- A list of all the ATM module subsystems.
- A list of all the commands in each subsystem or in a particular subsystem.
- The subsystem(s) that contains a particular command.
- Complete syntax information for a specific command.

Additionally, if you issue a valid command with incorrect syntax, the ATM module automatically displays syntax information for that command.

Displaying a List of Subsystems

As described in "Accessing a Subsystem" on page 3-5, the ATM module commands are organized into subsystems. At any time, you can display a list of these subsystems by issuing the **subsystems|ss** command.

The display produced by this command follows:

```
1:ATM-C1:mgmt: subsystems
atm bridge ip mgmt snmp tcpstack tftp
2:ATM-C1:mgmt:
```

To access a subsystem listed by **subsystems**, enter the subsystem name at the command prompt.

Displaying a List of Commands

To display a list of all the commands in all of the subsystems, issue the **findcmd|fcmd** command.

The commands are grouped by subsystems, and displayed in alphabetical order within each subsystem. The global commands are shown first.

Displaying a List of Commands Within a Subsystem

To display a list of all the commands within a specific subsystem, issue the **help** or **?** command from within the subsystem.

In the following example, the **help** command is used to list all the commands in the **mgmt** subsystem.

```
2:ATM-C1:mgmt: help
Management subsystem commands:

checksum | sum            copy | cp
dir | dir                 endcfg | ecfg
format | fmt              fremove | frm
help | h                  listdir | ls
version | ver            readcfg | rdcfg
reboot | boot            remove | rm
rename | ren             savecfg | svcfg
showfile | shf           stty | sy

3:ATM-C1:mgmt:
```

Listing the Subsystem that Contains a Particular Command

To list the subsystems that contain a particular command, issue the **findcmd** command, followed by the command for which you are searching:

findcmd|fcmd [*<command>***]**

where:

<command>	Represents the command name for which you are searching.

Enter the command as follows:

```
3:ATM-C1:mgmt: findcmd showcfg
bridge: showcfg|scf
ip: showcfg|scf
snmp: showcfg|scf
tcpstack: showcfg|scf

4:ATM-C1:mgmt:
```

In the last example, all subsystems that contain the command **showcfg** are listed. The information displayed by the **showcfg** command differs depending upon the subsystem from which it is issued.

Displaying Syntax Information for a Command

To display complete syntax information for a specific command, issue the following command:

help|**h** *<command>*

where:

<command>	Specifies the command for which you want to display syntax information. You must specify either a global command or a command within the current subsystem.

Enter the command as follows:

```
5:ATM-C1:mgmt: help exit
Closes current command-line session
6:ATM-C1:mgmt:
```

Note

If you specify a valid command name for *<command>*, but no help text is displayed, make sure the command is part of the current subsystem. If the command is part of a different subsystem, change to that subsystem, then reissue the **help** command.

Using the Command History

For each session, the ATM module software maintains a history of the 32 most recently issued commands. Using the history commands, you an display the command history, reissue commands, or edit and reissue commands.

To display the 32 most recently issued commands, issue the **history** command.

To reissue or edit commands listed in the command history, use the history control characters. The default history control characters are as follows:

! – History-prefix character.

^ – Quick-substitution character.

The combination of history control characters with one another or with selected parameters lets you modify and reissue commands from the command history. These combinations are shown below, using the default history characters.

Table 3-3. Combinations and Variations of History Characters

Combination	Result
!!	Repeats the previous command.
!*<n>*	Repeats a command listed in the command history, where *<n>* indicates the number of the command as listed in the history.
!*<-i>*	Issues a previously issued command, where *<i>* is the offset back from the current command. For example, the command **!-1** gives the same results as **!!**, reissuing the previous command.
!*<substring>*	Repeats a previous command that begins with the string identified by *<substring>*.
^*<old>***^***<new>*	Modifies, then reissues the previous command, where *<old>* indicates a string to be replaced with *<new>*.

Displaying and Changing the History Control Characters

Use the **histchars** command to display the current history control characters.

To change the history control characters, issue the **histchars** command with one or both optional arguments:

histchars|**hch** *<hist-char>* **[***<quick-char>***]**

where:

<hist-char>	Specifies the new character you want to use in place of the current history-prefix character.
<quick-char>	Specifies the new character you want to use in place of the quick character.

An example of using the **histchars** command follows:

```
4:ATM-C1:mgmt: histchars
history sub: !      quick sub: ^
5:ATM-C1:mgmt:
```

Changing Only the Quick-Substitution Character

Although the history-prefix character is normally used only at the beginning of the command line, it is recognized and active anywhere on the command line. To turn off the special meaning of the history-prefix character, preface it with a backslash. This is done, for example, to issue a **histchars** command that changes the quick-substitution character but not the history-prefix character. Enter the command as follows:

```
6:ATM-C1:mgmt: hc \!^
7:ATM-C1:mgmt: !5
help exit
Closes current command-line session
8:ATM-C1:mgmt: ^exit^subsystems
Displays a list of all the subsystems
9:ATM-C1:mgmt:
```

Boot PROM Commands

This section describes the commands in the ATM module boot PROM. The boot PROM commands are accessible from the `<PROM-ATM-x1>` prompt.

Accessing the Boot PROM

The boot PROM can be accessed by disabling the ATM module's port (via the Switch 2000 console interface) and resetting the Switch 2000 (see below).

Disabling the ATM Module Port

To disable the port on the ATM module, perform the following:

1. In the Main Menu of the Switch 2000 Console Interface, move the cursor to `Configuration...` and press Return.
2. In the Configuration Menu, move the cursor to `Ports...` and press Return.
3. Move the cursor to `Edit` and press Return.
4. Move the cursor to the `Enabled` field of the ATM module.
5. Toggle the value in the `Enabled` field to `No` with the Spacebar.
6. Press Return, move the cursor to `Save`, and press Return.
7. After returning to the Configuration Menu, move the cursor to `ATM Console Port x1...` and press Return.
8. At the `mgmt` prompt, enter the **`reboot`** command.
9. A message telling you that the module is rebooting will appear, and you will be returned to the Switch 2000 Configuration Menu (may take 10 to 20 seconds).
10. Move the cursor to `ATM Console Port x1...` and press Return.

The ATM console will appear and you will see the `<PROM-ATM-x1>` prompt.

Note

When finished in the Boot PROM, enable the port (in the same way it was disabled) and the ATM module will be reset by the Switch 2000.

If you have any problems with this procedure (e.g., the ATM or PROM console does not appear, or the entire Switch 2000 console is frozen), you may have to reset the Switch 2000.

You can use boot PROM commands to perform the following tasks:

- Boot the ATM module software
- Display a directory of the files contained on the Flash Memory module
- Upload a file from a workstation to the ATM module
- Download a file from the ATM module to a workstation

Note

The ATM module supports ZMODEM, YMODEM, and XMODEM. Therefore, to upload or download files between the ATM module and a workstation, the workstation must support *at least one* of these protocols.

Table 3-4 lists the commands in the ATM module boot PROM.

Table 3-4. ATM Module Boot PROM Commands

Command	Description
boot|**b**	Boots the ATM module software from the Flash Memory module.
delete|**del** *<filename>*	Removes a specified file from the Flash Memory module.
exit	Returns the user to the Switch 2000 console.
format|**fmt**	Re-formats the Flash Memory module.
ls|**dir [***<filespec>* **[***<filespec>***...]]**	Displays a directory of the files in the Flash Memory module. Equivalent to the **mgmt dir** command.
more [-*<rows>***]** *<filename>* **[***<filename>***...]]**	Displays a file located in the Flash Memory module. Similar to the **mgmt showfile** command, except more lets you specify how many lines to display at a time.
rename|**mv** *<old-filename> <new-filename>*	Moves or renames a file located in Flash memory.
remove|**rm** *<filename>*	Removes a specified file from the Flash Memory module.
zreceive|**zr**|**rz [-+7abcetw]** *<filename>*	Uploads a file from a workstation that supports ZMODEM or XMODEM.
zsend|**zs**|**sz [-+7abekL1NoptwXYy]** *<filename>*	Downloads a file to a workstation that supports ZMODEM or YMODEM.

Booting the Runtime Software

Entering the **boot** command in the boot PROM boots the ATM module runtime software. Enter the command as follows:

```
boot|b
```

The system will boot the system software image file from the Flash Memory module. Note that the software image file must already be present.

Removing a File

Use the **delete** or **remove** command to remove a file from Flash memory.

Note

These commands prompt you to enter **y** or **n** to confirm removal of a file. There is no way to restore a removed file, so use caution. Also, the software image files are not protected. They can accidentally be removed by ATM module commands.

Enter the commands as follows:

delete|del *<filename>*

remove|rm *<filename>*

where:

<filename>	Specifies the name of the file to be removed.

The **delete** command is used as follows:

```
<PROM-ATM-C1> del bridge.cfg
remove BRIDGE.CFG? y
del: BRIDGE.CFG: deleted
```

The **remove** command is used as follows:

```
<PROM-ATM-C1> rm bridge.cfg
remove BRIDGE.CFG? y
rm: BRIDGE.CFG: deleted
```

Ending an ATM Module Session

To leave a command-line session on the ATM module and return to the Switch 2000 console, use the **exit** command, as shown below:

```
<PROM-ATM-C1> exit
```

Reformatting the Flash Memory Module

If ever necessary, you can use the **format** command to reformat the Flash Memory module. When you reformat the module, all the system software and data files are physically removed from the module.

WARNING

This command does not display a confirmation message. The software begins reformatting the Flash Memory module as soon as you issue the command. Before you reformat the Flash Memory module, make sure you copy any files you want to keep to another device, such as a file server.

Enter the command as follows:

format|fmt *<device-name>*

where:

<device-name>	Specifies the file device. Specify **fm** as the device name.

Note

After formatting the Flash Memory module, you should reload the ATM module's runtime software images (see Chapter 5, "Software Upgrade Procedures," for more information).

Displaying a Directory

Use the **ls|dir** command to list the files in Flash memory. These commands are similar to the **mgmt dir** command. Each command displays the volume name, the files contained on the volume, and the amount of free space on the volume. Enter the command as follows:

ls|dir [*<filespec>* **[***<filespec>***...]]**

where:

<filespec>	Specifies a file name. The wildcards * and ? can be used for any portion of the file name.

Displaying a File

Use the **more** command to display a file located in Flash memory. Enter the command as follows:

more [-*<rows>***]** *<filename>* **[***<filename>***...]]**

where:

<rows>	Specifies how many rows of the file are displayed at a time.
<filename>	Specifies a file name. The file is assumed to be located in Flash memory.

Moving or Renaming a File

Use the **move** command to move or rename a file contained in the Flash Memory module. Enter the command as follows:

rename|**mv** *<old-filename> <new-filename>*

where:

<old-filename>	Indicates the name of the file you are moving or renaming.
<new-filename>	Indicates the new name or path for the file.

If you specify the name of an existing file for the new file name, the software does not overwrite the existing file, but instead displays the following error message: `file exists`

Uploading and Downloading Files

The ATM module supports ZMODEM, YMODEM, and XMODEM for sending and receiving files. All three transfers are invoked with the **zsend** and **zreceive** commands, but the options selected for the transfer determine exactly which protocol is used.

Using the ATM module **zsend** and **zreceive** commands, you can copy files between the ATM module's flash memory and a workstation that supports one of the above protocols.

To use the **zsend** and **zreceive** commands, a workstation that supports ZMODEM must be connected to the console RS-232 port of the Switch 2000.

Uploading a File to the ATM Module

The **zreceive** command prepares the ATM module to receive a file in flash memory. After you issue the **zreceive** command, you then must use the ZMODEM or XMODEM application on the workstation to actually begin the transfer.

zreceive provides several options, but the defaults are appropriate for most file transfers. The defaults are the same for XMODEM transfers, except that a file name must be specified when performing an XMODEM transfer. You do not specify the file name when performing a ZMODEM transfer. Enter the command as follows:

zreceive|zr|rz [-+7abcetw] *<filename>*

The options in the **zreceive** command are described in Table 3-5.

Table 3-5. Command Options for Uploads

Option	Meaning
–	Introduces the argument list. If you specify any arguments, the argument list must be preceded by the **–**.
+	Appends the received file to an existing file. Specify the file name at the end of the argument list (ex: **zr -+ae auc1.log**).
7	Uses 7-bit bytes for the transfer. By default, ZMODEM uses 8-bit bytes.
a	Performs the transfer in ASCII mode, using the appropriate newline translation. By default, the transfer takes place in binary mode.
b	Performs the transfer in binary mode (default).
c	XMODEM only. Uses a 16-bit CRC.
e	Ignores control characters.
t	Set the receive timeout to N/10 seconds (10 <= N <= 1000). Specify the file name at the end of the argument list (ex: **zr -at 500**). The default is 100 seconds
w	Sets the protocol window to N bytes. Specify the filename at the end of the argument list (ex: **zr -aw 10**).
<filename>	Causes the XMODEM protocol to be used. Do not specify a file name if you intend to use ZMODEM. The ATM module software assumes that you want to write the file to the Flash Memory module.

If you do not specify any of the optional arguments or a file name, the ATM module software prepares to use the ZMODEM protocol to receive a file, in binary mode, using 8-bit bytes. When you have issued the **zr** command on the ATM module, you then need to use the ZMODEM application on the workstation to specify the file to be transferred and perform the transfer.

If you specify a filename, the ATM module software prepares to receive the named file using the XMODEM protocol, using the same default settings used for the ZMODEM protocol. After you issue the **zr** command and specify a file name, you then need to use the XMODEM application on the workstation to perform the transfer.

The following are examples of the use of **zreceive**. For each example, after issuing the command on the ATM module, you use the ZMODEM or XMODEM application on the workstation to send the file.

In the first example, **zreceive** is used to prepare the ATM module to receive a binary file from the workstation. All the defaults are used. Notice that no file name is specified. When using ZMODEM, you specify the file name on the workstation.

```
<PROM-ATM-C1> zreceive
```

In the following example, the ATM module is prepared to receive a configuration file from a workstation. All defaults are accepted, except the default for transfer mode. The **a** argument is used to change the transfer mode to ASCII, which is appropriate for ATM module configuration files. Notice that the hyphen is used to introduce the argument list.

```
<PROM-ATM-C1> zreceive -a
```

The following example shows how the ATM module is prepared to upload a file using XMODEM. Because XMODEM does not send file names from the sending device, the receiving device (the ATM module in this case) must supply the file name.

```
<PROM-ATM-C1> zreceive atmod
```

Downloading a File to a Workstation

Use the **zsend** command to download a file from the ATM module to a workstation. You can use this command to perform transfers to devices that support ZMODEM, YMODEM or XMODEM. Like the **zreceive** command, the **zsend** command provides many options, but the defaults are appropriate for most transfers. Enter the command as follows:

zsend|zs|sz [-+7abekL1NoptwXYy] *<filename>*

The options in the **zsend** command are described in Table 3-6.

Table 3-6. Command Options for Downloads

Option	Meaning
–	Introduces the argument list. If you specify any arguments, the argument list must be preceded by the **–**.
+	ZMODEM only. Causes the file you are receiving to be appended to an existing file. Specify the file name at the end of the argument list (ex: **zs –+a auc1.log**).
7	Uses 7-bit bytes for the transfer. By default, ZMODEM uses 8-bit bytes.
a	Performs the transfer in ASCII mode, using the appropriate newline translation. By default, the transfer takes place in binary mode.
b	Performs the transfer in binary mode (default).
c	XMODEM only. Uses a 16-bit CRC.
e	ZMODEM only. Ignores all control characters.
k	YMODEM only. Transfers the file in 1024-byte packets.
L	ZMODEM only. Limits the subpacket length to N bytes. Specify the file name at the end of the argument list (ex: **zs –aL 64**).
l	ZMODEM only. Limits the frame length to N bytes (1 >= L). Specify the file name at the end of the argument list (ex: **zs –al 64**).
N	ZMODEM only. Transfers the file only if the version on the ATM module is longer than the version on the workstation. Otherwise, the file is not transferred.
o	ZMODEM only. Uses a 16-bit CRC rather than the default 32-bit CRC.
p	ZMODEM only. Protects the file specified by *<filename>* if it already exists on the workstation. If the file is already present on the device, it is not overwritten by the file on the ATM module.

Option	Meaning
t	Set the receive timeout to N/10 seconds (10 <= N <= 1000). Specify the file name at the end of the argument list (ex: **zs -at 500**). The default is 100 seconds.
w	ZMODEM only. Sets the protocol window to N bytes. Specify the filename at the end of the argument list (ex: **zs -aw 10**).
X	Uses the XMODEM protocol. Note that some of the other arguments are not valid with the XMODEM protocol.
Y	ZMODEM only. Overwrites the file specified by *<filename>*, but skips the file altogether if the file is not present on the workstation. If the file specified by *<filename>* is not already present on the workstation, the file is not written to that device.
y	ZMODEM only. Overwrites the file specified by *<filename>*. Unlike Y, the y argument does not skip the file if it is not on the workstation. Even if the file is not on the device, the ATM module writes the file to the device.
<filename>	Specifies the file name you want to send. The ATM module software assumes the file is located in the Flash Memory module.

The following are examples of the use of **zsend**. In the first example, ZMODEM is used to send a software image file to the workstation. All **zsend** defaults are used.

```
<PROM-ATM-C1> zsend hp/images/hpmain
```

In the following example, a configuration file is sent to the workstation connected to the Switch 2000. The **a** argument is used to change the transfer mode to ASCII, which is appropriate for ATM module configuration files. In addition, the **N** argument is used to ensure that the file is transferred only if it is longer than the identically named file on the workstation. Notice that the hyphen is used to introduce the argument list and no spaces separate the arguments in the list. A space does, however, separate the file name from the argument list.

```
<PROM-ATM-C1> zsend -aN root.cfg
```

The Management Subsystem

This section describes the commands in the Management subsystem. The management commands control the configuration of the ATM module.

You can use the management commands to perform the following tasks:

- Display the ATM module configuration.
- Manage files in the Flash Memory module.
- Create, edit, and load configuration files.

Accessing the Management Subsystem

To access the Management subsystem, enter **mgmt** at any command prompt.

Management Subsystem Commands

Table 3-7 lists and describes the **mgmt** subsystem commands.

Table 3-7. Management Subsystem Commands

Command	Description
checksum|**sum** *<filespec>* **[***<filespec>***]**	Computes and displays a checksum for the specified file(s).
copy|**cp** *<src-file> <dest-file>*	Makes a copy of the specified file on the Flash Memory module.
dir [*<filespec>***]**	Lists directory and volume information for the specified file(s) on the Flash Memory module.
endcfg|**ecfg**	Marks the end of a configuration file. This command applies only to configuration files and must be the last command in the file.
format|**fmt**	Re-formats the Flash Memory module.
fremove|**frm [-f] [-i]** *<filespec>* **[***<filespec>***...]**	Removes a file from the Flash Memory module.
listdir|**ls [***<filespec>***]**	Displays directory data for the specified file(s) on the Flash Memory module.
readcfg|**rdcfg** *<file-or-device-name>*	Reads the specified configuration file or loads a configuration file from the specified device.

Command	Description
reboot|rb	Reboots the ATM module and returns the console to the Switch 2000 Main Menu.
rename|ren *<oldfilename> <newfilename>*	Renames the specified file on the Flash Memory module.
savecfg|svcfg [*<file-or-device-name>***]**	Saves the current configuration to the specified file or device.
showfile|shf [*<filename>***]**	Displays the contents of a file stored on the Flash Memory module.
stty|sy [rows *<numrows>***] [more|mo enl|dis]**	Sets the scroll amount and enables the **more** feature.
version|ver [prom|p | runtime|rt]	Displays the installed version of the system software or boot PROM.

File Management Commands

The Flash Memory module uses an MS-DOS® style file system that provides file services to the ATM module. For example, when you read or save a configuration file, that file system is used to read or write the appropriate file.

You can use this file system to perform the following tasks:

- Display a directory of files (**dir** command).
- Display volume information as well as a directory of files (**listdir** command).
- Display a file on the management terminal (**showfile** command).
- Copy a file (**copy** command).
- Rename a file (**rename** command).
- Remove a file (**fremove** command).
- Generate a checksum for verifying the integrity of a file (**checksum** command).
- Reformat the Flash Memory module (**format** command).

File Naming Conventions

File names must conform to the following rules:

- The maximum length is eight characters, optionally followed by an extension from one to three characters in length (e.g., `filename.ext`).
- File names are not case sensitive. For example, the file names `filename` and `FILENAME` are considered identical by the file system.
- You can use any combination of letters, numbers, or special characters except the following when naming files: **`*`**, **`–`**, **`!`**, **`?`**, **`:`**
- You can use the following wildcards in place of any portion of a file name:

`*`	Allows any character string. For example, the file specification `*.cfg` yields all file names that end with the `.cfg` extension.
`?`	Allows any single character. For example, the file specification `foo?.cfg` yields all file names that begin with "`foo`," contain one additional character following "`foo`," and have the extension "`cfg`."

- You can combine both wildcards in the same file specification. For example, `foo?.*` is a valid file specification.

Displaying Directory and Volume Information

Use the **`listdir`** command to display a directory of the Flash Memory module. Enter the command as follows:

`listdir|ls [`*`<filespec>`***`]`**

where:

`<filespec>`	Specifies a file name. You can use the wildcards * and ? for any portion of the file name.

This command is designed to present directory information in a way familiar to UNIX™ users. The following is an example of the type of display produced by the **`listdir`** command:

```
61:ATM-C1:mgmt: listdir

3116        FM:JID.DY
3322        FM:INTLOOP
902117      FM:HPMAIN
913282      FM:HPATM
```

Note

The ATM module's MS-DOS® style file system does not support hierarchical directories.

Use the **dir** command to display file directory that includes volume information and available space for the storage device. Enter the command as follows:

dir [*<filespec>***]**

where:

<filespec>	Specifies a file name. You can use the wildcards * and ? for any portion of the file name.

While the **listdir** command presents a UNIX™ style directory, the **dir** command presents an MS-DOS® style directory. The following is an example of the display produced by the **dir** command:

```
62:ATM-C1:mgmt: dir

Volume in device is 4MB FLASH

JID         DY      3116
INTLOOP             3322
HPMAIN              902117
HPATM               913282

4 Files(s)  540986 bytes free
```

Displaying a File

Use the **showfile** command to display a file contained in the Flash Memory module. The file's contents are written to the management terminal. Enter the command as follows:

showfile|shf *<filename>*

where:

<filename>	Specifies the name of the file you want to display.

Copying a File

Use the **copy** command to copy a file contained in the Flash Memory module. Enter the command as follows:

copy|**cp** *<src-file> <dest-file>*

where:

<src-file>	Indicates the name of the file you are copying.
<dest-file>	Indicates the name of the new file into which you are copying the contents of the *<src-file>*.

Caution

If the destination file you specify is an existing file, the **copy** command overwrites that file. No warning message is displayed.

If the Flash Memory module contains enough free space to hold the copy, the file is copied. If the Flash Memory module does not contain enough free space for the copy, the following message is displayed: `device is full`

Renaming a File

Use the **rename** command to rename a file contained in the Flash Memory module. Enter the command as follows:

rename|**ren** *<oldfilename> <newfilename>*

where:

<oldfilename>	Indicates the name of the file you are renaming.
<newfilename>	Indicates the new name for the file.

If you specify an existing file name for *<newfilename>*, the existing file is not overwritten. The following error message is displayed: `file exists`

Removing a File

Use the **fremove** command to remove a file from Flash memory.

Note

The **fremove** command prompts for a **y** or **n** to confirm removal of a file. A deleted file can not be restored, so use caution. Also, the runtime images are not protected; they can accidentally be removed by ATM module commands.

Enter the **fremove** command as follows:

fremove|frm [-f] [-i] *<filespec>* **[***<filespec>***...]**

where:

-f	Forces the software to remove the file(s), without presenting a warning prompt.
<filespec>	Specifies the name of the file(s) you want to delete.

An example of the **fremove** command's usage is shown below:

```
63:ATM-C1:mgmt: fremove bridge.cfg
remove BRIDGE.CFG? y
frm: BRIDGE.CFG: deleted
```

Calculating a Checksum

Use the **checksum** command to generate a checksum of a file in the Flash Memory module. The checksum always produces the same result for identical files. Therefore, you can use the checksum to verify the integrity of duplicate files or files transmitted from one ATM module to another over the network.

For example, suppose you want to copy a configuration file. Before copying the file, use the **checksum** command to calculate the checksum for the file. Then use the **tftp put** command to write the file to a TFTP server. From a command-line session on the target ATM module, download the file using the **tftp get** command (see "The TFTP Subsystem" on page 3-54).

To ensure that the file has arrived intact, you can issue the **checksum** command against the new copy of the file received on the target ATM module. If the checksums match, the file is very likely intact. However, if the checksums do not match, an error must have occurred during transmission or storage. Enter the command as follows:

checksum|sum *<filespec>* **[***<filespec>***...]**

where:

<filespec>	Specifies a file name. You can use the wildcards * and ? for any portion of the file name.
<filespec>...	Specifies additional files. To calculate individual checksums for all the files on the Flash Memory module, enter **checksum *** .

Enter the **checksum** command as follows:

```
67:ATM-C1:mgmt: checksum file1.cfg

0x0fcf9636 FILE1.CFG
```

The software calculates the checksum for the specified file(s) and displays the checksum(s).

Reformatting the Flash Memory Module

Generally, you can prevent filling up your Flash Memory module by removing files you no longer need. The module contains more than enough space to hold the system software and self-test scripts, as well as your configuration files and dump files(s). However, you can use the **format** command to reformat the Flash Memory module. When you reformat the module, all the system software and data files are physically remove from the module.

WARNING

This command does not display a confirmation message. The software begins reformatting the Flash Memory module as soon as you issue the command. Before you reformat the Flash Memory module, make sure you copy any files you want to keep to another device, such as a file server.

Enter the command as follows:

format|**fmt** *<device-name>*

where:

<device-name>	Specifies the file device. Specify **fm** as the device name.

Note

After formatting the Flash Memory module, you should reload the ATM module's runtime software images (see Chapter 5, "Software Upgrade Procedures," for more information).

Configuration File Commands

A configuration file is an ASCII file containing ATM module commands that set configuration parameters and definitions including:

- Virtual port parameters
- Bridge Parameters
- LAN Emulation parameters

Normally, when the ATM module is reset, any changes made to these configuration items are lost. However, if you save a configuration file before powering down or rebooting, commands to create or set the current configuration items are placed into an ASCII file. If you read (load) that file at boot time or during a command-line session, the commands in the file recreate the saved configuration items and settings.

Note that configuration parameters affect the entire ATM module. Consequently, if you read a configuration file during a command-line session, configuration changes caused by the commands in the file have global effect.

You can save or load multiple configuration files during a command-line session; the effects of multiple configuration files are cumulative.

You can load a configuration file automatically when the ATM module reboots. At startup, the software checks for a file named `cfg`, the default configuration file name. If this file is present, the software assumes it is a configuration file and loads the file. The commands in the file are executed to configure the ATM module.

Whenever you make configuration changes that you want to add to the default configuration file, you can add those changes by saving the configuration file.

If the configuration file is located on the Flash Memory module, issue the following command:

savecfg|**svcfg** *<filename>*

If the configuration file is located on a TFTP server, save it by issuing the following command:

tftp svcfg [-h *<host>***]** *<remfile>*

See “Saving Configuration Changes” on page 3-29 for information about these commands.

Example Configuration File

An example configuration file is shown below. Notice that the file contains comments (preceded by #) and commands. Configuration files are organized according to subsystem. The commands shown under each subsystem are ordinary ATM module commands. You could issue these command manually and in the same order to achieve the same configuration this file achieves. Configuration files simply make using the ATM module more practical by issuing the commands automatically when the system is booted.

In every configuration file, the last command is **endcfg**. This command must be present at the end of the configuration file. If you edit a configuration file using an ASCII editor, make sure you add this command to the end of the file.

```
##########################################################################
#
#        Bridge Configuration
#
bridge
##########################################################################
#
#        Bridge Configuration (port configuration)
#
vpo 1 enl
vpo 2 enl
(listing continues)...
##########################################################################
#
#        Mgmt Configuration
#
mgmt
dcd dis
sl Undefined
##########################################################################
#
#        IP Interface Configuration
#
ip
##########################################################################
#
#        SNMP Communities Table
#
snmp
add c public ro
##########################################################################
#
#        TCP connection timers
#
tcpstack
##########################################################################
#
#        End config
#
endcfg
```

Saving Configuration Changes

You can save configuration changes to the `cfg` file (or the ATM module's configuration file on the TFTP server), in which case they are automatically applied each time you reboot the software. Alternatively, you can save the changes to a different file name. If you save configuration changes to a file other than `cfg`, you must load the file after the ATM module is booted to apply the configuration settings in the file.

Saving the Configuration to the Flash Memory Module

To save a configuration file to the Flash Memory module, issue the following command:

savecfg|**svcfg** *<filename>*

where:

<filename>	Specifies a file name.

The following is an example of the use of this command. In the following examples, the current configuration is save to a file named `Lab1.cfg`.

```
99:ATM-C1:mgmt: savecfg Lab1.cfg
Configuration saved to Lab1.cfg
```

Saving the Configuration to a TFTP Server

To save a configuration to a TFTP server, issue the following command:

tftp svcfg [-h *<host>***]** *<remfile>*

where:

<host>	Specifies the IP address of the TFTP server. Unless you have already specified a default TFTP server using the **tftp set** command, you need to include this argument. For information on the **tftp set** command, see "The TFTP Subsystem" on page 3-54.
<remfile>	Specifies the configuration file name. Specify a name that is meaningful to the TFTP program on the server. For example, if the server contains a subdirectory called `atm` and this directory is specified as the TFTP home directory, do not specify `atm` a part of the file name.

Note

Some TFTP servers require that the remote file name exist on the server before you can write to that file name. If your server requires that the file name already exist, create a zero-length file (named the same as your configuration file) on the server, then specify that file name for *<remfile>*.

Also, on some TFTP servers, including servers running Sun/OS 4.x, files that you overwrite on the server are not properly truncated. When you overwrite an existing file on the TFTP Server, if the older version of the file is longer than the new file, the older version is not truncated properly by the server. As a result, the new version of the file contains part of the older version of the file.

Enter the command as follows:

```
99:ATM-C1:mgmt: tftp svcfg 147.128.128.7 Lab1.cfg
Configuration saved to Lab1.cfg
```

Reading (Loading) a Configuration File

When you boot the software, the system looks for a configuration file. The default configuration file name is `cfg`.

Even if the system finds and loads a configuration file when the software is booted, you can read (load) additional configuration files during an ATM module session using the **`readcfg`** command.

Note

The new configuration information does not undo the configuration information used form the `cfg` file. Instead, the new configuration is added to current configuration, until the Switch 2000 is powered down or rebooted.

Loading a Configuration From the Flash Memory Module. To load a configuration file located on the Flash Memory module, issue the following command:

`readcfg`|**`rdcfg`** *<filename>*

where:

<filename>	Specifies the name of the configuration file to be read.

Loading a Configuration From a TFTP Server. To load a configuration file located on a TFTP server, issue the following command:

tftp rdcfg [-h *<host>***]** *<remfile>*

where:

<host>	Specifies the IP address of the TFTP server. Unless a default TFTP server has already been set, using the **tftp set** command, you need to include this argument. For information on the **tftp set** command, see "The TFTP Subsystem" on page 3-54.
<remfile>	Specifies the configuration file name. Specify a name that is meaningful to the TFTP program on the server. For example, if the server contains a subdirectory called `atm` and this directory is specified as the TFTP home directory, do not specify `atm` as part of the file name.

Rebooting Without Loading the Default Configuration File

If you need to reboot the software without loading the configuration file, use the **rename** command to temporarily rename the default configuration file. For example, rename `cfg` to `temp.cfg` (see "File Management Commands" on page 3-21 for information about the **rename** command).

Editing a Configuration File

Although you can automatically write changes to a configuration file using the **savecfg** command, you also can manually edit the file directly using a text or ASCII editor. To move the file to a machine that contains an ASCII editor:

- If the editor is on the file server, use the **tftp put** command to write the file to the server, edit the file, then use the **tftp get** command to download the edited file back to the Flash Memory module.
- If the editor is on a workstation, use the boot PROM **zs** command to write the file to the workstation, edit the file, then use the **zr** command to transfer the edited file to the Flash Memory module. See "Boot PROM Commands" on page 3-11.

Displaying the Installed Software Versions

To display the version of the system software and boot PROM installed on the ATM module, issue the **version** command. The system software contains the runtime code used by the ATM module. The boot PROM contains code used by the ATM module when the system software is booted.

To display the installed versions of the system software and the boot PROM, issue the command as follows:

```
1:ATM-C1:mgmt: version
        Runtime:   2.6-6
        PROM:      2.4
```

In this example, the installed version of the runtime software is 2.6-6, and the installed version of the ATM module boot PROM is 2.4.

You can limit the display to only the runtime or boot PROM version by issuing the command as follows:

version|ver [prom|p | runtime|rt]

where:

prom|p | runtime|rt	Specifies which version you want to display. Specify **prom** for the Boot PROM or **runtime** for the runtime software.

Setting the Scroll (stty) Parameters

The **stty** command is used to control the scrolling of data displayed on the management terminal. This command lets you:

- Specify the maximum number of rows displayed on the management terminal at one time when scrolling is enabled.
- Enable or disable the scrolling of information on the screen

Setting the Scroll Amount

To specify the maximum number of rows that can be displayed on the terminal, issue the following command. Note that regardless of the number of rows you specify, scrolling is controlled only if enabled with the **stty more** command.

stty|sy [rows *<numrows>***]**

where:

[rows *<numrows>***]**	Specifies the number of rows to display at one time. If a file or table contains more rows than the number specified, the ATM module pauses until you are ready to display the next group of rows.

If the **stty** command is issued without the rows argument, the current scroll control settings are displayed. The command is used as follows:

```
1:ATM-C1:mgmt: stty rows 20

Number of rows on screen set to 20
```

Enabling or Disabling Scrolling

To enable or disable scrolling, issue the following command:

stty|sy more|mo [enl|dis]

where:

enl|dis	Enables or disables scrolling. When this feature is disabled, the ATM module does not control scrolling.

If you do not specify **enl** or **dis**, the current scroll control settings are displayed, as shown in the following example:

```
1:ATM-C1:mgmt: stty more

Number of rows on screen set to : 24
2:ATM-C1:mgmt:
```

When scrolling is enabled, output that exceeds the number specified for *<numrows>* is paused until you press Enter or Space to continue, or press Q to end the output. This is shown in the following example:

```
1:ATM-C1:mgmt: showfile default.cfg

##########################################################################
#
#        Bridge Configuration
#
bridge
##########################################################################
#
#        Mgmt Configuration
#
mgmt
dcd dis
sl Undefined
##########################################################################
#

-- more [<space>,<ret>,q] --
```

As shown in this example, you can respond to the more prompt with any one of the following:

Space	Scrolls the display one screen forward
Return	Scrolls the display one line forward
Q	Ends the display

The Bridge Subsystem

The ATM module software contains implementations of IEEE 802.1d Bridging. Bridging is only relevant when using PVCs, since the ATM module only supports one LAN Emulation client.

Note

Because Spanning Tree functionality is provided by the Switch 2000, this same functionality is not implemented in the ATM module. The module forwards all traffic received on its active virtual ports to the Switch 2000.

See the documentation that came with your Switch 2000 for more information about Spanning Tree functionality.

This chapter describes the Bridge subsystem commands you can use to perform the following tasks:

- Enable or disable bridging on ATM module virtual ports
- Display the bridge configuration
- Display, add static entries to, or clear the bridge table
- Display or clear the bridge cache
- Display or clear packet, bridge and virtual port statistics
- Display the connection state and enabled state of each virtual port
- Set bridge parameters

In addition, the **`bridge`** subsystem contains commands for creating and applying rules to filter bridged packets.

Accessing the Bridge Subsystem

To access the Bridge subsystem, enter **`bridge`** at any command prompt.

Bridge Subsystem Commands

Table 3-8 lists and describes the **bridge** subsystem commands.

Table 3-8. Bridge Subsystem Commands

Command	Description
bridge-table|bt [*<vport-list>***|all] [***<MAC-address>***] [-t | [[-h] [-mh]]]**	Displays the bridge table.
bridge-tableclear|btc	Clears the bridge table.
display-cache|dc [*<vport-list>***|all]**	Displays the bridge cache.
flush-cache|fc	Clears the bridge cache.
vport|vpo *<vport-list>***|all enl|dis**	Enables or disables bridging on the specified virtual port(s).
vppstats|vpp enl|dis *<from-vport-list> <to-vport-list> <stat-list>*	Enables or disables virtual port-to-virtual port statistics collection. When *<from-vport-list>, <to-vport-list>,* and *<stat-list>* are specified, displays bridge statistics.
vppstats|vpp sc	Clears virtual port-to-virtual port statistics.
set|se *<parameters>*	Sets bridge parameters and creates bridge table entries for use with multi-homed hosts.
showcfg|scf [*<argument-list>***]**	Displays the current settings of the bridge runtime parameters.
state|sa [*<vport-list>***|all]**	Shows the connection state and enabled state for the specified virtual port(s) or for all virtual ports.
stats|s *<vport-list>***|all** *<stat-list>***|all**	Displays basic bridging statistics for the specified virtual port(s) or for all virtual ports.
stats-clear|sc	Clears all basic bridging statistics.

Enabling and Disabling Virtual Ports

By default, all virtual ports on the ATM module are enabled to forward packets. Forwarding can be disabled with the **vport** command, which is used as follows:

vport\|vpo *<vport-list>***\|all enl\|dis**

where:

*<vport-list>***|all**	Specifies the virtual port(s) to be enabled or disabled. You can specify **all** to affect all virtual ports.
enl|dis	Specifies whether forwarding is to be enabled or disabled.

Caution

The **vport** command affects packets forwarded by bridging. However, it does not affect the transmission of packets generated by the ATM module, such as PING or SNMP response packets.

When virtual ports are enabled, packets can be bridged on these virtual ports. When virtual ports are disabled, normal traffic stops on these virtual ports.

You can display the state of a virtual port using the **state** command. See "Displaying the Bridge State for Virtual Ports" on page 3-37.

Displaying the Bridge Configuration

Use the **showcfg** command to display the bridge configuration parameters. The syntax for this command is:

showcfg|**scf** [*<argument-list>*|**all**]

where:

<argument-list>|**all**	Specifies the configuration parameters you want to display. You can specify an option, a comma-separated list of options, or **all** for all options.

Table 3-9 lists the options you can specify for **showcfg**, the default is **all**.

Table 3-9. Options for Displaying the Bridge Configuration

Parameter	Displays...
aging_time|**t**	The aging time for entries in the bridge table.
vports|**s**	The packet-forwarding restrictions for all virtual ports. This includes the source and destination logical filtering rules and whether or not learned entries are blocked.

The following example shows the type of information displayed by the **showcfg** command when issued without arguments.

```
46:ATM-C1:bridge: showcfg

Vport  Priority Cost    Des. Bridge       Des Vport Des Cost  Sta Chngs
----   -------- ----    -----------       --------  --------  ---------
2      128      100     this-bridge        2         10        1
3      128      100     this-bridge        3         10        1
4      128      100     this-bridge        4         10        1
5      128      100     this-bridge        5         10        1
6      128      100     this-bridge        6         10        1
7      128      100     this-bridge        7         10        1
8      128      100     this-bridge        8         10        1
9      128      100     this-bridge        9         10        1
10     128      10      00-00-ef-01-10-20  11        0         1
11     128      10      this-bridge        11        10        1
12     128      100     this-bridge        12        10        1

Vport configuration
Vport         Source-rule    Dest-rule    Block-learned-entries
Vport_2       none           none         no
Vport_3       none           none         no
Vport_4       none           none         no
Vport_5       none           none         no
Vport_6       none           none         no
Vport_7       none           none         no
Vport_8       none           none         no
Vport_9       none           none         no
Vport_10      none           none         no
Vport_11      none           none         no
Vport_12      101            none         no

Bridging table aging time: 60 minutes
```

Displaying the Bridge State for Virtual Ports

The **state** command lets you display the bridge state for each virtual port. Enter the command as follows:

state|sa [*<vport-list>***|all]**

where:

<vport-list>|**all**	Specifies the virtual ports for which you want to display state information. You can specify a single virtual port, a comma-separated list of virtual ports, or a hyphen-separated range of virtual ports. If you do not specify the *<vport-list>* argument (or you specify **all**), state information for all virtual ports is displayed.

The following is an example of the display produced by the **state** command:

```
54:ATM-C1:bridge: state

Vport-Num          Diagnostics          Management
---------          -----------          ----------
2                  good                 enabled
3                  good                 enabled
4                  good                 disabled
5                  good                 enabled
6                  good                 enabled
7                  good                 enabled
8                  good                 enabled
9                  good                 enabled
10                 bad                  enabled
11                 good nobr            enabled
12                 good nobr            enabled
```

For traffic to be bridged on a virtual port, the Diagnostics state must be good and the Management state must be enabled.

The columns in this display show the following information:

Vport-Num	The virtual port number listed in this column corresponds to the logical virtual port on the ATM module. Use the **mgmt showcfg** command to display information about a virtual port. In this example, bridging has been disabled on virtual ports 11 and 12.
Diagnostics	Indicates whether the virtual port is enabled and functioning normally. Generally, the state is good when a virtual port cable is attached to the virtual port, and bad when no virtual port cable is attached. The value in this column is supplied by the automatic virtual port-state detection feature. If automatic virtual port-state detection is disabled, this field always shows the value good, regardless of the actual virtual port state. The value nobr indicates that bridging has been disabled using the **vport** command.
Management	This column shows the enabled state of the virtual port. The value can be enabled or disabled and is supplied by the automatic virtual port-state detection feature. When the Management state is enabled, the virtual port is enabled for forwarding bridge traffic. If the Management state is disabled, no bridge traffic can be forwarded on the virtual port. If automatic virtual port-state detection is disabled, this field shows enabled, regardless of the actual management state of the virtual port. The only way to change the state to disabled is to issue the **vport** *<vport-list>* **dis** command.

Using the Bridge Table

The bridge table contains information about devices attached to the ATM module. The ATM module software uses the entries in the bridge table to bridge packets. Entries are added to the table automatically or manually.

Automatic Entries

Each time the ATM module bridging engine receives a packet, it checks the packet's source address against the source addresses listed in the bridge table. If the address is not listed in the table, the ATM module adds an entry to the table. The entry contains the source device's MAC-layer hardware address, the virtual port number on which the ATM module received the packet, and other information used for bridging.

Manual Entries

You can create a static entry using the **`set node`** command. A static entry is manually added to the bridge table, rather than learned by the bridge table. Static entries are not subject to aging and remain in the bridge table until you remove them. Moreover, they are saved in the configuration file when you save the file. Use static entries when you want to ensure that the ATM module always reaches a specific node on the same virtual port.

Displaying the Bridge Table

To display the bridge table, issue the **`bridge-table`** command, as follows:

`bridge-table|bt [`*`<vport-list>`***`|all] [`***`<MAC-address>`***`] [-t|[[-h] [-mh]]]`**

where:

`<vport-list>``|all`	Specifies the virtual port(s) for which you want to display bridge table entries. You can specify a single virtual port, a comma-separated list of virtual ports, or a hyphen-separated range of virtual ports. If you specify **`all`**, the entire bridge table is displayed. The default is **`all`**.
`<MAC-address>`	Indicates the MAC-layer hardware address of the device for which you want to display the ATM module system's bridge-table entries. Specify the address as six hyphen-separated, two-digit hexadecimal octets (ex: **`08-00-20-0f-a5-ab`**). You can use **`*`** in place of any of the octets.

-t	Displays the total number of entries in the table. The total is comprised of the total number of learned entries and permanent (static) entries. This argument also shows how many entries are available in the bridge pool (the number of entries for which the table still has room).
-h	Displays the hash displacements for the specified entries.
-mh	Displays entries for multi-homed hosts.

The following is an example of the output produced by the **bridge-table** command:

```
40:ATM-C1:bridge: bridge-table
Bridging table (aging time = 60 minutes)
     Ethernet-address   Vport Rule  Flags
     00-00-ef-01-93-40  10    none
     aa-00-04-00-16-08  11    none
     07-00-2f-e4-b3-ee  --    none  permanent bmcast
     ab-00-00-03-00-00  --    none  permanent bmcast
     08-00-20-02-e4-3f  05    none  permanent
     00-00-ef-02-7d-60  10    none
     00-00-ef-01-e1-40  11    none
     09-00-07-ff-ff-ff  --    none  permanent bmcast
     00-00-ef-02-42-50  --    none  system permanent
     08-00-20-00-ef-2b  MH    none  permanent
     aa-00-04-00-ee-98  10    none
     00-00-ef-01-10-20  10    none
     aa-00-04-00-f1-33  10    none
     ff-ff-ff-ff-ff-ff  --    none  permanent bmcast
Total entries: 14, Learned entries: 7, Permanent Entries: 7
```

The bridge table contains the following information for each entry:

`Ethernet-address`	The MAC-layer hardware address of the device.
`Vport`	The virtual port number of the selected connection. If the MAC-layer hardware address belongs to a multi-homed host, the virtual port number is shown as MH.
`Rule`	Indicates the source and destination logical filtering rules that are applied to the address. The ATM module does not support filtering rules (i.e., Spanning Tree). Therefore, the rule for every entry will be `none`.
`Flags`	The software maintains certain flags in order to use and manage addresses in the bridge table. For example, system entries such as the ATM module's own address are marked, and entries that have not been used recently are flagged for possible deletion (`aging`).

Each entry in the bridge table can have one or more of the following flags:

`aged`	A non-permanent entry that has not appeared in the source or destination address field of a packet since the last time the bridge table was aged.
`bmcast`	A broadcast/multicast address.
`permanent`	Most often, this flag indicates that the address is a static entry (created using the **`set node`** command). Otherwise, it is a system-defined entry.
`system`	The MAC-layer hardware address of the ATM module, assigned by the Switch 2000.
blank	In a typical application, most entries in the bridge table have none of the preceding flags set. Such entries are learned addresses that have been seen at least once since the last time the bridge table was aged.

Removing Entries from the Bridge Table

The bridging engine searches through the entire bridge table each time it needs to locate a device's address or add an entry to the bridge table.

To prevent the bridge table from filling with unused entries, the ATM module software allows entries to be removed from the table, either automatically or manually.

Automatic Removal. *Aging* is a mechanism that periodically clears learned entries from the table. At an interval you specify (the *aging interval*), the ATM module software determines which of the learned entries in the table have not been used recently. Each learned entry that has not been used during the specified interval is marked `aged`. This value shows up in the `Flags` column of the bridge table.

If an entry marked `aged` is used during the next aging interval, the `aged` flag is removed and the entry remains in the table. However, if an entry marked `aged` is unused during the next interval, the entry is removed from the table.

You cannot manually remove individual learned entries from the table; however, you can clear all learned entries from the table using the **`bridge-tableclear`** command (see "Clearing the Bridge Table" on page 3-42).

Manual Removal. Static entries are not subject to aging, but remain in the bridge table indefinitely. You can remove static entries only by using the **`set node del`** command (see "Deleting a Static Entry from the Bridge Table" on page 3-49).

Clearing the Bridge Table

Periodically, learned entries are automatically removed from the bridge table through aging. However, you can clear all learned entries from the table using this command:

bridge-tableclear|btc

Using the Bridge Cache

The ATM module software maintains a *bridge cache*. Each time the bridging engine bridges a packet, it creates an entry in the bridge cache containing the packet's destination MAC address and source MAC address. The bridge cache is frequently updated with the most-recently used source-destination pairs and provides a fast path for bridge traffic.

You can use the bridge cache to learn about the current bridge traffic in your network.

Displaying the Bridge Cache

To display the bridge cache, issue the following command:

display-cache|dc [*<vport-list>***|all]**

where:

<vport-list>|**all**	Specifies virtual ports for which you want to display the cache entries. Specify a single virtual port, a comma-separated list of virtual ports, or a hyphen-separated range of virtual ports. If you specify **all**, the entries for all virtual ports are displayed.

Enter the command as follows:

```
17:ATM-C1:bridge: display-cache
Bridging cache:
Vport 01: Dest: 08-00-20-08-70-54, Source: 08-00-20-0f-dd-99
          Dest: 08-00-20-08-70-54, Source: 08-00-20-0f-6c-96
Vport 02: Dest: 00-00-6b-82-3f-34, Source: 08-00-20-0e-ae-03
          Dest: 00-00-94-06-79-12, Source: 08-00-20-10-56-53

Listing continues...
```

Flushing the Bridge Cache

To ensure that the entries displayed in the bridge cache are recent and reflect current traffic patterns, you can clear the cache just before displaying it.

To clear the bridge cache, issue the **`flush-cache|fc`** command. The entire contents of the bridge cache are removed.

Note

On busy networks, you might see some entries immediately re-appear when using the **`display-cache`** command. This re-appearance is normal and indicates that the source-destination pairs are being used.

Statistics

The ATM module software collects and maintains a wide array of bridge statistics including:

- Octets and packets transmitted and received
- Peak and current utilization
- Table misses
- Buffer, frame-check sequence (FCS), and frame-alignment errors
- Transmit queue length
- Excessive retries

The software begins collecting bridge statistics as soon as it is booted and continues collecting them as long as the ATM module is operating.

When you display the statistics, the numbers shown reflect either the count since the software was booted or the count since the most recent statistics clear:

- If statistics have not been cleared since the software was booted, the numbers show the count accumulated *since the software was booted*.
- If statistics have been cleared since the software was booted, the numbers show the count *since the most recent clear*.

Displaying Statistics

Use the **stats** command to display a particular statistic, a subset of statistics, or all statistics. Enter the command as follows:

stats|s *<vport-list>*|**all** *<stat-list>*|**all**

where:

<vport-list>|**all**	Specifies the virtual ports for which you want to display the specified bridge statistics. You can specify a virtual port, a comma-separated list of virtual ports, or a hyphen-separated range of virtual ports.
<stat-list>|**all**	Specifies the bridge statistics you want to display. You can specify a statistic, a comma-separated list of statistics, or **all** for all statistics. Table 3-10 lists the specific statistic types.

Table 3-10. Bridge Statistics

Statistic type	*<stat-list>* option...	Description	Note
Buffer errors	**rbe** Receive-buffer Errors	Receive-buffer errors can occur under one of the following conditions: Total traffic received on all virtual ports exceeds the ATM module's maximum aggregate packet-throughput specification. When heavy traffic is received during CPU-intensive operations, such as aging large tables.	Incremented each time the ATM module detects an incoming packet but does not have a buffer in which to store the packet.
	xbe Transmit-buffer Errors	Incremented each time the ATM module attempts to forward a packet to a busy destination virtual port whose output buffers all are full.	Each virtual port can buffer up to 3000 packets worth of outgoing traffic, depending upon packet length.
Frame errors	**fa** Frame-alignment Errors	Incremented each time the ATM module software receives a packet with a frame alignment error (that is, the packet did not contain an integral number of octets). Such packets are not bridged, or further processed.	Indicates a possible problem in the physical layer.
	fcs Frame-check Sequence (Fcs) Errors	Incremented each time the ATM module software receives a properly aligned packet with an incorrect frame-check sequence. Such packets are not bridged, routed, or further processed.	Indicates a problem in the physical layer.
Octets	**oi** Good Octets	This statistic includes 8 octets per packet to account for the preamble.	Error packets are not listed.

	oo Octets Out	This statistic includes 8 octets per packet to account for the preamble.	Incremented when a packet is scheduled for transmission.
Packets	**pi** Good Packets	Good packets received on the virtual port, listed regardless of packet type and regardless of whether the packet was forwarded to another virtual port.	Error packets are not listed.
	po Packets Transmitted	Packets transmitted on the virtual port.	Incremented when a packet is scheduled for transmission.
	bpi Broadcast-multicast Packets	Incremented for each good broadcast or multicast packet received on the virtual port.	Error packets are not listed.
	bpo Broadcast Multicast Packets Out	Incremented once for each broadcast or multicast packet scheduled for transmission on the virtual port.	Incremented when a packet is scheduled for transmission.
	gp Giant Packets	Number of packets longer than 1518 octets received by the ATM module. Such packets are not bridged or further processed. They might indicate a problem on the MAC layer on another device.	None
Queue	**q** Transmit Queue Length	The number of outgoing packets in the transmit queue. These packets have been scheduled for transmission but have not been transmitted yet.	A transmitted packet is one completely transmitted on the virtual port, or one that the transmitter gives up on due to excessive collisions on the outgoing virtual port.
Retries	**er** Excessive Retries	Incremented whenever all of 15 attempts to transmit a single packet cause a collision.	Can happen in very busy networks or when an enabled BNC virtual port is missing.
Table Misses	**tm** Table Misses	Incremented each time a packet with an unknown destination address is received. If learning is enabled and the destination replies to the sender, the destination is added to the bridge table. This statistic might be incremented multiple times if any one of the following conditions is true: - Learning is disabled. - A learned address has been 'aged out.' - Packets are being forwarded to an unknown destination that is not responding.	None

Utilization	**cu** Current Utilization	This calculation includes 8 octets per packet to account for each packet's 64-bit preamble. For Ethernet virtual ports, this statistic is calculated as follows: Once per second, the current one-second utilization is computed as the total number of octets transmitted and received on the virtual port during the previous second, multiplied by 8 bits/octet, divided by 10 Mbps (the Ethernet data rate).	The 9.6 microsecond interpacket gap associated with each packet is not included in this statistic. The maximum value of current utilization is lower for short packets than for long packets.
	pu Peak Utilization	The virtual port's maximum utilization during a one-second interval since the statistics last were cleared. This calculation includes 8 octets per packet to account for each packet's 64-bit preamble. The peak utilization is the maximum of the current one-second utilization and the previous peak utilization (see current utilization, above).	The 9.6 microsecond interpacket gap associated with each packet is not included in this statistic. The maximum value of current utilization is lower for short packets than for long packets.

The following is an example of the use of the **stats** command. In this example, arguments are used to display for all virtual ports the number of packets sent and received since the last time statistics were cleared.

```
18:ATM-C1:bridge: stats all po,pi
Pkts in
07  928     0       0       0       0       0
01  33686   34462   0       0       181     34610
Pkts out
07  100802  99842   99836   99834   99848   99913
01  67369   66578   99904   99904   99898   66434
```

Clearing Statistics

Use the **stats-clear** command to clear all bridge statistics. This command resets all bridge statistics to 0, then begins collecting statistics again. Once you clear the bridge statistics, the statistics displayed in response to the **stats** command show the counts since the most recent clear, rather than since the most recent reboot.

Enabling Virtual Port-to-Virtual Port Statistics

Unlike the collection of aggregate bridging statistics, the collection of virtual port-to-virtual port statistics is not automatically enabled. To enable virtual port-to-virtual port statistics, issue the **vppstats enl** command.

As soon as this command is issued, the software begins collecting virtual port-to-virtual port statistics.

Displaying Virtual Port-to-Virtual Port Statistics

After enabling virtual port-to-virtual port statistics, you can display statistics for bridged traffic between a specific pair of virtual ports. To display virtual port-to-virtual port statistics, issue the following command:

vppstats|vpp *<from-vport-list> <to-vport-list> <stat-list>*|**all**

where:

<from-vport-list>	Specifies the virtual port(s) on which packets are received for which you want to display transmit statistics.
<to-vport-list>	Specifies the virtual port(s) on which packets are transmitted for which you want to display receive statistics.
<stat-list>|**all**	Specifies the particular statistics you want to display. You can specify one of the following: **p** Displays the number of packets forwarded from the 'from' virtual port(s) to the 'to' virtual port(s). **o** Displays the number of octets forwarded from the 'from' virtual port(s) to the 'to' virtual ports(s).

If you specify **all**, all statistics are displayed.

Clearing Virtual Port-to-Virtual Port Statistics

Use the **vppstats sc** command to clear all virtual port-to-virtual port statistics. The statistics counters are reset to 0, and the ATM module software begins accumulating statistics again.

Disabling Virtual Port-to-Virtual Port Statistics

To disable virtual port-to-virtual port statistics, issue the **vppstats dis** command. After you issue this command, the software stops collecting virtual port-to-virtual port statistics.

Setting Bridge Parameters

Although the ATM module is shipped from the factory with a default bridge configuration, you can set bridge parameters individually to meet your configuration needs. Using the **set** command, you can do any of the following:

- Specify the aging time for learned bridge table entries.
- Add or delete permanent addresses (entries) to the bridge table, including a single entry spanning multiple virtual ports for a multi-homed host.

To display the current setting of a bridge parameter, use the **showcfg** command (see "Displaying the Bridge Configuration" on page 3-36).

Specifying the Aging Time

Use the **set aging** command to specify the aging time for learned bridge table entries or to turn aging off. When the time interval you specify expires, unused bridge table entries are marked **aged**. If an entry marked **aged** is still unused the next time the aging interval expires, the entry is removed from the bridge table. Note that static entries created using the **set node** command are not subject to aging (see "Deleting a Static Entry from the Bridge Table" on page 3-49). Enter the command as follows:

set|**se aging**|**a** *<minutes>*|**off**

where:

<minutes>|**off**	Specifies the aging interval, in minutes, or turns aging off. The default is **60** minutes.

Adding a Static Entry to the Bridge Table

Use the **set node** command to add a static (permanent) entry to the bridge table. The entry is added to the table as soon as you issue the command and remains in the table until you remove the entry. This command is helpful because adding static bridge entries is an effective way to ensure that an ATM module can always recognize a specific node that is permanently located on a virtual port. Unlike learned entries, static entries are not subject to aging.

Enter the command as follows:

set|se node|n *<vport-list> <MAC-address>*

where:

<vport-list>	Specifies the virtual port(s) associated with the specified node. To ensure that packets destined for the device are forwarded successfully, make sure you specify the virtual port to which the device is attached.
<MAC-address>	Specifies the MAC-layer hardware address of the device.

Deleting a Static Entry from the Bridge Table

The **set node** command can also be used to delete a permanent bridge entry from the bridge table. The entry is deleted by issuing this command along with the entry's MAC address. Enter the command as follows:

set|se node|n del|d *<MAC-addr>*

where:

<MAC-addr>	Specifies the MAC address of the entry to be deleted.

The TCPstack Subsystem

The ATM module software includes an implementation of TCP (Transmission Control Protocol), a connection-oriented, industry-standard protocol for moving data between nodes in a network environment.

This section describes the commands in the TCPstack subsystem. It also describes how to use these commands to perform the following tasks:

- Display the TCP configuration settings.
- Display the TCP table.
- Display TCP and UDP statistics.
- Clear TCP and UDP statistics.
- Display the UDP table.

Accessing the TCPstack Subsystem

To access the TCPstack subsystem, enter **`tcpstack`** at any command prompt.

TCPstack Subsystem Commands

Table 3-11 lists and describes the **`tcpstack`** subsystem commands.

Table 3-11. TCPstack Subsystem Commands

Command	Description
`showcfg|scf`	Displays the settings for the TCP parameters.
`stats|s tcp|udp [-t]`	Displays statistics for the specified packet type. The **`-t`** argument shows only the total counts for each statistic.
`stats-clear|sc tcp| udp`	Clears TCP statistics for the specified packet type.
`udp-table|ut`	Displays the UDP clients supported by the ATM module.

Displaying the Current TCP Configuration

Use the **showcfg** command to display configuration parameters used by the TCP subsystem. An example of the display produced by this command follows:

```
67:ATM-C1:tcpstack: showcfg
TCP Configuration
-----------------

Round Trip Algorithm:                    vanj
Min Rexmit Interval:                     1000 ms
Max Rexmit Interval:                    64000 ms
Max Connections Allowed:                    2

connection-idle-time:                      20 minutes
keep-alive-interval:                       75 seconds
Time to disconnect on idle conn:           30 minutes 0 seconds
```

This display shows the following information about the current TCP configuration parameters:

- The round-trip algorithm used by the ATM module software is the Van Jacobson algorithm.
- The minimum retransmit interval is 1,000 milliseconds.
- The maximum retransmit interval is 64,000 milliseconds.
- The connection-idle time is 20 minutes.
- The keep-alive interval is 75 seconds.
- The time allowed before an idle connection is automatically disconnected is 30 minutes. This value is based on the values of the connection-idle time and the keep-alive interval.

Displaying Statistics

The TCP subsystem maintains statistics on TCP and UDP packets, which are a superset of the corresponding statistics provided in the SNMP MIB.

The software maintains two copies of each TCP and UDP statistics counter:

- Count since last statistics clear
- Count since last system reset

Use the **stats** command to display statistics. Enter the command as follows:

```
stats|s tcp|udp [-t]
```

where:

tcp|udp	Specifies the type of protocol for which you want to display packet statistics.
-t	Displays statistics totals collected since the last system reset, rather than the statistics collected since the last statistics clear.

The following is an example of the use of this command. In this example, TCP statistics collected since the last statistics clear are displayed.

```
62:ATM-C1:tcpstack: stats tcp

TCP Connection & Pkt statistics (count since last stats clear):
Active Opens:                          0
Passive Opens:                         5
Failed Conn Attempts:                  0
Resets In Estb State:                  0
Current Open Conns:                    2
Segments Received:                  1088
Segments Sent:                      1030
Rexmitted segments:                    2
Segments Rcvd With Err:                0
Resets Sent:                           0

Short Segments Rcvd:                   0
```

Clearing Statistics

Use the **stats-clear** command to clear statistics for TCP or UDP packets. Enter the command as follows:

```
stats-clear|sc tcp|udp
```

where:

tcp|udp	Specifies the type of protocol for which you want to clear packet statistics.

When you clear statistics, the counters that record statistics since the last clear are reset to zero. The ATM module software immediately begins collecting new statistics. The counters that record statistics since the last system reset are unaffected by the **stats-clear** command.

Displaying the UDP Table

The ATM module software contains agents that can respond to certain 'well-known' UDP port requests, such as RIP packets and SNMP requests. The ports listed in the UDP port table are the port numbers that UDP clients register with the UDP protocol code.

When the ATM module receives a UDP packet, it checks the UDP port number specified in the packet against the list of UDP ports in the UDP port table. If the ATM module can respond to the UDP request, it does so. If the ATM module cannot respond to the UDP request, it drops the packet.

To display a complete list of the UDP protocol ports supported by the ATM module software, issue the **udp-table** command. The numbers and names are 'well-known' UDP protocol port numbers and names as defined in RFC 1340.

The following is an example of the display produced by this command.

```
81:ATM-C1:tcpstack: udp-table
List of registered UDP clients:
 161    SNMP
```

The UDP ports listed in this display indicate that the ATM module contains an agent for processing UDP packets sent to UDP protocol port 161. In other words, the ATM module supports only SNMP packets.

The TFTP Subsystem

The TFTP subsystem contains the ATM module implementation of TFTP (Trivial File Transfer Protocol). Use the TFTP subsystem commands to perform the following tasks:

- Set, unset, or display the default TFTP server.
- Move files between the ATM module and a TFTP server.
- Load (activate) a configuration file stored on a TFTP server.
- Save ATM module configuration changes to a configuration file on a TFTP server.

To use the commands in this subsystem, you must configure your TFTP server to support TFTP file transfers. The procedures for configuring your server depend upon the particular type of server you are using. See your server documentation for configuration information.

Caution

The TFTP protocol provides no authentication for any services, including downloading or changing files stored on the TFTP server. If you configure your TFTP server to allow the **`tftp`** commands to be used, anyone with access to the server can download or change files.

Accessing the TFTP Subsystem

To access the TFTP subsystem, enter **`tftp`** at any command prompt.

TFTP Subsystem Commands

Table 3-12 lists and describes the **tftp** subsystem commands.

Table 3-12. TFTP Commands

Command	Description
get [-h *<host>***] [-a]** *<remfile>* **[***<localfile>***|tty]**	Downloads or displays a file from the file server or other specified host.
put [-h *<host>***] [-a]** *<localfile>* **[***<remfile>***]**	Uploads a file to the file server or other specified host.
rdcfg [-h *<host>***]** *<remfile>*	Downloads and processes the specified configuration file.
set *<variable> <value>*	Sets a TFTP variable to the specified value. You can use this command to specify the default TFTP server for use in TFTP file operations.
show *<variable>*	Displays the current setting for the specified TFTP variable.
svcfg [-h *<host>***]** *<remfile>*	Saves a configuration file to the specified file server or other host.
unset *<variable>*	"Unsets" the specified variable.

Note

The ATM module TFTP commands work with many types of TFTP servers, including servers running UNIX, DOS, Windows, OS/2, or other operating systems. Regardless of the platform used for the TFTP servers in your network, it is recommend that you consult your server's documentation regarding the following:

- File permissions (not applicable to some operating systems)
- Conventions for path names and file names

If you experience problems uploading or downloading files between the ATM module and your TFTP server, you often can resolve the problems by verifying whether the ATM module has or needs read and write access to the server, and how file names need to be specified to the ATM module.

Displaying, Setting, or Unsetting the Default Server

The commands described in the following sections let you specify a particular TFTP server to be used in the file operations described in this chapter.

If you choose not to specify a default TFTP server, you still can specify a server with the individual TFTP commands.

Displaying the Default TFTP Server

Use the **show** command to display the IP address of the default TFTP server. Enter the command as follows:

```
show <variable>
```

where:

<variable>	Specifies the TFTP parameter you want to display. In this case, specify server.

Setting the Default TFTP Server

Use the **set server** command to specify the default TFTP server. Enter the command as follows:

```
set server <value>
```

where:

<value>	Specifies the IP address of the TFTP server you want to use as the default. Specify the address in dotted-decimal notation.

Removing the Default TFTP Server Setting

Use the **unset** command to remove the default TFTP server setting. Enter the command as follows:

```
unset server
```

Downloading or Displaying a File

Use the **get** command to display or download a file stored on a server. Enter the command as follows:

get [-h *<host>***] [-a]** *<remfile>* **[***<localfile>***|tty]**

where:

<host>	Specifies the IP address, in dotted-decimal notation, of the TFTP server. If you do not specify this argument, the default server is used. The default server is specified using the **set server** command (see "Setting the Default TFTP Server" on page 3-56). If you do not specify a TFTP server and no default server has been configured, an error message is displayed. To configure a default server, use the **set server** command (see "Setting the Default TFTP Server" on page 3-56).
-a	Forces the transfer to take place in net-ASCII transfer mode, rather than octet mode. Octet mode transfers the file, including end-of-line characters, exactly as it is stored on the server. Net-ASCII changes the end-of-line characters to be compatible with the display or storage device that receives the file. Use the default (octet-mode) to download software image files (ex: `hpmain` or `hpatm`). Use the net-ASCII mode to download configuration files and other text files. If you plan to display the file on your management terminal (by specifying **tty** as the local file name), omit this argument. The file is automatically transferred in net-ASCII format.
<remfile>	Specifies the name of the remote file. Specify the name that is meaningful to the TFTP program on the server. For example, if the server contains a subdirectory called `transfer` and this directory is specified as the TFTP home directory, do not specify `transfer` as part of the file name.
<localfile>|**tty**	Used as follows: If you omit this argument, the ATM module software assumes that you want to use the file name on the server and include the pathname (if any) in the file name. If you omit this argument or specify a local file name, the file is written to the Flash Memory module. If the file name on the server is an invalid name on the ATM module, an error message is displayed on the terminal. If you specify **tty**, the file is not downloaded to your system, but an image of the file is displayed on the management terminal. You can display the file from within a TTY (RS-232) session or a TELNET session.

Uploading a File

Use the **put** command to upload a file stored on the Flash Memory module to a server. Enter the command as follows:

put [-h *<host>***] [-a]** *<localfile>* **[***<remfile>***]**

where:

<host>	Specifies the IP address, in dotted-decimal notation, of the TFTP server. If you do not specify this argument, the default server is used. The default server is specified using the **set server** command (see "Setting the Default TFTP Server" on page 3-56).
-a	Forces the transfer to take place in net-ASCII transfer mode, rather than octet mode. Octet mode transfers the file, including end-of-line characters, exactly as it is stored on the server. Net-ASCII changes the end-of-line characters to be compatible with the display or storage device that receives the file. Use the default (octet-mode) to upload software image files (ex: `hpmain` or `hpatm`). Use the net-ASCII mode to upload configuration files and other text files.
<localfile>	Specifies the local file name. The software assumes that the file is located on the Flash Memory module.
<remfile>	Specifies the name of the file as you want it to appear on the server. Specify the name that is meaningful to the TFTP program on the server. For example, if the server contains a subdirectory called `transfer` and this directory is specified as the TFTP home directory, do not specify `transfer` as part of the file name.

The following is an example of the use of this command. In this example, a configuration file is uploaded to a TFTP program on a UNIX server.

```
12:ATM-C1:tftp: put -a /fore/atm/atm1.cfg
177.177.45.20:/fore/atm: 833 bytes
13:ATM-C1:tftp:
```

Notice that a pathname is specified with the file name. Make sure you specify the pathname that is meaningful to your TFTP program.

On UNIX machines, if the write permission for 'others' is not enabled on the TFTP server for the file name or the directory to which you are trying to write the file, a message such as the following is displayed:

```
12:ATM-C1:tftp: put -a atm1.cfg
tftpWrite: Peer generated error
tftp: Permission denied: Access violation
13:ATM-C1:tftp:
```

If you receive this error, check the file and directory permissions for 'others' on the TFTP server.

If your TFTP program is on a UNIX machine and that machine requires that the file name already exist, but the file does not yet exist on the server, a message such as the following is displayed on the terminal:

```
14:ATM-C1:tftp: put atm2.cfg
tftpWrite: Peer generated error
tftp: File not found: File not found
15:ATM-C1:tftp:
```

Loading a Configuration File

During normal operation of the ATM module, you can read a configuration file stored on a remote TFTP server. To do so, issue the following command:

rdcfg [-h *<host>***]** *<remfile>*

where:

<host>	Specifies the IP address of the TFTP server. If you do not specify this argument, the default server is used (the default server is specified using the **set server** command, see "Setting the Default TFTP Server" on page 3-56).
<remfile>	Specifies the name of the configuration file to load. Specify a name that is meaningful to the TFTP program on the server. For example, if the server contains a subdirectory called `configs` and this directory is specified as the TFTP home directory, do not specify `configs` as part of the file name (see Section 4.3.4 on page 65).

As with the **get** command, if you do not specify a host server name and no default server name has been configured, an error message is displayed.

Saving a Configuration File

During normal runtime operation of the ATM module, you can save the current configuration to a file on a remote TFTP server. To save configuration files, issue the following command:

svcfg [-h *<host>***]** *<remfile>*

where:

<host>	Specifies the IP address of the TFTP server (the default server is specified using the **set server** command, see "Setting the Default TFTP Server" on page 3-56).
<remfile>	Specifies the name of the configuration file you want to save. Specify the name that is meaningful to the TFTP program on the server. For example, if the server contains a subdirectory called `configs` and this directory is specified as the TFTP home directory, do not specify `configs` as part of the file name.

On UNIX-based TFTP servers, if the write permission for 'others' is not enabled for the configuration file name or the directory to which you are trying to write the file, a message such as the following is displayed:

```
16:ATM-C1:tftp: svcfg ace.cfg
tftpWrite: Peer generated error
tftp: Permission denied: Access violation
17:ATM-C1:tftp:
```

If you receive this error, check the file and directory permissions for 'others' on the TFTP server.

If your UNIX-based server requires that the file name already exist, but the file does not yet exist on the server, a message such as the following is displayed on the terminal:

```
18:ATM-C1:tftp: svcfg ace.cfg
tftpWrite: Peer generated error
tftp: File not found: File not found
19:ATM-C1:tftp:
```

The SNMP Subsystem

The ATM module software contains an implementation of SNMP (Simple Network Management Protocol). SNMP uses UDP (User Datagram Protocol), an industry-standard, connectionless protocol used to send and receive packets between network devices and management stations.

This section describes the commands in the **`snmp`** subsystem and tells you how to perform the following tasks:

- Display the SNMP configuration.
- Add an SNMP management community.
- Add an SNMP manager.
- Delete an SNMP management community.
- Delete an SNMP manager.
- Display SNMP packet statistics.
- Delete SNMP packet statistics.

Supported SNMP Traps

The ATM module software supports the following standard traps defined in RFC 1157.

- coldStart
- warmStart
- linkDown
- linkUp
- authenticationFailure

The ATM module software does not support Bridge MIB traps or any specific enterprise traps.

Accessing the SNMP Subsystem

To access the SNMP subsystem, enter **`snmp`** at any command prompt.

SNMP Subsystem Commands

Table 3-13 lists and describes the **snmp** subsystem commands.

Table 3-13. SNMP Subsystem Commands

Command	Description
add|a community|c *<community-name>* **[ro|rw]**	Adds an SNMP management community from which requests can be received.
add|a manager|m *<community-name> <IP-addr>* **[trap|notrap]**	Adds an SNMP manager.
delete|d community|c *<community-name>*	Deletes an SNMP management community.
delete|d manager|m *<community-name> <IP-addr>*|**all**	Deletes an SNMP manager.
showcfg|scf [-l] [*<community-name>***]**	Displays the name and access level for SNMP management communities.
stats|s [-t]	Displays SNMP packet statistics.
stats-clear|sc	Clears SNMP packet statistics.

Displaying the SNMP Configuration

To display the current configuration of communities and managers, use the **showcfg** command as follows:

showcfg|scf [-l] [*<community-name>***]**

where:

-l	Specifies that managers and trap configurations are to be listed.
<community-name>	Specifies the community for which you want configuration information displayed.

When used with no arguments, this command lists only communities and each community's access (the first and second column from the example shown below).

The example that follows illustrates the **showcfg** command containing both arguments (i.e., the manager and trap configuration for a specific community).

```
47:ATM-C1:snmp: showcfg -l admin

Community            Access     Managers       Traps
-----------------    ------     ------------   ------
admin                rw         147.128.7.3    notrap
```

Displaying Statistics

The SNMP subsystem maintains statistics on SNMP packets that it transmits and receives. These statistics are a superset of the corresponding statistics provided in the SNMP MIB.

The ATM module software maintains two copies of each SNMP statistics counter:

- Count since last clear.
- Count since last system reset.

To display these statistics, use the following command:

stats|s [-t]

where:

-t	Displays the count since the last reset. If this argument is not used, the default display is the count since the last clear.

The example that follows shows the **stats** command used without the [**-t**] argument:

```
50:ATM-C1:snmp: stats
SNMP packet statistics (count since last stats clear):
Packets Rcvd:          49086     Packets Sent:           49086
Bad Version Rcvd:      0         Bad Comm Name Rcvd:     0
Bad Comm Uses Rcvd:    0         ASN Parse Err Rcvd:     0
Bad Type Rcvd:         0         Too Big Rcvd:           0
No Such Name Rcvd:     0         Bad Values Rcvd:        0
Read Onlys Rcvd:       0         Gen Errs Rcvd:          0
Total vars Req:        49086     Total vars Set:         0
Get Req Rcvd:          0         GetNext Req Rcvd:       49086
Set Req Rcvd:          0         Get Resp Rcvd:          0
Traps Rcvd:            0         Too Big Sent:           0
No Such Name Sent      0         Bad Values Sent:        0
Read Onlys Sent:       0         Gen Errs Sent:          0
Get Req Sent:          0         GetNext Req Sent:       0
Set Req Sent:          0         Get Resp Sent:          49806
Traps Sent:            0
```

Clearing Statistics

To clear statistics, use the **stats-clear** command, as in the following example:

```
51:ATM-C1:snmp: stats-clear
Okay
```

Adding an SNMP Community

The default system configuration includes the standard default SNMP community, **public**, which has read-only access. You can add other communities with the add community command. Enter the command as follows:

add|a community|c *<community-name>* **[ro|rw]**

where:

<community-name>	Specifies the community that you want to add.
[ro/rw]	Specifies the community's access as read-only (**ro**) or read-write (**rw**). The default is read-only access.

The example that follows illustrates adding an **admin** community with read-write access.

```
43:ATM-C1:snmp: add community admin rw
```

The software supports a maximum of eight SNMP communities.

Deleting an SNMP Community

Communities are deleted using the **delete community** command. Enter the command as follows:

delete|d community|c *<community-name>*

where:

<community-name>	Specifies the community name you want to delete.

This command deletes both the community name and all managers that have been associated with it.

The command that follows illustrates deleting the **admin** community.

```
44:ATM-C1:snmp: delete community admin
```

Adding an SNMP Manager

Each community can include up to 16 managers. Managers are added with the **add manager** command. Enter the command as follows:

add|a manager|m *<community-name> <IP-addr>* **[trap|notrap]**

where:

<community-name>	Specifies the community name for which you want to add a manager.
<IP-addr>	Specifies the IP address of the manager.
trap/notrap	Is an optional flag, indicating whether the manager should receive traps. If the manager should receive traps, use (**trap**). If the manager should not receive traps, use (**notrap**). The default is **notrap**.

In the example that follows, a manager with IP address 147.128.7.3 is added to the **admin** community.

```
44:ATM-C1:snmp: add manager admin 147.128.7.3 notrap
```

Deleting an SNMP Manager

To delete a manager, use the **delete manager** command. Enter the command as follows:

delete|d manager|m *<community-name> <IP-addr>*|**all**

where:

<community-name>	Is the community name of the manager which you want to delete.
<IP-addr>/**all**	Is the IP address of the manager which you want to delete. If you use **all**, all managers in the community are deleted, but the community itself remains configured.

The ATM Subsystem

This section describes the commands in the ATM subsystem. These commands let you configure and manage the ATM module.

Accessing the ATM Subsystem

To access the ATM subsystem, enter **atm** at any command prompt.

ATM Subsystem Commands

Table 3-14 lists and describes the **atm** subsystem commands.

Table 3-14. ATM Subsystem Commands

Command	Description
ama-set|ase *<param> <value>*	Selects the AMA (PHY) to be used for ATM traffic.
ama-showcfg|ascf	Displays the configuration of the primary and backup AMAs (PHYs).
br-encap-showcfg|bscf *<vport>*|**all**	Displays the configuration of the Permanent Virtual Circuit (PVC) associated with *<vport>* or all PVCs.
br-encap-set|bse *<vport> <param> <value>* **[***<param> <value>...***]**	Creates a PVC to associate to an ATM module virtual port.
elan-add|eadd *<elan-name>* **[***<les-atm-address>***]**	Adds an ELAN to the ATM module.
elan-arptable|eat *<MAC-address>*	Displays the LE_ARP table for the ELAN.
elan-arptableclear|eatc	Clears LE_ARP table entries for the ELAN.
elan-del|edel	Deletes the ELAN from the ATM module.
elan-set|ese *<param> <value>* **[***<param> <value>...***[***<param> <value>***]]**	Sets ATM configuration parameters for the ELAN.
elan-showcfg|escf elan|if|all	Shows ELAN-specific (**elan**) or interface-specific (**if**) configuration information for the ELAN.
elan-stats|est elan|if|all	Shows ELAN-specific (**elan**) or interface-specific (**if**) statistics for the specified ELAN.
elan-statsclear|estc	Clears statistics for the ELAN.

Command	Description
elan-vctable|evt	Lists the VCs (Virtual Circuits) that are in use by the ELAN.
lec-set|lse *<param> <value>* **[***<param> <value>***]**	Configures the ATM module as a LEC (LAN Emulation Client).
lec-showcfg|lscf	Displays LANE 1.0 configuration information for the ATM module
stats|s	Displays statistics for the ATM port on the ATM module on which the command line session is open.
stats-clear|sc	Clears the statistics for the ATM port.

ATM Commands

The following sections describe the **atm** commands:

- PHY (AMA) selection commands let you select a PHY and display information about the PHYs (see "PHY (AMA) Selection Commands" on page 3-67).
- Statistics commands
- Permanent Virtual Circuit (PVC) configuration commands
- LANE 1.0 commands let you configure the ATM module for LANE 1.0 (see "LANE 1.0 Configuration Commands" on page 3-71).

PHY (AMA) Selection Commands

The commands in this section enable you to select and display information about the primary and backup AMA (PHY) on the ATM module.

Selecting an AMA. The ATM module software uses the primary AMA (PHY) by default. If the link to the primary AMA fails, the backup AMA automatically takes over, provided you have established a redundant link to the ATM switch by connecting the backup AMA to the switch.

After you correct the problem that led to the link failure on the primary AMA, you must manually change to the primary AMA if you want to use it again. You can manually switch between the backup AMA and primary AMA using the **ama-set** command.

Note

When you change from one AMA to the other, your connection to the ATM switch (and therefore to the ELAN configured on the switch) is temporarily lost while the software switches the connections to the new AMA.

Enter the command as follows:

ama-set|ase *<value>*

where:

<value>	Represents an AMA parameter, either **primary** or **backup**. If you specify **primary**, the AMA labeled PRIMARY is used. If you select **backup**, the AMA labeled BACKUP is used. The default is **primary**.

Note

If the ATM module contains a backup AMA but the backup AMA is bad, the software attempts to switch to the backup AMA, recognizes the AMA is not available, the immediately switches back to the primary AMA. Connection to the ATM switch is temporarily lost, then quickly re-established.

Enter the command as follows:

```
1:ATM-C1:atm: ama-set primary
```

This command selects the primary AMA. To save the AMA selection, save the ATM module configuration using the **mgmt svcfg** command or the **tftp svcfg** command (see "Configuration File Commands" on page 3-26).

Verifying AMA Selection. Use the **ama-showcfg** command to indicate the AMA that has been selected for use and the AMA that actually is in use. Enter the command as follows:

ama-showcfg|ascf

The following is an example of the display produced by this command. In this example, the primary AMA is both selected and in use.

```
1:ATM-C1:atm: ama-showcfg
AMA Configuration

                    Primary AMA            Backup AMA
-------------------------------------------------------
User Selected AMA : PRIMARY
Actual In Use AMA : PRIMARY
PHY UTOPIA Level  : 1                      1
PHY UTOPIA Version: 2                      2
PHY Protocol Type : 155M OC3               155M OC3
PHY Media Type    : Multimode Fiber        Multimode Fiber
```

The fields in this display show the following information:

`User Selected AMA`	The AMA you specified for normal operation. Unless you explicitly change the AMA assignments, the software uses the primary AMA by default and the backup AMA only if the link to the primary AMA fails.
`Actual In Use AMA`	The AMA that is actually being used. If the link to the primary AMA fails, this field shows that the backup AMA is in use, even though the primary AMA was selected for use.
`PHY UTOPIA Level`	The PHY UTOPIA level in use by the ATM module and AMA. UTOPIA is an ATM standard for the communication between the ATM module and the PHY (AMA). The level can be 1 or 2.
`PHY UTOPIA Version`	The version of the PHY UTOPIA in use by the ATM module and the AMA.
`PHY Protocol Type`	The PHY-layer protocol in use on the AMA.
`PHY Media Type`	The type of cable connecting the AMA to the ATM switch.

Normally, the primary AMA is selected by the software and used for ATM traffic between the ATM module and the ATM switch. However, if the primary link fails or you explicitly select the backup AMA, the ATM module uses the backup AMA. The **`ama-showcfg`** command shows that the backup AMA is in use as follows:

```
1:ATM-C1:atm: ama-showcfg

AMA Configuration:

                     Primary AMA             Backup AMA
-------------------------------------------------------
User Selected AMA : PRIMARY
Actual In Use AMA :                          BACKUP
PHY UTOPIA Level  : 1                        1
PHY UTOPIA Version: 2                        2
PHY Protocol Type : 155M OC3                 155M OC3
PHY Media Type    : Multimode Fiber          Multimode Fiber
```

Notice that the `Actual In Use AMA` field (shown in bold type in this example) lists the backup AMA in use, even though the primary AMA is selected. To use the primary AMA again, you must correct the problem that caused the primary link to fail, use the **`ama-set`** command to select the primary AMA (see "PHY (AMA) Selection Commands" on page 3-67).

Statistics Commands

These commands can be used to display or clear statistics gathered for the ATM module.

Displaying Statistics. To display ATM Statistics, enter the following:

```
stats|s
```

The command will produce a display similar to the following:

```
       Cells          Cells
Port   Transmitted    Received     HEC Errors     PDU Discards
----   -----------    --------     ----------     ------------
  C1   23162276       21187910     0              0
```

Clearing Statistics. To clear ATM statistics, enter the following command:

```
stats-clear|sc
```

Permanent Virtual Circuit (PVC) Configuration Commands

The PVC (bridge encapsulation) commands let you create and display full-time connections between ATM devices (e.g., two Switch 2000s).

Creating a PVC. To create a PVC on the ATM module, enter the following:

br-encap-set|bse *<vport> <param> <value>* **[***<param> <value>...***]**

where:

<vport>	Indicates the virtual port on which the PVC is to be created.
<param> <value>	Represent the following: **in-pvc|ip** *<vci>* - Indicates the incoming Virtual Circuit Identifier (VCI) of the PVC. **out-pvc|op** *<vci>* - Indicates the outgoing VCI of the PVC. **state|s enl|dis** - Indicates whether the PVC is to be created (**enl**) or torn down (**dis**).

For example, to create a PVC on virtual port 2, with an incoming VCI of 100, an outgoing VCI of 110, and no FCS information, enter the following:

```
br-encap-set 2 in-pvc 100 out-pvc 110 fcs discard state enl
```

Deleting a PVC. To delete a PVC, use the same command as for creating one, except that the value for `state` is disabled (**`dis`**). Enter the following:

```
br-encap-set 2 in-pvc 100 out-pvc 110 fcs discard state dis
```

Displaying a PVC's Configuration. To display the configuration of a particular PVC, enter the following command:

`br-encap-showcfg|bscf` *<vport>*`|all`

where:

<vport>`|all`	Indicates the virtual port for which PVC information is to be displayed. *<vport>* displays the configuration for a specific PVC, **`all`** displays the configuration for all PVCs.

LANE 1.0 Configuration Commands

The commands in this section let you configure ATM module to use LANE 1.0.

Adding the ELAN to the ATM Module. An ELAN (Emulated LAN) lets you forward traffic between Ethernet and FDDI LANS and ATM LANE 1.0 LANs. To add the ELAN to the ATM module, issue the following command:

`elan-add|eadd` *<elan-name>* **`[`***<les-atm-address>***`]`**

where:

<elan-name>	Is a name from one to 32 characters in length. You can use alphabetic characters, numerals, and special characters in the name, but you cannot use blank spaces. ELAN names are case-sensitive.
<les-atm-address>	Specifies the LES (LAN Emulation Server) address of the ELAN being added. If you do not specify the LES address, the ATM module software will try to get the LES address from the LECS (LAN Emulation Configuration Server).

Note

If you did not configure the LECS on your ATM switch or enable LECS usage on the ATM module, you must specify the LES address when you add the ELAN.

Deleting the ELAN from the ATM module. To delete the ELAN from the ATM module, issue the following command:

```
elan-del|edel
```

Configuring the ATM Module as a LEC. To configure the ATM module as a LEC (LAN Emulation Client), issue the following command:

lec-set|lse *<param> <value>* **[***<param> <value>***...[***<param> <value>***]]**

where:

<param> <value> Specifies the LEC parameter and the value you are assigning to the parameter. You can specify one of the following parameters:

lecs-usage|lu enl|dis [*<lecs-atm-address>***]**

Enables or disables the use of the LECS by the LEC of the specified slot.

If you specify the LECS address, separate each portion of the address with a period (.), a colon (:), or a hyphen (-).

If you do not specify the LECS ATM address, the well-known address is used. If you specify **dis** (disabled), the LECS is not used.

NOTE: To specify the well-known LECS address, enter the following: 47:0079:0000:0000:0000:0000:0000:00a03e000001:00

state|s enl|dis

Starts or stops the LEC of the specified slot.

Displaying LEC Configuration Information. To display LEC configuration information for the ATM module, issue the following command:

lec-showcfg|lscf

The following is an example of the information displayed by this command. The "LE Client" is the LEC (ATM module).

```
5:ATM-C1:atm: lscf

LEC Configuration:
------------------------------------------------------
LE Client State       : Enabled
LE Client ATM Address :
47:0005:80ff:e100:0000:f21a:1e3c:0000ef0282d0:00
LECS ATM Address     : 47:0079:0000:0000:0000:0000:0000:00a03e000001:00
```

The fields in this display show the following information:

`LE Client State`	Indicates whether the ATM module is enabled as a LEC.
`LE Client ATM Address`	Indicates the ATM address of the ATM module. The address displayed is the base address of the LEC (ATM module). The Selector byte contains zeroes (00). The ELAN configured on the ATM module uses the base address but has a unique value in the Selector byte.
`LECS ATM Address`	Indicates the ATM address of the LECS.

Displaying the LE_ARP Table for the ELAN. The ATM module software maintains an LE_ARP (LAN Emulation Address Resolution Protocol) table for the ELAN on the ATM module. The LE_ARP table maps the MAC addresses of the devices in the ELAN to their corresponding ATM addresses.

To display the LE_ARP table for the ELAN, issue the following command:

elan-arptable|eat *<mac-address>*

where:

<mac-address>	Indicates the MAC address of a LANE 1.0 in the ELAN.

The following are examples of the information displayed by this command. In the following example, the LE_ARP table entries for `elan1` are displayed.

```
5:ATM-C1:atm: eat

ARP Table for ELAN: elan1

Vport  MAC Address      ATM Address
-------------------------------------------------------
2    00-20-48-1a-1e-3c 47:0005:80ff:e100:0000:f21a:1e3c:0020481a1e3c:10

2    ff-ff-ff-ff-ff-ff 47:0005:80ff:e100:0000:f21a:1e3c:0020481a1e3c:02
```

In the following example, a MAC address is specified. The ELAN name and ATM address corresponding to the MAC address are listed.

```
6:ATM-C1:atm: eat 00-20-48-1a-1e-3c

ARP Table for MAC Address: 00-20-48-1a-1e-3c

Vport  Elan Name         ATM Address
-------------------------------------------------------
2     elan1          47:0005:80ff:e100:0000:f21a:1e3c:0020481a1e3c:10
```

The fields in these displays show the following information:

`Vport`	Indicates the ATM module virtual port on which the ELAN is configured.
`MAC Address`	Indicates the MAC address of a LANE 1.0 device.
`ELAN Name`	Indicates the name of the ELAN.
`ATM Address`	Indicates the ATM address of a LANE 1.0 device.

Clearing the ELAN's LE_ARP Table. To clear the ELAN's LE_ARP table, issue the following command:

```
elan-arptableclear|eatc
```

Displaying the Virtual Circuits on the ELAN. To display the VCs (Virtual Circuits) in use on the ELAN, issue the following command:

```
elan-vctable|evt
```

The following is an example of the information displayed by this command. In this example, the VCs for `elan1` are displayed.

```
7:ATM-C1:atm: evt

VC Table For ELAN: elan1

Vport  MAC Address          VC     LEC-ID
-------------------------------------------------------

   2   00-20-48-1a-1e-3c    67      2
```

The fields in this display show the following information:

`Vport`	Indicates the virtual port on which the ELAN is configured.
`MAC Address`	Indicates the MAC address of the device at the other end of the VC (Virtual Circuit).
`VC`	Indicates the number of the VC connecting the ELAN on the ATM module to the other device. The VC number is negotiated by the ATM module and the ATM switch when the VC is established. The VC number can be different for each VC.
`LEC-ID`	Indicates the ATM module LEC ID of the ELAN. The ATM module LEC ID is local. The LEC ID of the same ELAN can be different on other devices. Each ELAN on the ATM module can have a different LEC ID.

Displaying Statistics. The ATM module collects statistics for the data traffic and the control traffic sent and received by the ELAN configured on the ATM module.

Statistics for data traffic are collected as interface statistics because the ELAN data packets are processed on the interface layer.

Statistics for ATM control traffic are collected as ELAN statistics because they are processed on the ELAN layer.

To display ATM statistics, issue the following command:

elan-stats|est elan|if|all

where:

elan|if|all	Specifies the type of statistics you want to display: **elan** - Displays ELAN (control) statistics. **if** - Displays interface (data) statistics. **all** - Displays ELAN statistics and interface statistics.

The following is an example of the interface statistics displayed by this command. In this example and the following example, interface statistics are displayed for the ELAN named "elan1."

```
8:ATM-C1:atm: est if

Interface Statistics For ELAN: elan1

------------------------------------------------------------------------

Out MCast Pkts    :          1
Out Errors        :          0
Out Discard       :          0
Out Ucast Pkts    :          1
In MCast Pkts     :          0
In Errors         :          0
In Discard        :          0
In UCast Pkts     :          0
In Unknown Protos :          0
MTU Size          :       1514
```

The fields in this display show the following information:

Out MCast Pkts	Indicates the number of Ethernet broadcast or multicast packets the ELAN has sent to the ATM network.
Out Errors	Indicates the number of Ethernet packets sent by the ELAN that experienced an error during transmission.
Out Discard	Indicates the number of Ethernet packets that were discarded due to an error on the ATM module, rather than sent to the ATM network.
Out UCast Pkts	Indicates the number of Ethernet unicast packets the ELAN has sent to the ATM network.
In MCast Pkts	Indicates the number of Ethernet broadcast or multicast packets the ELAN has received from the ATM network.
In Errors	Indicates the number of Ethernet packets received by the ELAN that contain errors.
In Discard	Indicates the number of Ethernet packets that were discarded due to an error in the ATM module, rather than received for the ELAN.
In UCast Pkts	Indicates the number of Ethernet unicast packets the ELAN has received from the ATM network.
In Unknown Protos Pkts	Indicates the number of Ethernet packets received that were using an unknown protocol.
MTU Size	Indicates the MTU (maximum transmission unit) for the protocol being used in the ELAN. For Ethernet, the MTU is 1514 bytes.

The following is an example of the ELAN statistics displayed for the ELAN.

```
9:ATM-C1:atm: est elan

ELAN Statistics For ELAN: elan1

------------------------------------------------------------------------

SVCs Released     :        1
Total Control In  :        5
Total Control Out :        5
ARP Replies In    :        2
ARP Replies Out   :        0
ARP Request In    :        0
ARP Request Out   :        2
Join ELAN Calls   :        1
```

The fields in this display show the following information:

`SVCs Released`	Indicates the number of SVCs (Switched Virtual Circuits) that have been released (torn down) by this ELAN. An SVC is released after the two ends of the SVC (the ELAN on the ATM module and the device on the other end) stop exchanging traffic.
`Total Control In`	Indicates the number of LANE 1.0 control packets received on this ELAN by the ATM module.
`Total Control Out`	Indicates the number of LANE 1.0 packets sent on this ELAN by the ATM module.
`ARP Replies In`	Indicates the number of LE_ARP replies received on this ELAN by the ATM module
`ARP Replies Out`	Indicates the number of LE_ARP replies sent on this ELAN by the ATM module.
`ARP Request In`	Indicates the number of LE_ARP requests received on this ELAN by the ATM module.
`ARP Request Out`	Indicates the number of LE_ARP requests send on this ELAN by the ATM module.
`Join ELAN Calls`	Indicates the number of times the ELAN on the ATM module has requested to join the like-named ELAN configured on the ATM switch.

Clearing Statistics. To clear ATM statistics, issue the following command:

```
elan-statsclear|estc
```

Displaying ELAN Parameters. You can display the ELAN parameters configured on the ATM module by issuing the **`elan-showcfg`** command.

```
elan-showcfg|escf
```

Note

To change the settings for the ELAN, use the **`elan-set`** command (see "LANE 1.0 Configuration Commands" on page 3-71).

The following is an example of the information displayed by this command. In this example, configuration information is displayed for the ELAN named "elan1."

```
10:ATM-C1:atm: escf
Configuration For ELAN: elan1

-------------------------------------------------------
Vport          :      2
Max ARP Retry  :      2
ARP Aging Time :    300 (sec)
Control Timeout:    120 (sec)
Flush Timeout  :      6 (sec)
Forward Delay  :     15 (sec)
VCC Timeout    :     20 (min)
BUS Rate       :      1 (pps)
LES Address    : 47:0005:80ff:e100:0000:f21a:1e3c:0020481a1e3c:01
BUS Address    : 47:0005:80ff:e100:0000:f21a:1e3c:0020481a1e3c:02
```

In addition to the LES address and the BUS address, this command displays the following information:

`Vport`	Indicates the ATM module virtual port on which the ELAN is configured.
`MAX ARP Retry`	Indicates the number of times the ELAN will send an LE_ARP Request for a given frame's LAN destination if a reply is not received the first time the ATM module sends the LE_ARP request.
`ARP Aging Time`	Indicates the maximum number of seconds that the ATM module will maintain and entry in the ELAN's LE_ARP cache after receiving a packet from the source address in the cache entry. If Topology Change is true, the forward delay is used to age LE_ARP entries, instead of the ARP aging time (see the description of the Forward Delay field).
`Control Timeout`	Indicates how many seconds the ELAN will wait for a response to a control-frame request.
`Flush Timeout`	Indicates how many seconds the ELAN module will wait to receive a response to a request to flush the BUS.
`Forward Delay`	Indicates how many seconds the ATM module will maintain an entry in the ELAN's LE_ARP cache following verification of the entry, as long as Topology Change is true. Topology Change is true when Topology Change frames notify LECs (including the ATM module) that the LECs' cached LE_ARP entries might be incorrect. When Topology Change is true, the forward delay timer is used in place of the ARP aging time to age LE-ARP entries.
`VCC Timeout`	Indicates how many minutes the ATM module will maintain a Data Direct VCC that is idle before closing the VCC.

BUS Rate	Indicates the rate (in Packets Per Second) at which the ELAN can send unknown packets to the BUS. An unknown packet is a packet whose destination's ATM address is unknown to the ELAN.
Changing ELAN Parameters	Use the **elan-set** command to change the default for the ELAN parameter. You can display the current settings for each parameter using the **elan-showcfg** command. See "LANE 1.0 Configuration Commands" on page 3-71 for information about this command and for descriptions of the ATM parameters.

The LECS configuration on the LECS host or switch contains parameters similar to the ELAN parameters maintained by the ATM module. Most of the ATM module defaults for the parameters match the defaults specified in the ATM Forum LANE 1.0 specification.

It is recommended that you use the defaults for these values. If you use the **elan-set** command to change the value of the ELAN parameter in the LECS, it is recommended that you also change the value of the parameter on the ATM module. Enter the command as follows:

elan-set|ese *<param> <value>* **[***<param> <value>***...[***<params> <value>***]]**

where:

<param> <value> Specifies the ELAN parameter and the value you are assigning to the parameter. You can specify one of the following parameters:

arp-aging|aa *<seconds>* - From **10** and **300** seconds. The default is **300**. LECS equivalent is `.Aging_Time`.

bus-rate|br *<packets-per-second>* - From **0** to **10** Packets Per Second. The default is **1**. LECS equivalent is `.Maximum_Unknown_Frame_Time`.

control-timeout|cto *<seconds>* - From **10** to **600** seconds. The default is **120**. LECS equivalent is `.Control_TimeOut`.

flush-timeout|fto *<seconds>* - From **1** to **10** seconds. The default is **6**. LECS equivalent is `.Flush_TimeOut`.

forward-delay|fd *<seconds>* - From **4** to **30** seconds. The default is **15**. LECS equivalent is `.Forward_Delay_Time`.

max-arp-retry|mar *<count>* - From **0** to **2** requests. The default is **2**. LECS equivalent is `.Maximum_Retry_Count`.

vcc-timeout|vto *<minutes>* - From **1** to **720** minutes. The default is **20**. LECS equivalent is `.VCC_TimeOut_Period`.

The IP Subsystem

This section describes the commands in the **`ip`** subsystem and details how to use them to configure and manage the ATM module's use of the IP protocol. Using **`ip`** subsystem commands, you can:

- Add, delete, or display ARP table entries
- Add, delete, or display the ATM module's IP address
- Add or delete a default route
- Display IP, ARP, and ICMP statistics
- Ping an IP address

Note

The commands in this subsystem are only useful for modifying how SNMP, TFTP, or other IP packets are handled by the ATM module. Although "routes" to other subnets can be added to the ATM module, the module itself does not *perform* any routing.

Accessing the IP Subsystem

To access the IP subsystem, enter **`ip`** at any command prompt.

IP Subsystem Commands

Table 3-15 lists and describes the **ip** subsystem commands.

Table 3-15. IP Subsystem Commands

Command	Description
add-arp|aa *<IP-addr> <MAC-addr>*	Adds a permanent ARP entry to the ARP table.
add-interface|ai *<IP-addr>* **[***<subnet-mask>* **[br0|br1] [cost** *<cost>***] [allsubnets|as]]**	Assigns an IP address to the ATM module.
add-route|ar net|n default *<subnet-mask> <gw-addr> <vport> <metric>* **[strict]**	Adds a default route to unknown subnets.
arp-table|at [*<IP-addr>***] [-t|-s]**	Displays the ARP table.
arp-tableclear|atc	Clears the ARP table.
del-arp|da *<IP-addr>*	Deletes an ARP entry from the ARP table.
del-interface|di *<IP-addr>*	Deletes the IP address assigned to the ATM module.
del-route|dr net|n *<nw-addr> <subnet-addr> <subnet-mask>*	Deletes the default route.
interface-table|it [*<IP-addr>***] [-s]**	Displays the interface table.
ping|pi *<IP-addr>* **[***<timeout>* **[***<pktsize>***]]**	Tests a connection to an IP address.
route-table|rt [-a] [-f] [-c|-d|-r|-s|-o] [*<IP-addr>***]**	Displays the IP route table.
set-arpage|saa *<time>***|off**	Sets the aging time for entries in the ARP table.
showcfg|scf	Shows the current IP configuration of the ATM module.
stats|s arp|icmp|ip [-t]	Displays statistics for ARP, ICMP, or IP packets.
stats-clear|sc arp|icmp|ip [-t]	Clears statistics for ARP, ICMP, or IP packets.

IP Interface Commands

The following subsection provides information about adding, deleting, and displaying IP interfaces on the ATM module. “IP Configuration” in Chapter 2 contains additional information about adding IP interfaces.

Adding an IP Interface

Note

Only one IP interface can be assigned to the ATM module.

Use the **`add-interface`** command to assign an IP address to the ATM module. The command is used as follows:

`add-interface|ai` *<IP-addr>* **[***<subnet-mask>* **[br0|br1] [cost** *<cost>***] [allsubnets|as]]**

where:

<IP-addr>	Specifies the IP address to assign to the ATM module.
<subnet-mask>	Allows a standard IP subnet mask to be used. If a particular network uses IP subnet addressing, then the subnet mask should be specified here. Otherwise, the system uses a default subnet mask equal to the "natural" subnet mask for the particular class of address.
`br0|br1`	Specifies the style of broadcast address: - Specifying `br0` forces the ATM module to send an "all-0s" broadcast (i.e., all bits in the host segment of the address are 0s). The `br0` argument is useful when the ATM module interoperates with workstations that use the old style of IP broadcast address, with all 0s as the host number. - Specifying `br1` forces the ATM module to send a standard "all-1s" broadcast (i.e., all bits in the host segment of the address are 1s). The default is `br1`.
<cost>	Specifies the cost of using the interface, equal to the number of extra hops to the destination, ranging from 1 to 14. (An IP packet's time-to-live field is reduced by one at each hop.) The default is zero.
`allsubnets|as`	Allows the addition of an IP interface having all 0s or all 1s as the subnet part of its address.

Displaying the IP Interface Table

The **interface-table** command displays configured IP interface addresses. The table lists assigned IP addresses, the link state of the interface (UP or DOWN), and other information. The command is issued as follows:

interface-table|it [*<IP-addr>***] [-s]**

where:

<IP-addr>	Specifies the IP address for which interface information should be displayed. A wildcard character (*) can be used in place of any portion of the IP address.
-s	Forces the display of additional statistics, including the number of packets and octets transmitted to and received by the interface.

The following examples demonstrate the use of this command:

```
25:ATM-C1:ip: interface-table
Interface 1: 192.12.20.17  255.255.255.0  br1   mtu 1500  up    cost 2

26:ATM-C1:ip:
```

Using the **-s** argument with this command forces the display of additional statistics, including the number of packets and octets transmitted to and received from the subnet by each interface:

```
26:ATM-C1:ip: interface-table -s
Interface 1: 92.12.20.17   255.255.255.0, br0   mtu 1500  up    cost 0
 9432 pkts in,  490464 octets in,  13139 pkts out,  713710 octets out

27:ATM-C1:ip:
```

Deleting an IP Interface

The **del-interface** command is used to delete the ATM module's IP interface. The command is issued as follows:

del-interface|di *<IP-addr>*

where:

<IP-addr>	Specifies the IP address to be deleted.

The following is an example of how this command is used:

```
31:ATM-C1:ip: del-interface 147.128.132.1
Interface address 147.128.132.13: deleted
```

Default Route Commands

The following subsection provides information about adding and deleting the default route on ATM module. “IP Configuration” in Chapter 2 contains additional information about configuring the default route.

Defining the Default Route to Unknown Subnets

You can use the **`add-route net default`** command to assign the default route to the ATM module. The default route is used by the ATM module to send response SNMP and TFTP packets to nodes that reside on a different subnet. Commonly, the default route is the address of an enterprise router.

The **`add-route net default`** command is used as follows:

`add-route|ar net|n default` *<subnet-mask> <gw-addr> <metric>* **`[strict]`**

where:

<subnet-mask>	Specifies the subnet mask value for the network. If the network does not use a subnet mask, then specify the natural subnet mask here. The natural subnet mask depends upon the class of the IP address (A, B, or C). **NOTE:** Specifying `default` requires that 255.255.255.255 be used as the subnet mask.
<gw-addr>	Specifies the IP address of the gateway (router) to which packets destined for the specified subnet are forwarded. **NOTE:** The ATM module can not be configured as its own default gateway.
<vport>	Specifies the virtual port onto which a packet is forwarded to reach the specified gateway.
<metric>	Indicates the cost of the route (number of hops to the destination). Generally, the route with the lowest cost is used.
`strict`	Indicates that the route is to be used, even if its cost is greater than that of another route, unless the route is unavailable.

The following example shows how to add the default route to the ATM module:

```
61:ATM-C1:ip: add-route net default 255.255.255.255 147.128.128.62 3 4

default, 255.0.0.0, 147.128.128.62, 3, 4: added
Currently active
```

SNMP and TFTP response packets with unknown destinations are sent to a default gateway with address 147.128.128.62. Packets will require 4 hops to reach the destination net.

Displaying the Route Table

To display the IP route table, issue the following command:

route-table|rt [*<IP-addr>***]**

where:

<IP-addr>	Specifies the IP address for which route information should be displayed. A wildcard character (*) can be used in place of any part of the IP address.

The following is an example of how this command is used:

```
35:ATM-C1:ip: route-table
Destination       Subnet Mask         Gateway
------------      -------------       ------------
195.1.1.0         255.255.255.0       -----------
Total routes: 1
```

For each route, the following information is displayed:

`Destination`	The IP address of the destination subnet.
`Subnet Mask`	The subnet mask used by the destination subnet.
`Gateway`	The IP address of the gateway (router) through which packets for the destination are routed.

Deleting the Default Route

To delete the default route, issue the **`del-route net`** command, as follows:

del-route|dr net|n *<nw-addr> <subnet-addr> <subnet-mask>*

where:

<nw-addr>	Should be **`default`**
<subnet-addr>	Specifies the IP subnet address
<subnet-mask>	Specifies the subnet mask

You cannot use the **`del-route`** command to delete learned entries. Entries that are not used for 180 seconds are automatically deleted.

ARP Commands

Adding a Static ARP Entry

Use the **add-arp** command to add a static ARP entry to the ARP table. Static ARP entries are not subject to aging and are not cleared when the ARP table is cleared (using the **arp-tableclear** command). Enter the command as follows:

add-arp|**aa** *<IP-addr> <MAC-addr>*

where:

<IP-addr>	Specifies the IP address to be translated.
<MAC-addr>	Specifies the MAC address corresponding to the given IP address.

Some examples of the **add-arp** command are shown below:

```
75:ATM-C1:ip: aa 147.128.128.8 08-00-02-03-04-05
Added/changed:
    Internet address: 147.128.128.8
    Ethernet address: 08-00-02-03-04-05
    Flags: PERMANENT

76:ATM-C1:ip: aa 147.128.128.1 00-00-ef-01-02-03
Added/changed:
    Internet address: 147.128.128.1
    Ethernet address: 00-00-ef-01-02-03
    Flags: PERMANENT

Permanent entries are flagged in the ARP table:

77:ATM-C1:ip: arp-table 147.128.128.*
147.128.128.1   00-00-6b-82-3f-34     perm
147.128.128.2   08-00-20-08-70-54
147.128.128.3   08-00-20-08-85-69
147.128.128.8   08-00-20-03-2e-a2     perm
```

Displaying the ARP Table

Use the **arp-table** command to display the current contents of the ARP table. Enter the command as follows:

arp-table|at [*<IP-addr>***] [-t|-s]**

where:

<IP-addr>	Specifies a specific IP address for which you want to display the ARP table entry. You can use a 'wildcard' character (*****) in place of any byte(s) of the IP address, in which case only entries that match that address are displayed.
-t	Specifies that only the total count of entries is to be displayed.
-s	Specifies that the ARP entries to be displayed are sorted by the IP address (in increasing order).

Following are some examples of the use of this command. If no argument is given, the entire table is displayed.

Permanent entries can have a system flag, indicating that the entry was added automatically by ATM module software, and a broadcast flag, indicating that the MAC-layer address is broadcast or multicast.

You can specify an optional IP address with the **arp-table** command, in which case only the entry for that address is displayed:

```
71:ATM-C1:ip: arp-table 147.128.128.2
147.128.128.2    08-00-20-08-70-54                          6
```

A 'wildcard' character (*) can be used in place of any byte(s) of the IP address, in which case only entries that match that address are displayed.

Clearing the ARP Table

Use the **arp-tableclear** command to clear the ARP table.

arp-tableclear|atc

All learned entries are removed, but static entries (created using the **add-arp** command) remain in the table. These must be removed manually using the **del-arp** command.

You can use this command to help stabilize the network after a host is moved from one virtual port to another. When there is activity on the network, the cleared entries quickly reappear in the ARP table, and a host that has been moved will be relearned on its new virtual port.

Deleting a Static ARP Entry

Use the **del-arp** command to delete static or dynamically learned ARP entries from the ARP table. Enter the command as follows:

del-arp|**da** *<IP-addr>*

where:

<IP-addr>	Specifies the IP address in the ARP entry you want to delete.

When a host is moved from one virtual port to another, you can use this command to delete its obsolete learned entry from the ARP table without disturbing any other entries. The network can then relearn the host's new location without being forced to relearn other host locations, as it would if you cleared the ARP table.

Setting the ARP Age

By default, the ATM module software automatically checks learned entries in the ARP table every five minutes to see if they have been used. Each unused entry is marked aged. If an aged entry is used during the next five-minute interval, the aged flag is removed. However, aged entries that remain unused during the second five-minute interval are removed from the ARP table.

You can change the aging interval or turn off aging using the **set-arpage** command. Enter the command as follows:

set-arpage|**saa** *<time>*|**off**

where:

<time>|**off**	Specifies (in minutes) a new aging interval or turns aging off. The default is **5** minutes.

Note

If you turn ARP aging off, the ARP table can quickly overflow. Make sure you monitor the table frequently if you turn ARP aging off.

Enter the command as follows:

```
73:ATM-C1:ip: set-arpage 30

ARP cache aging set to 30 minutes
```

To display the current ARP aging interval, issue the **showcfg** command.

Displaying Statistics

The **ip** subsystem maintains statistics on ARP, ICMP, and general IP packets. These statistics are a superset of the corresponding statistics provided in the SNMP MIB.

Use the **stats** command to display statistics. Enter the command as follows:

```
stats|s arp|icmp|ip [-t]
```

where:

arp|**icmp**|**ip**	Specifies the type of packet protocol for which you want to display statistics.
-t	Specifies to display all statistics collected since the software was rebooted, rather than just the statistics collected since the last time the **stats-clear** command was issued.

The ATM module software maintains two copies of each IP statistics counter (and similarly for ICMP and ARP packets):

- Count since last clear
- Count since last system reset

Both counters are updated when the corresponding events occur, but the **stats-clear**|**sc** command clears only the count since last clear. To display the count since last reset, use the **-t** option with the **stats** command.

The following are examples of the information displayed by the **stats** command. Notice that the first line in each example informs you that statistics since the last statistics clear are being displayed, rather than total statistics accumulated since the ATM module was last rebooted.

In the first example, IP statistics are displayed.

```
1:ATM-C1:ip: stats ip
IP statistics:
count since last stats clear
--- Incoming Packets---           --- Outgoing Packets---
Datagrams rcvd:          24700    Datagrams sent:            19200
Datagrams forwarded:     15228    Datagrams not sent:        0
Hdr errors rcvd:         0        - No route to send:        0
Addr errors rcvd:        0        - No Arp/Arp que full:     0
Unknown protocols rcvd:  0        - Queued for arp:          0
Datagrams discarded:     0        - Net bcast not bridged:   0
- TTL expired:           0        - Dropped by filter:       0
- Checksum errors:       0        - Pkt too big:             0
- Dropped by mcast rtr:  0        - MAC layer snd failed:    0
- Net bcast not routed:  0        - Pkt addressed to us:     0
- Invalid IP option:     0        - Invalid security opt:    0
- Invalid security opt:  0        - No route to next hop:    0
Reassembly requests:     0        - Invalid hdr len:         0
Reassemblies:            0        - Invalid IP version:      0
Reassembly timeouts:     0        - Dropped by filter:       0
Reassemblies failed:     0        - No buf for mgmt pkts:    0
Fragmentations:          0        Fragmentations created:    0
Fragmentations failed:   0        Datagrams delivered to higher
layer:9472
Number of Cache Flushes: 0
```

As shown in this example, the IP statistics are organized according to incoming packets and outgoing packets. In addition to totals for packets received, sent, and forwarded, the **`stats ip`** display lists statistics for many of the types of IP routing errors that can occur in a network.

In the following example, ARP statistics are displayed.

```
74:ATM-C1:ip: stats arp
ARP statistics: count since last stats clear
ARP Packet Statistics:
Requests received:            38
Replies received:             25
Invalid opcodes received:     0
Requests sent:                226
Replies sent:                 36 (0 proxies)
```

The following is an example of the ICMP statistics displayed by the **stats** command.

```
74:ATM-C1:ip: stats icmp
ICMP statistics: Count Since last stats clear
Messages received:        0       Errors received:           0
Dest unreach msgs rcvd:   0       TTL expired msgs rcvd:     0
Param prob msgs rcvd:     0       Src quench msgs rcvd:      0
Redirect msgs rcvd:       0       Echo request msgs rcvd:    0
Echo reply msgs rcvd:     0       Timstamp req msgs rcvd:    0
Timstamp rpl msgs rcvd:   0       AddrMask req msgs rcvd:    0
AddrMask rpl msgs rcvd:   0
Messages sent:            200     Errors sent:               0
Dest unreach msgs sent:   200     TTL expired msgs sent:     0
Param prob msgs sent:     0       Src quench msgs sent:      0
Redirect msgs sent:       0       Echo request msgs sent:    0
Echo reply msgs sent:     0       Timstamp req msgs sent:    0
Timstamp rpl msgs sent:   0       AddrMask req msgs sent:    0
AddrMask rpl msgs sent:   0

Clearing Statistics
```

Use the **stats-clear** command to clear statistics. Enter the command as follows:

stats-clear|sc arp|icmp|ip

where:

arp|icmp|ip	Specifies the type of packet protocol for which you want to clear statistics.

Testing a Connection

The ATM module software supports the echo facility of the Internet Control Message Protocol (ICMP) in two ways:

- The ATM module generates a response to any ICMP echo request packet that it receives.
- Under your control, the ATM module software can send an ICMP echo request packet to any IP address.

ICMP echo requests are commonly used to determine whether devices are reachable on the network. Most UNIX workstations provide a ping command that generates an ICMP echo request to a specified IP address.

When you issue the ping command from your workstation, the ATM module software responds and you can determine whether the ATM module system is reachable from your workstation.

Similarly, the ATM module itself provides a **ping** command to generate an ICMP echo request to a specified IP address. Enter the command as follows:

ping|**pi** *<IP-addr>* **[***<timeout>* **[***<pktsize>***]]**

where:

<IP-addr>	Specifies the IP address of the device you are trying to reach.
<timeout>	Specifies how many seconds the ATM module waits for a response from the specified device. The default is 15 seconds.
<pktsize>	Specifies the packet length. You can specify any length from 64 through 1472 bytes. The default is 64 bytes.

Enter the command as follows:

```
83:ATM-C1:ip: ping 147.128.128.8
147.128.128.8 is alive

84:ATM-C1:ip: ping 147.128.128.15
No response from 147.128.128.15
```

The **ping** command normally waits 15 seconds for the specified host to respond before timing out. However, you can specify a shorter or longer time-out, as shown in the following example. In this example, a one-second delay is specified.

```
85:ATM-C1:ip: ping 147.128.128.8 1
No response from 147.128.128.8
```

4

- Typical Problems
  - Improper Installation
  - Switch 2000 OS Version
  - Corrupted Runtime Image
  - Defective Module or PROM
- Basic Troubleshooting Tips

Troubleshooting

Typical Problems

This chapter highlights the problems most common to the installation and operation of the HP AdvanceStack ATM Uplink Module.

If the topics in this chapter do not yield a solution, contact Hewlett-Packard support (see the card at the front of this manual for more information).

Improper Installation

To verify whether the ATM module is properly installed and the slot and module hardware are functioning properly, check the LEDs on the front of the Switch 2000 and those on the ATM module (see "LED Behavior" on page 1-13).

If the LEDs indicate a problem, re-install the module according to "Installing the ATM Module" on page 1-8.

Switch 2000 OS Version

The Switch 2000 must be running OS version A.03.20, B.03.20, or later to recognize the ATM module. To determine which OS version is running in the switch, see "Verifying Current Switch Software" on page 1-5.

Corrupted Runtime Image

If either or both of the runtime software images (`hpmain` and `hpatm`) on the ATM module are corrupted, the module will not boot. The symptoms of a corrupted image may resemble any of the following:

- During a boot of the Switch 2000 or following the insertion of the ATM module, the module LEDs (on the Switch 2000 brow) will illuminate and then be extinguished (after less than 30 seconds).
- The ATM module configuration screen is not available from the "`ATM Console Port xx`" option on the Switch 2000's Configuration menu. For example, when the ATM Console screen appears, it is blank (and should revert back to the Switch 2000 Configuration screen after approximately 30 seconds).

Verifying a Corrupted Image

If any of the above symptoms appear, follow the procedures below:

1. Disable the ATM port (see "Disabling the ATM Module Port" on page 3-11).
2. Enter the ATM module's Boot PROM by selecting "`ATM Console Port xx`" from the Switch 2000 Configuration screen.
3. Confirm that both runtime images (`hpmain` and `hpatm`) are present.
4. Confirm that both runtime images are the correct size (i.e., compare them to the files on the HP support sites listed in the front of this manual).

Replacing a Corrupted Image

1. If either of the ATM module's runtime software images is the incorrect size, retrieve a new copy and download it to the ATM module via zmodem (see "Uploading a File to the ATM Module" on page 3-16).
2. Re-enable the ATM port (the same way it was disabled).

Replacing Both Runtime Images

If the ATM module still fails to boot and both runtime images are the correct size, it is possible that one of the images is corrupted in a way that does not affect its size. In this case, follow the steps below:

1. Retrieve both files and download them to the ATM module via zmodem (see "Uploading a File to the ATM Module" on page 3-16).
2. Re-enable the ATM port (the same way it was disabled).

Defective Module or PROM

Your ATM module or the module's PROM may be defective if:

- The module will not boot at all
- The ATM module configuration screen is not available from the "`ATM Console Port xx`" option on the Switch 2000's Configuration menu (i.e., selecting `ATM Console Port xx` has no effect

If this is the case, contact HP Customer Support (see the front of this manual).

Basic Troubleshooting Tips

The following hints are not exhaustive, there may be other troubleshooting techniques that can help diagnose problems. These steps are meant to give the troubleshooter a place to start, and they are written from the perspective of the ATM module in the Switch 2000 (i.e., they have a LAN perspective).

Save the Configuration

Before changing any of the ATM module's configuration parameters, save the current configuration (see "Saving a Configuration File" on page 3-60). After saving the configuration, you can make any modifications to the ATM module that might be necessary.

Only a few commands are necessary to get a basic LANE or PVC configuration up and running.

Ensure the ATM Port is Enabled

To verify that the port on the ATM module is enabled, select the `Ports...` option in the Switch 2000 Configuration Menu. The ATM port should read `Yes` in the `Enabled` column. If this column reads `No`, see "Accessing the ATM Module" on page 3-2 for instructions on how to change the status of the port.

Check Link Indicators

1. On the ATM module, a good link is indicated by a solid green LINK LED (i.e., the SONET carrier has been detected). On a FORE Systems ATM switch, a good link is indicated when the Tx and Rx LEDs are extinguished (this indication can be reversed on the switch as required).

Check VCC Indicators

1. When using LANE, VPI and VCI values should be available (as set up by UNI signaling).
2. If you have established permanent connections (PVCs), check that they have been configured properly (consult the respective manuals to determine the proper commands for this).
   a. To check PVCs on the ATM module, use the **`br-encap-showcfg`** command in the ATM subsystem. On a FORE Systems ATM switch, use the commands in the `configuration VCC>` level of the ATM Management Interface (AMI).
3. If using signaling, check that the ATM module and the ATM switch are connected and running the same UNI specification.
   a. FORE Systems ATM switches auto-negotiate the UNI connection, other vendor switches may not.

Check the Configuration of the Active Protocol

1. If using LANE, check the following:
   a. Check that the LEC can find the LECS.
      i. Is the LEC configured to use the well-known address?
         – Is the well-known address showing up as the LECS address when checking the LEC?
      ii. If the address is manually configured, check that the LECS actually resides at that address and that it is up and running.
   b. Can the LEC find the LES and BUS for the ELAN it needs to join?
      i. Check the LEC to see if it has the addresses of its LES and BUS.
      ii. Check the LECS configuration file to see if the correct addresses for the LES and BUS are present.
         – Are the LES and BUS configured to work on this ELAN?
         – Can the LES and BUS be confirmed to work for others on this ELAN?
      iii. Check for restrictions that may have been placed in the LECS configuration file about who can join.
         – Is your LEC address allowed?

2. If you are using bridging with PVCs, check the following:
   a. Is the physical port on the central ATM switch configured for the PVC you are using?
   b. Is the physical port on the central ATM switch configured properly for the other edge switch you are trying to reach?
   c. Are both edge switches configured with the correct PVC?
   d. Try bringing the ATM uplinks and Switch 2000s together (i.e., use a temporary physical connection, eliminating the central ATM switch).
      i. Temporarily configure a switch-to-switch PVC according to Chapter 2 of this manual. If connectivity is achieved at this point, then the trouble is in the central ATM switch.

Check Protocol Addresses

1. Carry out normal IP troubleshooting.
   a. Double check you addressing scheme.
   b. Start pinging network devices (nearest to furthest) to try and pinpoint a bad link.
2. Carry out normal IPX, Apple Talk, or other troubleshooting.

5

Software Upgrade Procedures

Overview

This chapter explains the procedures necessary for upgrading the operational software on the HP ATM module. For upgrading the software on the ATM module, you can use TFTP or ZMODEM.

Note

For information on upgrading the operational software on the Switch 2000, you can use the procedures in Chapter 1 of this manual, or refer to the *HP AdvanceStack Switch 2000 Console User's Guide*.

Prerequisites

To use TFTP for the upgrade, the following prerequisites must be met:

- The switch must be configured for either IP or IPX service.
- The upgrade file must be stored on a reachable TFTP server
- The switch must be connected to the network properly.

To use ZMODEM to perform the upgrade, the Switch 2000 must be connected to a PC or workstation that supports ZMODEM or XMODEM.

Obtaining the Upgrade File(s)

For information on how to obtain the correct files for you particular upgrade, see the HP Customer Support Services at the very front of this manual.

Performing the Upgrade

After you have obtained the proper ATM module software file(s), copy (or move) them to a machine that meets the prerequisites listed on page 5-2 (depending on which download method you will use).

Download the files to the Flash Memory Module of the ATM module according to the following:

- If you are using ZMODEM, see "Uploading and Downloading Files" on page 3-15.
- If you are using TFTP, see "Downloading or Displaying a File" on page 3-57.

After downloading the file(s), reboot the Switch 2000.

6

- Protocol Support
- Hardware Specifications
- Standards Compliance
  - Regulatory Statements
    - VCCI Class 1 (For Japan Only)
    - European Community
    - Canada
    - Australia
    - Korea
- Environmental Specifications

Specifications

Protocol Support

Table 6-1. ATM Module Protocol Support

Protocol	Details
LAN Emulation (LANE) 1.0	LEC only (no LECS, LES, or BUS)
UNI 3.0	Supports PVCs and SVCs
TFTP	File transfer, software upgrades (IP only)
Zmodem	Provides access from Boot PROM
SNMP	Used in network management

Hardware Specifications

Table 6-2. ATM Module Hardware Specifications

Specification	Value
Dimensions	4.29 cm H x 16.51 cm W x 25.09 cm D (1.69" H x 6.50" W x 9.88" D)
Power Consumption	5 Amps (40 Watts)
Port Capacity	One redundant ATM port per module
Data Rate	155.52 Mbps
Media	Multimode Fiber
Maximum Line Length	approximately 2 km
Connectors	Fiber SC
Core Diameter	62.5 μm
Fiber Diameter	125 μm
Wavelength	~ 1310 nm

Standards Compliance

Table 6-3. ATM Module Standards Compliance

Category	Compliance
Safety	Complies with IEC 950: (1991)+A1,A2/.EN60950 I(1992)+A1,A2
Emissions	FCC Part 15 Class A CISPR-22 (1985) Class A EN 55022 (1988) Class A VCCI-1
Immunity	ESD: European Standard IEC 1000-4-2 4kV CD, 8kV AD Radiated Immunity - IEC 1000-4-3 3V/m EFT/Burst - IEC 1000-4-4 0.5kV signal line, 1.0kV power line EN50082-1 (Generic Immunity)

Regulatory Statements

FCC Statement (For U.S.A. Only) Federal Communications Commission Radio Frequency Interference Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

VCCI Class 1 (For Japan Only)

注意

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づく第一種情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

European Community

This equipment complies with ISO/IEC Guide 22 and EN55022 Class A.

Note

This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

Canada

Complies with Canadian EMC Class A requirements

Australia

This equipment complies with Australian EMC requirements.

Korea

사용자 안내문 : A 급기기

이기기는 업무용으로 전자파 적합등록을 받은 기기이오니, 판매자 또는 사용자는 이점을 주의하시기 바라며, 만약 잘못 구입하셨을 때에는 구입한 곳에서 비업무용으로 교환하시기 바랍니다.

This equipment complies with Korean EMC requirements.

Environmental Specifications

Table 6-4. ATM Module Environmental Specifications

Operating Specifications	
Temperature	0° C to 55° C (32° F to 131° F)
Relative Humidity	15 to 95% @ 40° C (104° F), non-condensing
Altitude	4.6 km max. (15,000 ft)
Non-operational Specifications	
Temperature	-40° C to 70° C (-40° F to 158° F)
Relative Humidity	90% @ 65° C (149° F)
Altitude	4.6 km max. (15,000 ft)

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