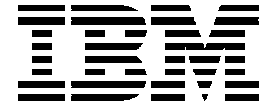


8271 Nways Ethernet LAN Switch
ATM OC-3c Module



User's Guide

OPTIONS
by IBM



Before using this information and the product it supports, be sure to read the general information under Appendix A, "Safety Information" and Appendix F, "Notices, Trademarks, and Warranties".

First Edition (October 1997)

This edition applies to the IBM 8271 Nways Ethernet LAN Switch ATM 3C-Oc Module with agent software version 1.05 and IBM 8271 Nways Ethernet LAN Switch Models 524, 612, 624, 712 with agent software version 3.1.

Order publications through your IBM representative or the IBM branch office serving your locality. Publications are not stocked at the address given below.

If you have any comments on this publication, please address them to:

Department CGF
Design & Information Development
IBM Corporation
PO Box 12195
RESEARCH TRIANGLE PARK NC 27709
U.S.A.

When you send information to IBM, you grant IBM a non-exclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

© COPYRIGHT INTERNATIONAL BUSINESS MACHINES CORPORATION
1997. ALL RIGHTS RESERVED.

Note to US Government Users — Documentation released to restricted rights — Use, duplication or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corporation.

CONTENTS

ABOUT THIS GUIDE

Introduction 1
Terminology 1
 ATM Terminology 1
Finding Information in This Guide 2
Conventions 2
Related Documentation 3

1 FEATURES AND BENEFITS

ATM Benefits 1-1
ATM Module Features 1-2

2 NETWORK LAYER CONCEPTS

The Layered Network Architecture 2-1
Upper Layer Protocols 2-2
What is LAN Emulation (LANE)? 2-2
 LAN Emulation Components 2-3
 LAN Emulation Client (LEC) 2-3
 LAN Emulation Server (LES) 2-3
 Broadcast and Unknown Server (BUS) 2-3
 LAN Emulation Configuration Server (LECS) 2-3
LAN Emulation Components in Your Network 2-4
 LAN Emulation and IBM Devices 2-4
Joining the ELAN 2-5
 Locating the LECS 2-5

Mapping Ethernet and ATM Addresses 2-6

 Address Resolution 2-6

 LAN Emulation Address Resolution Protocol (LE_ARP)
 2-7

 What Happens to Unicast Frames? 2-7

 What Happens to Broadcast and Multicast Frames? 2-7

ATM Adaptation Layer (AAL) 2-8

Asynchronous Transfer Mode (ATM) Layer 2-8

 ATM is Cell-based 2-8

 ATM is Service Transparent 2-9

 ATM is Connection-oriented 2-9

 Switched Virtual Circuits (SVCs) 2-12

 Permanent Virtual Circuits (PVCs) 2-12

 ATM Interfaces 2-12

 Interim Local Management Interface (ILMI) 2-13

 ATM Address Registration 2-13

 The ATM Layer and Cell Structure 2-14

Physical Layer 2-15

 SONET STS-3c 2-15

 SDH STM-1 2-15

3 VIRTUAL LAN CONCEPTS

What is a Virtual LAN (VLAN)? 3-1

Creating Inter-switch VLANs 3-1

Extending VLANs into the ATM Network 3-2

4 PUTTING YOUR ATM NETWORK TOGETHER

- Planning Your Network 4-1
- ATM Configuration Rules 4-2
- Extending VLANs Through the ATM Network 4-2
- ATM Connections Within Your Network 4-3

5 NETWORK CONFIGURATION EXAMPLES

- ATM Backbone in the Building 5-1
- Campus Configuration 5-2
- Making a Building Resilient to Network Failure 5-4

6 INSTALLING AND SETTING UP THE MODULE

- Following Safety Information 6-1
- Device Support 6-3
- Pre-installation Procedure 6-3
 - Check the Power Supply 6-3
- Installation 6-4
 - Connecting a cable to the ATM Port 6-5
 - Powering Up the Switch 6-5
 - Power On Self Test (POST) 6-5
- Post-Installation Checks 6-5
 - LED Summary 6-6
 - Checking the Power Supply 6-7
 - Checking that the ATM Module is Installed Correctly 6-7
 - Checking the Physical Connections 6-7

7 ACCESSING MANAGEMENT FEATURES

- Screen Map 7-1
- Keyboard Shortcuts 7-1
- Correcting Text Entry 7-1

- Logging On 7-3
- Logging Off 7-4
 - Automatic Logout 7-4

8 MANAGING THE ATM MODULE

- Configuring an ATM Port 8-2
- Extending VLANs into the ATM Network 8-4
 - Displaying all VLANs 8-5
- ATM Port Setup 8-6
- Mapping Far End MAC Addresses 8-8
 - Creating a MAC Address to ATM Entry 8-9
 - Finding an Address Entry 8-10
 - Updating Address Entries 8-10
 - Deleting an Address Entry 8-10
- Displaying an ATM Connection 8-10
 - Finding an ATM Connection 8-11
 - Updating Address Entries 8-11
- Setting Up Resilient Links 8-11
- Upgrading Software 8-12
 - Error Messages 8-13
 - Status Messages 8-14

9 MONITORING THE ATM MODULE

- Statistics Overview 9-2
- ATM Port Statistics 9-3
- ATM VLAN LEC Status 9-5
- ATM Physical Layer Statistics 9-10
 - Using Physical Layer Statistics to Troubleshoot 9-12

A SAFETY INFORMATION

- Safety Notices A-1
 - World Trade Safety Information A-1

B SCREEN ACCESS RIGHTS

C ATM MODULE TECHNICAL SPECIFICATIONS

- Environmental Specifications C-1
- ATM Cable Specification C-1
 - Does the Cable Provide Sufficient Bandwidth? C-2

D TROUBLESHOOTING

- How to Use this Guide to Troubleshoot D-1
- Using LEDs D-2
- Identifying the Problem D-3
 - ELAN Configuration Problems D-15
- Solving Known Problems D-17
 - Power Supply Problems D-18
 - Power On Self Test (POST) Failure D-19
 - Cable Connection Problems D-20
 - ATM Problems D-21
 - VLAN or ELAN Problems D-22
- Cleaning Dirty Fiber Optic Connectors D-24

E TECHNICAL SUPPORT AND SERVICE

- Electronic Support E-1
 - WWW E-1
 - FTP E-1
 - IBM Bulletin Board System E-1
- Voice Support E-1

F NOTICES, TRADEMARKS, AND WARRANTIES

- Trademarks F-1
- Statement of Limited Warranty F-2
 - Production Status F-2
 - The IBM Warranty for Machines F-2
 - Warranty Service F-3
 - Extent of Warranty F-3
 - Limitation of Liability F-4
- Electronic Emission Notices F-5
 - Federal Communications Commission (FCC) Statement F-5
 - Canadian Department of Communications (DOC) Compliance Statement F-5
 - Avis de conformite aux normes du ministere des Communications du Canada F-5
 - European Union (EU) Statement F-6
 - Japanese Voluntary Control Council for Interference (VCCI) Statement Class B F-7
 - Korean Communications Statement F-7
 - Information To The User F-7

GLOSSARY

BIBLIOGRAPHY

- Asynchronous Transfer Mode (ATM) 1
- LAN Emulation (LANE) 1

INDEX

ABOUT THIS GUIDE

Introduction

This guide provides the information that you need to install and configure the IBM 8271 Nways Ethernet LAN Switch ATM OC-3c Module (agent software version 1.05) within an IBM 8271 Nways Ethernet LAN switch which has version 3.1 agent software installed.

This guide is intended for use by network administrators who are responsible for installing and setting up networking equipment. It assumes a basic working knowledge of Local Area Networks.

This guide explains *Asynchronous Transfer Mode (ATM)* and *LAN Emulation (LANE)* concepts, and provides a Bibliography for further reading.



The Release Notes shipped with the ATM Module may contain information that updates or overrides information in this guide. You should always follow the information in the Release Notes if it is different from the information given in this guide.

Terminology

In this User's Guide the term ATM Module is used when referring to the IBM 8271 Nways Ethernet LAN Switch ATM OC-3c Module.

The device into which the ATM Module is fitted, is known simply as the *Switch*. An example of a Switch is the IBM 8271 Nways Ethernet LAN Switch Model 624.

This type of Switch is often referred to as an *edge-device*, *edge-switch* or *boundary switch*.

The term *ATM Switch* is used to identify the ATM device to which the edge-switch is connected.

Switches in IBM's 8271 Nways Ethernet LAN Switch device range provide support for the ATM Module.

ATM Terminology

This user guide uses the term *Network-To-Network Interface (NNI)*. You may know this protocol by its alternative name, *Network-to-Node Interface (NNI)*. Additional ATM definitions can be found in the Glossary at the end of this guide.

Finding Information in This Guide

The following table shows you where to find specific information within this guide.

Task	Location
Learning concepts	Chapter 1, 'Features and Benefits' Chapter 2, 'Network Layer Concepts' Chapter 3, 'Virtual LAN Concepts'
Planning your network	Chapter 1, 'Features and Benefits' Chapter 4, 'Putting Your ATM Network Together' Chapter 5, 'Network Configuration Examples' Appendix C, 'ATM Module Technical Specifications'
Upgrading Software	Chapter 8, 'Managing the ATM Module'
Installing the ATM Module	Chapter 6, 'Installing and Setting Up the Module' Appendix A, 'Safety Information'
Accessing screens	Chapter 7, 'Accessing Management Features' Appendix B, 'Screen Access Rights'
Managing the ATM Module	Chapter 8, 'Managing the ATM Module'
Monitoring the ATM Module	Chapter 9, 'Monitoring the ATM Module'
Troubleshooting	Appendix D, 'Troubleshooting'
Getting Technical Support	Appendix E, 'Technical Support and Service'
Identifying terms	'Glossary'
Further reading	'Bibliography'

Conventions

Table 1 and Table 2 list conventions that are used throughout this guide.

Table 1 Notice Icons





Icon	Notice Type	Alerts you to...
	Information note	Important features or instructions
	ATTENTION	Risk of system damage or data loss
	CAUTION	Conditions or procedures that can cause personal injury that is neither lethal nor extremely hazardous
	DANGER	Conditions or procedures that can result in death or severe personal injury

Table 2 Text Conventions

Convention	Description
Screen display	This typeface represents information as it appears on the screen.
The words "Enter" and "Type"	The word "enter" means type something and then press the Return or Enter key. Do not press the Return or Enter key when an instruction simply says "type."
[Key] names	Key names appear in text in one of two ways: <ul style="list-style-type: none"> ■ Referred to by their labels, such as "the Return key" or "the Escape key". ■ Enclosed within brackets, such as [Return] or [Esc]. <p>If you must press two or more keys simultaneously, the key names are linked with a plus sign (+). For example: Press [Ctrl]+[Alt]+[Del].</p>

Table 2 Text Conventions (continued)

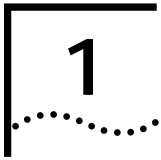
Convention	Description
Words in <i>Italics</i>	Italics emphasize a point or denote new terms at the place where they are defined in the text.
Words in bold	Bold text denotes key features.

Related Documentation

The ATM OC-3c Module documentation set includes:

- *IBM 8271 Nways Ethernet LAN Switch ATM OC-3c Module Quick Reference Guide.*
Part Number 02L1333
- *IBM 8271 Nways Ethernet LAN Switch ATM OC-3c Module Release Notes.*
Part Number 02L1334





FEATURES AND BENEFITS

This chapter describes the main features of the IBM 8271 Nways Ethernet LAN Switch ATM OC-3c Module and the benefits of ATM within your network.

The ATM Module provides a high-speed ATM connection between your IBM 8271 Nways Ethernet LAN Switch and the ATM network.

Positioned within a workgroup or departmental LAN, the ATM Module provides a fast ATM downlink to the building or ATM campus.

Resilient links protect your Switch from network and equipment failure, while the software upgrade feature future-proofs your Switch by allowing you to add new features as they become available.

Additional features are provided by the Switch, and you should refer to the guide that accompanies your Switch for more details. The Release Notes that accompany the ATM Module list the IBM 8271 Nways Ethernet LAN Switches that support the ATM Module.

ATM Benefits

ATM is the only technology specifically designed to carry voice, video and data traffic simultaneously and to provide the required level of service that these different applications need in order to run effectively across a network. ATM provides the following benefits:

- It is easy and low cost to add additional services to the ATM network.
- Services can be added as and when they are needed. It is easier to scale ATM networks compared to other network technologies.
- ATM devices interoperate with your existing network. *LAN Emulation (LANE)* is a standards based technology specifically designed to provide interoperability between existing Ethernet/Fast Ethernet networks and ATM networks. LANE allows users to interoperate with ATM or traditional LAN based servers over ATM for higher performance and functionality.

ATM Module Features

The following list summarizes the ATM Module features. These features are described in more detail in this guide.

- Conforms to ATM Forum Standards
- OC-3c 155Mbps Interface
 - SONET (STS 3c) and SDH (STM-1) compliant
 - Multi-mode Fiber, SC connectors
- *LAN Emulation (LANE)* version 1.0
 - 16 Emulated LAN Clients
 - 512 Virtual Circuits
 - 1024 remote MAC Addresses
- *User-To-Network Interface (UNI)* version 3.0 and 3.1
- *Interim Local Management Interface (ILMI)*
- AAL5 ATM Adaptation Layer
- 16 Virtual LANs (VLANs)
- RMON per Emulated LAN. RMON Groups supported:
 - Alarms
 - Events
 - Statistics
 - History
- Data buffer to store 40,000 ATM cells

- High performance with fast data transfer
 - *Wire Rate Transmission* on ATM port
 - Low Latency (68 microseconds when using Store and Forward traffic management between ATM and Ethernet components)
- Resilient Links protect your network against cable and equipment failure
- SNMP management
- Telnet and local management (using VT100 screens)



Cabling and environmental specifications are listed in Appendix C, 'ATM Module Technical Specifications'.

2

NETWORK LAYER CONCEPTS

This guide contains several chapters that describe the basic concepts behind ATM technology, and integrating ATM into your existing network:

- This chapter describes some of the concepts behind the network layer architecture of a typical ATM network.
- Chapter 3, "Virtual LAN Concepts" describes how *Virtual LANs (VLANs)* are extended into the ATM network.
- Chapter 4, "Putting Your ATM Network Together" describes how to plan your ATM network.
- Chapter 5, "Network Configuration Examples" provides some examples of how you can use the ATM Module within an ATM networks.

If you are already familiar with these concepts, refer to Chapter 6, "Installing and Setting Up the Module".

If you have read the concepts chapters and still require a more in-depth explanation, refer to the technical publications listed in the Bibliography.

The Layered Network Architecture

Asynchronous Transfer Mode (ATM) is only part of a layered network architecture. This architecture is shown in Figure 2-1.

Each of the layers in discussed in turn; starting with the Upper Layer and working down to the Physical Layer.

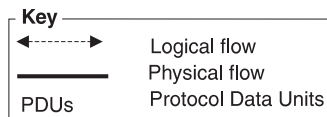
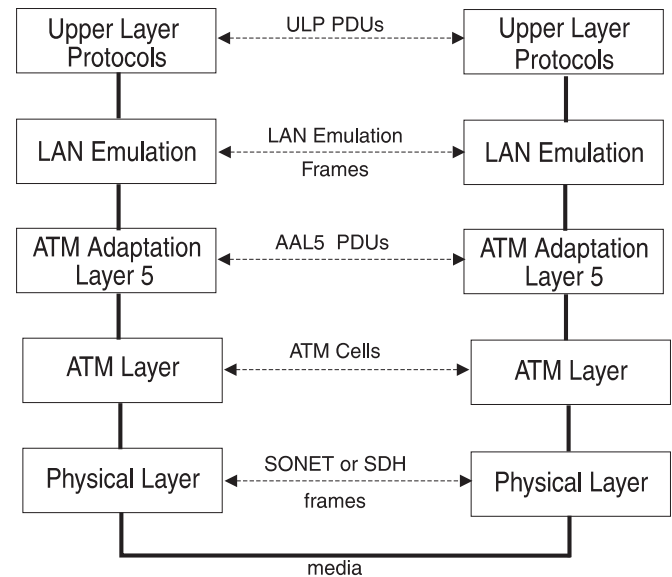


Figure 2-1 Network Layer Architecture

Upper Layer Protocols

The *Upper Layer* is the layer in the network architecture that relates to user applications and service requests. For example, an application could be file transfer software, and the service request could be a request to transfer a file from a user's PC to a shared file server.

User data and control information is passed down the network layers in the source device, and passed up the layers at the destination device.

What is LAN Emulation (LANE)?

LAN Emulation (LANE) allows users on Ethernet, Token Ring, and other traditional LAN networks, to communicate with each other over an ATM network.

LANE emulates the broadcast nature of traditional LANs. Each LANE broadcast domain is known as an *Emulated LAN (ELAN)*.

Each ELAN can only carry one type of traffic. For example, an ELAN could carry either Ethernet frames or Token Ring frames, but not both.

There can be several ELANs on a single ATM network. Some of these ELANs could be carrying Ethernet traffic and others could be carrying Token Ring traffic.

Traffic from one ELAN is not seen on another ELAN, as they are logically separate broadcast domains. If devices from different ELANs need to communicate with each other, they must do so using an ATM router.

LAN emulation software is contained within ATM devices which can be added to your existing network.

LANE allows you to add ATM to your network without having to replace or upgrade the whole of your underlying technology. LANE allows you to do this because it is completely transparent to the ATM network and to the traditional LAN network, end-users, operating systems and applications.

LAN Emulation allows users on traditional LANs to communicate over ATM by performing the following tasks:

- Emulates the broadcast nature of LANs.
- Maps MAC addresses to ATM addresses.
- Maps upper layer connection-less technologies to the *connection-oriented* ATM network.



Although LAN Emulation emulates a range of network technologies, all examples in this guide are based on an Ethernet network.

LAN Emulation Components

Each *Emulated LAN (ELAN)* is composed of a set of LAN Emulation components. This section describes each of these components.

LAN Emulation Client (LEC)

Each ATM device has a number of LAN Emulation clients. Each *LAN Emulation Client (LEC)* is responsible for taking Ethernet frames and passing them through the ATM network to the LEC serving the destination address. The destination LEC is responsible for receiving the frame from the ATM network and passing it to the local Ethernet network, where it can be delivered to the destination address.

LAN Emulation Server (LES)

Each *LAN Emulation Server (LES)* controls a single *Emulated LAN (ELAN)*. The purpose of the LES is to store address and control information for the ELAN it is serving, and to pass this information onto the clients and other components within the ELAN.

The LES, therefore, needs to know the address of every client and component in the ELAN.

Broadcast and Unknown Server (BUS)

Each ELAN has a *Broadcast and Unknown Server (BUS)*. The BUS forwards frames that it receives from any client to all of the clients in the ELAN. The BUS is used to forward broadcast and multicast frames so that they are *flooded* throughout the ELAN. The BUS also *floods* unicast frames if the location of the destination MAC address is unknown.

LAN Emulation Configuration Server (LECS)

The *LAN Emulation Configuration Server (LECS)* is an optional component, and is not essential for the normal running of an ELAN.

The LECS stores the names of all the ELANs that have been set up on the ATM network, and the address of the *LAN Emulation Server (LES)* that serves each of these ELANs.

If there is an LECS on the network, any client can interrogate the LECS to find the address of the server associated with the ELAN they wish to join. The clients may also get ELAN configuration information from the LECS.

If a LECS is not present on the ATM network, the server address to be used by the client must be specified using the management software on that client's ATM device.

LAN Emulation Components in Your Network

Each Emulated LAN consists of a single *LANE Service*, and a number of LAN Emulation clients.

A LANE Service consists of:

- A *LAN Emulation Server (LES)*
- A *Broadcast and Unknown Server (BUS)*
- Optional *LAN Emulation Configuration Server (LECS)*.

Figure 2-2 shows a logical view of a typical ELAN.

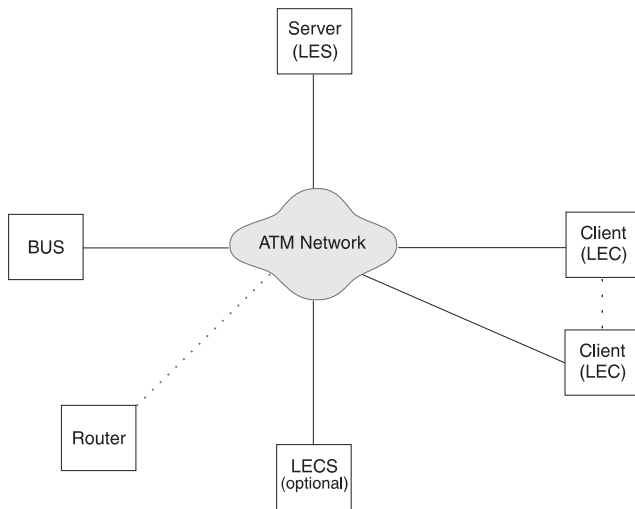


Figure 2-2 LAN Emulation Components



The router shown in Figure 2-2 is not a LAN Emulation component, but would be required should a device on one Emulated LAN need to communicate with a device on another Emulated LAN.

You may wish to have more than one LECS on your network for security reasons. For example, you may wish the Finance department to be controlled by one LECS and the rest of your network to be controlled by a different LECS.

LAN Emulation and IBM Devices

LAN Emulation components are implemented in ATM devices. The LAN Emulation standards (referenced in the Bibliography) do not specify how each vendor implements each of these components.

Joining the ELAN

Before a LAN Emulation Client (LEC) can transmit any Ethernet frames onto the ATM network it must first join an ELAN. To join the ELAN:

1 The LEC must know the name of the ELAN it is to join.

The ELAN name is specified through the management software on the Switch.

2 The LEC must communicate with the LAN Emulation Server (LES) that is serving that ELAN.

To communicate with the LES, the LEC must first locate the LES. The LEC can find the ATM address of the LES in one of the following ways:

- If there is a LAN Emulation Configuration Server (LECS) on the network, the LEC gets the address of the LES from the LECS.

The way in which the LECS determines which LES the LEC needs to communicate with, depends on the *policy* that the LECS is running. Refer to the user guide that accompanies your LECS for more details of the policies your LECS uses.

- If the network does not have a LECS, the LEC gets the LES address from the management software on the ATM device.

3 The LEC must have a connection to the Broadcast and Unknown Server (BUS).

When the LEC has joined the LES, the LES helps the LEC locate the *Broadcast and Unknown Server* (BUS) associated with that ELAN.

Locating the LECS

Before the LEC can ask the LECS for the address of the LES, the LEC must first locate the LECS. There are three ways in which the LEC can locate the LECS, and the LEC tries these methods in the following order:

- The LEC can ask the adjacent ATM Switch using the *Interim Local Management Interface (ILMI)*.
- The LEC can use a well known ATM address that is reserved for the LECS. The well known address is pre-programmed into most LECS devices. The well known address is:

47007900000000000000000000000000:00A03E000001:00
- The LEC can use a reserved *Permanent Virtual Circuit (PVC)* which the ATM Switch has already routed to the LECS. The reserved PVC is VPI 0, VCI 17.

Mapping Ethernet and ATM Addresses

Each device connected to an Ethernet port has one or more MAC addresses.

Each ATM device has a number of LAN Emulation clients, and each *LAN Emulation Client (LEC)* has an ATM address. An example of this is shown in Figure 2-3.

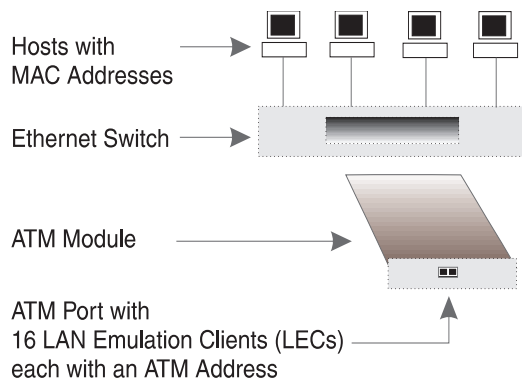


Figure 2-3 LAN Emulation Clients and Ethernet Hosts

These clients represent (act as a proxy) for devices connected to the Ethernet ports.

Whenever an Ethernet device wants to communicate with another device over the ATM network, the LEC must first discover the ATM address of the LEC that is acting as a proxy for the destination MAC address. The LEC must do this for each unicast Ethernet frame sent. The process is known as *Address Resolution*.

Address Resolution

The process by which a LEC associates a LAN destination address with the ATM address of another LEC (or the BUS) is known as *Address Resolution*.

Each LEC keeps a LAN Emulation *ARP Table* (which should not be confused with the IP ARP Table). The ARP Table lists the remote destination MAC addresses and the ATM address of the LEC through which each destination MAC address can be reached.

Prior to sending a frame with a known destination, the LEC checks the ARP Table to see if the destination MAC address of the frame is listed in the ARP Table. The action the LEC then takes depends on whether the MAC address is listed in the ARP Table:

- **If the destination MAC address is listed in the ARP Table:**
 - and there is an ATM connection to that LEC, the frame is sent directly to that LEC.
 - and an ATM connection has not already been set up, the LEC sets up an ATM connection.
- **If the destination MAC address is not listed in the ARP Table,** the LEC sends the frame to the BUS. The BUS then sends the frame to all LECs on the Emulated LAN.

Sending a frame to every LEC is an inefficient use of resources, so the LEC also tries to locate the MAC address for future use.

To discover the correct address, the LEC uses a process called *LAN Emulation Address Resolution Protocol (LE_ARP)*.

LAN Emulation Address Resolution Protocol (LE_ARP)

An LE_ARP request is sent to the LES to locate the destination MAC address. The LES in turn sends the LE_ARP request to all of the LECs in the Emulated LAN.

LECs represent (act as a proxy) for MAC address devices connected to the Ethernet ports. When a LEC receives an LE_ARP request it checks whether the MAC address is on its Switch. It does this by checking the entries in the Switch database.

If the MAC address belongs to one of the devices connected to an Ethernet port, the LEC sends an LE_ARP response to the LEC that sent the original LE_ARP request.

The LEC that sent the LE_ARP request adds this information to its ARP Table. The LEC then sets up a direct connection through the ATM network to the appropriate LEC, so that subsequent frames are forwarded more efficiently.

What Happens to Unicast Frames?

The path a unicast frame takes through the ATM network depends on whether the location of the destination address is known to the sending LEC.

- **If the location of the destination address is known**, the LEC sets up a direct connection to the LEC serving the destination address.
- **If the location of the destination address is unknown**, a unicast frame is sent to the *Broadcast and Unknown Server (BUS)*; where it is treated in the same way as a broadcast or multicast frame.

In addition the sending LEC attempts to locate the LEC serving the destination address. It does this using the LE_ARP process, described in "LAN Emulation Address Resolution Protocol (LE_ARP)".

What Happens to Broadcast and Multicast Frames?

Each *Emulated LAN (ELAN)* acts as a broadcast domain. When a broadcast or multicast frame is passed to the LEC for transmission, the frame is sent to the *Broadcast and Unknown Server (BUS)*.

When the LEC receives a broadcast, multicast, or unicast frame it checks to see if it originally sent the frame, and then does the following:

- If the LEC sent the frame, it discards the frame.
- If the LEC did not send the frame, the LEC passes the frame to the Ethernet device so that it can be forwarded to the appropriate port(s).



Unlike broadcast and multicast frames, the number of unicast frames that can be sent to the BUS every second is limited so as not to overload the BUS and LECs with too much traffic.

ATM Adaptation Layer (AAL)

Ethernet frames can be between 64 and 1514 bytes in length. ATM transmits data in fixed length *cells*. Each cell contains 48 bytes of user data. The *ATM Adaptation Layer (AAL)* converts data between the Ethernet and ATM formats.

The AAL has a *Segmentation and Reassembly (SAR)* sub-layer that does the conversion.

In the sending device the LEC passes the Ethernet frames to the SAR. The SAR converts the user data into fixed length cells, and passes these cells to the ATM Layer for transmission across the ATM network.

In the receiving device, the SAR converts the ATM cells back into the appropriate user data again, and passes this data to the LEC.

As ATM can carry different traffic types (for example, voice, video, and other data), several Adaptation Layer protocols have been defined. These protocols operate simultaneously within the Adaptation Layer, and allow the ATM Layer to support different applications and traffic types.



The IBM 8271 Nways Ethernet LAN Switch ATM OC-3c Module uses the AAL5 ATM Adaptation Layer protocol, which is a data-oriented protocol. The ATM Module will only work with other AAL5 devices.

Asynchronous Transfer Mode (ATM) Layer

Asynchronous Transfer Mode (ATM) is a connection-oriented transmission protocol that has the following features:

- ATM uses the *Signalling Protocol (Q.2931)* to dynamically create, maintain and clear ATM connections between end-systems.
- ATM uses fixed length packets known as *cells*, and each cell identifies the connection to be used.
- ATM is transparent to the multiple services it supports and can carry cells from different applications over the same physical connection.
- ATM has well-defined user and network interfaces.

ATM is Cell-based

ATM uses fixed length packets called *cells*. The first five bytes of the cell is the *cell header*. The cell header contains the information necessary to deliver the cell to the correct destination.

Fixed-length cells offer smaller and more predictable switching delays, because cell switching is less complex than variable-length packet switching.

Having all the data in the same cell format also dramatically increases the speed of transmission, by eliminating the need for protocol recognition and decoding. A good analogy is containerized shipping, where uniform shape and weight containers with standardized labelling, ease and speed up processing.

ATM is Service Transparent

ATM allows for the high speed transfer of a wide range of user traffic, including voice, video and other data.

The cell format means that more than one service (traffic type) can be *multiplexed* over the same physical line, see Figure 2-4.

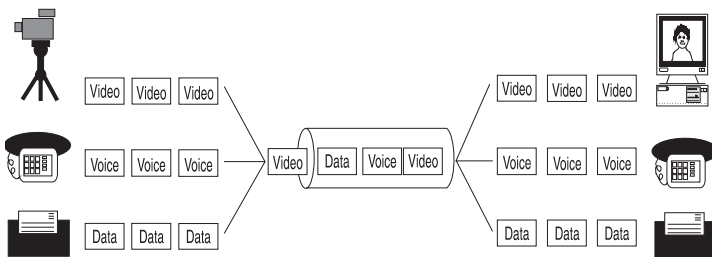


Figure 2-4 Service Processing

Cells are *de-multiplexed* at the other end of the connection and forwarded to the correct service destination.

Multi-service processing promotes scalability by significantly reducing the number of changes needed to add new service traffic types to your network.

ATM is Connection-oriented

ATM is a *connection-oriented* transport service that requires a communication channel to be set up between the ATM source and destination end-systems before ATM cells can pass between them.



Before a direct data connection can be set up between two end-systems, a number of control connections are set up. These control connections are beyond the scope of this guide. If you require further information about control connections, refer to the ATM Forum's "LAN Emulation Over ATM" document.

Figure 2-5 shows the logical structure of a communication channel.

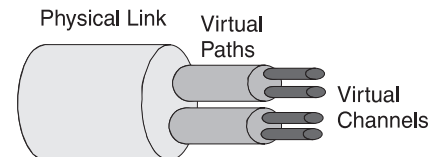


Figure 2-5 Communication Channels

Several communication channels can operate over the same physical link. Each *Virtual Path Connection (VPC)* contains several communication channels known as *Virtual Channel Connections (VCCs)*.



The ATM Module only manages Virtual Channel Connections (VCC).

A VCC is defined as spanning end-to-end, whereas a *Virtual Channel (VC)* is the name given to a section of the VCC, refer to Figure 2-6.

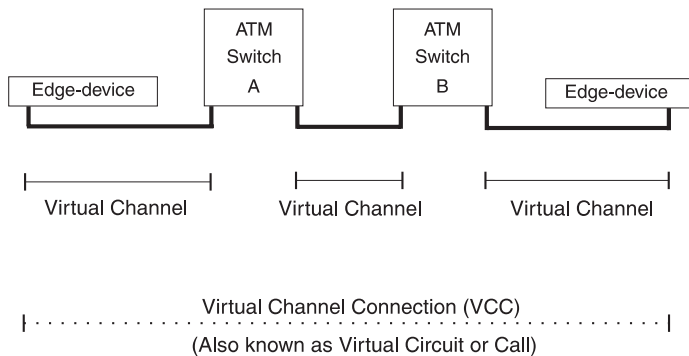


Figure 2-6 Connection Terminology

Many virtual channels can exist on the same physical link. Each virtual channel is identified by a pair of numbers:

- The *Virtual Path Identifier (VPI)* and
- The *Virtual Channel Identifier (VCI)*.

Any end-system that wishes to communicate with another end-system must first use the *Signalling* protocol to set up the VCC.

The *Signalling* protocol negotiates with each ATM device between the end-systems to set up a series of virtual channels. Each of these virtual channels is identified using the VPI and VCI values.

Figure 2-7 on page 2-11 shows how ATM cells are switched through the ATM network using the VPI/VCI values.

Instead of containing the ATM address of the final destination device, each cell header contains the VPI/VCI values associated with the virtual channel it is going to take to get to the next ATM Switch in the connection.

Each ATM switch knows that when it receives a cell with a particular VPI/VCI value on one port that it must transmit the cell on another port with another VPI/VCI.

Cells are switched through the network based on these VPI/VCI values, and switching is performed independently for every cell. Each cell can be thought of as taking a virtual channel connection.



The VPI/VCI values are only meaningful in the context of that user-to-switch, or switch-to-switch, interface. Identical VPI/VCI values can exist on different interfaces within the network.

Connections that are established dynamically using the Signalling protocol are known as *Switched Virtual Circuits (SVCs)*. *Switched Virtual Circuits* are described in "Switched Virtual Circuits (SVCs)" on page 2-12.

ATM connections can also be established via management, and these type of connections are known as *Permanent Virtual Circuits (PVCs)*. *Permanent Virtual Circuits* are described in "Permanent Virtual Circuits (PVCs)" on page 2-12.

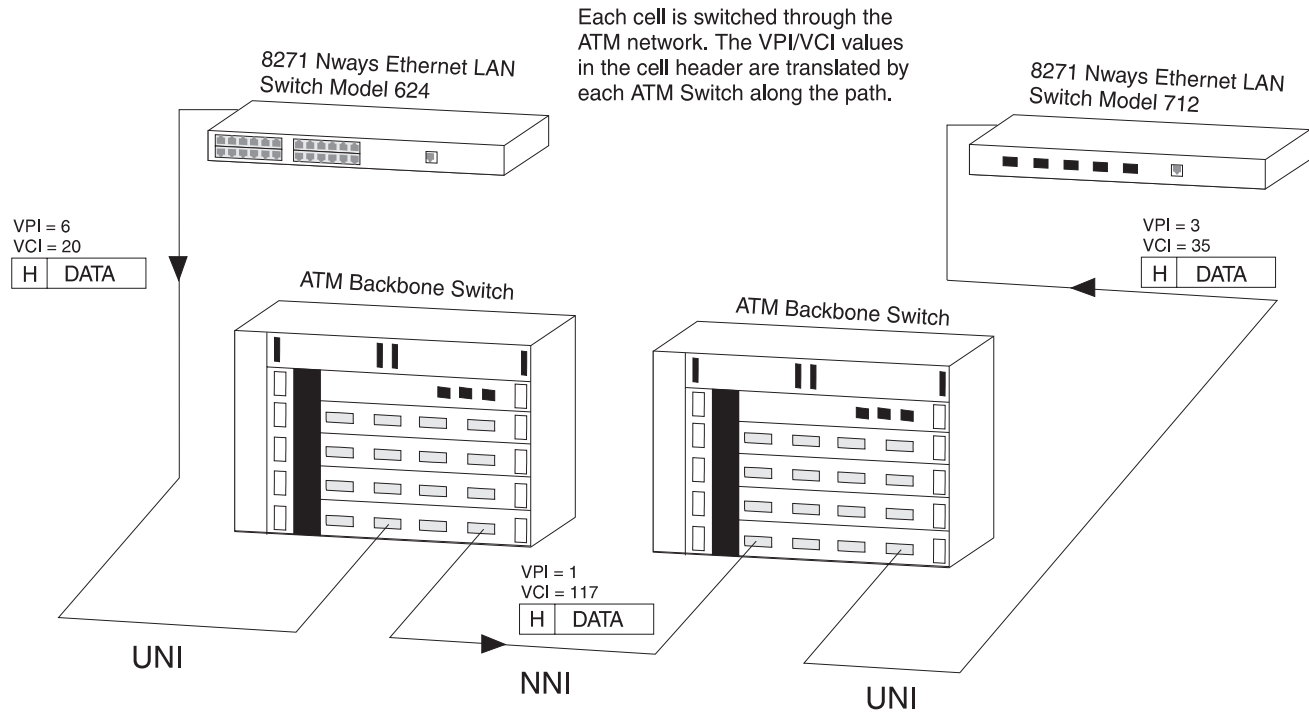


Figure 2-7 Switching Cells using VPI and VCI values.

Switched Virtual Circuits (SVCs)

SVCs use the signalling protocol to dynamically define connections as they are needed and to release them when they are no longer needed.

SVCs use signalling for:

- Connections initiated by the user/application.
- Connections established and dropped dynamically.
- Varied connection time.
- Connections not automatically re-established after network failure.

Permanent Virtual Circuits (PVCs)

The most basic connection setup requires the definition of each connection via management. These type of connections generally remain established for long periods of time.

PVC attributes include:

- Connections initiated by network management.
- Long-term connection duration.
- Automatically re-established after network failure.
- Supported by MIB or other management entity.



The ATM Module does not support PVCs.

ATM Interfaces

ATM technology is implemented in ATM edge-devices and ATM Switches.

ATM provides a *User-to-Network Interface (UNI)*. The User-to-Network Interface (UNI) is used to connect an ATM edge device to an ATM switch that is managed as part of the same network.

ATM also provides a *Network-to-Network Interface (NNI)* that is typically used to interconnect two ATM switches managed as part of the same network.

The ATM Interfaces are shown in Figure 2-8.

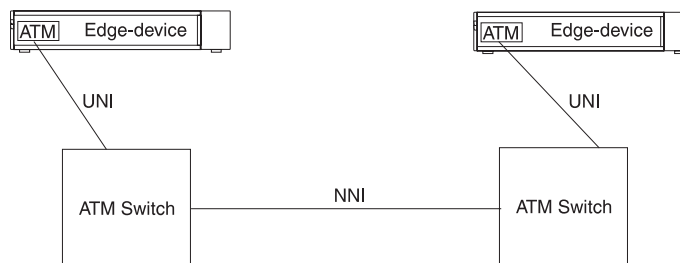


Figure 2-8 ATM Interfaces

The User-to-Network Interface (UNI) is managed by the *Interim Local Management Interface (ILMI)* protocol.

Interim Local Management Interface (ILMI)

The ATM Forum produced the *Interim Local Management Interface (ILMI)* to increase monitoring and diagnostic facilities, and to provide ATM address registration at the *User-to-Network Interface (UNI)*.

ILMI uses a *Management Information Base (MIB)* and the *SNMP* protocol.

Each device that provides ILMI support contains a *UNI Management Entity (UME)*, which uses SNMP to access management information stored in the ILMI MIB of the adjacent switch, see Figure 2-9.

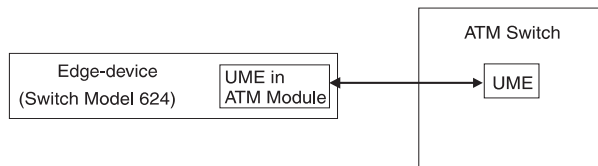


Figure 2-9 UNI Management Entities

ATM Address Registration

In order to establish an ATM connection, both the user and the network must know the ATM addresses used at that *User-to-Network Interface (UNI)*. An example of an ATM address is shown below.

```
4700790000000000000000000000:00A03E000001:00
```

An ATM address consists of three sections of information and is 20 bytes in length:

network:host:identifier

Where **network** is a network prefix assigned to the device by the ATM Switch, and is 13 bytes long.

Where **host** is the edge-device identifier, and is 6 bytes long.

Where **identifier** identifies the client within the edge-device, and is 1 byte long.

ILMI provides a mechanism for the edge-device (in this case the ATM Module) to inform the ATM Switch of the addresses it represents.

When the ATM Module initializes, the ATM Switch sends a network prefix to the ATM Module. The ATM Module then tries to register itself with the ATM Switch by attaching the prefix to the front of its MAC address, and an identifier to the end of the address. It then sends this back to the ATM switch. If acceptable, the ATM Switch registers the address as the ATM Module's ATM address.

The ATM Layer and Cell Structure

This section describes the cell structure, and how the ATM Layer uses the information stored in the cell header to perform each of its tasks.

The ATM Layer's primary responsibility is to manage the sending and receiving of cells between the user and the network.

The ATM Layer accepts the user data and control information from the ATM Adaptation Layer, adds the cell header, and passes the resulting 53 byte cell to the physical layer.

In addition, it also receives cells from the physical layer, strips off the cell header and passes the remaining 48 bytes to the higher layer protocols.

The ATM cell has 48 bytes of payload (information to be carried) and five bytes of header information, making the cell 53 bytes in length.

The cell header contains the information used by the network to forward each cell to its destination. The ATM cell structure is shown in Figure 2-10.

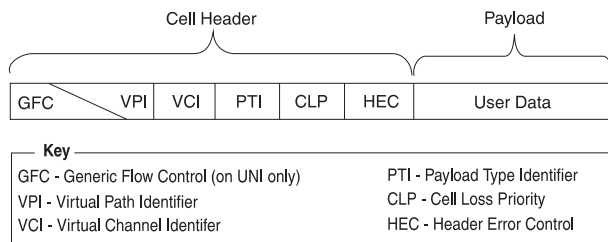


Figure 2-10 ATM Cell Structure

The ATM cell header consists of the following fields:

Generic Flow Control (GFC) — Provides local functions, such as flow control over the *User-to Network Interface (UNI)*. The value encoded in the GFC is not carried end-to-end and can be overwritten by the ATM Switch.

Virtual Path Identifier (VPI) and Virtual Channel Identifier (VCI) — The VPI/VCI values allow the network to associate a cell with a given connection, so that the cell can be switched to its destination.

Payload Type Identifier (PTI) — The PTI is used to indicate whether the cell contains user information, or management information. The management information is used for resource and network congestion management.

Cell Loss Priority (CLP) — The purpose of the *Cell Loss Priority (CLP)* bit in the ATM cell is to indicate that cells with this bit set should be discarded before cells which do not have the CLP bit set. Cells can be discarded based on CLP condition and according to the network load. When the network overloads, a discard mechanism, based on the value of the CLP bit in the cell header, may come into operation.

Header Error Check (HEC) — The HEC field is used for detecting bit errors in the cell header. It is also used for cell delineation, defining where the cell begins in a SONET frame.

Physical Layer

The physical layer is responsible for transmitting and receiving ATM cells over a physical medium. It is also responsible for checking the integrity of the bits being transferred over a physical media, and for making sure that they are error-free.

The ATM Module is compliant with both *SONET STS-3c* and *SDH STM-1* physical layer standards.

These standards are similar, and most devices allow you to use either framing standard on each link in the ATM network. The same framing standard must be used at each end of the link.

Many users prefer to use the same framing standard throughout their network (for example SONET STS-3c).

The physical layer is sub-divided into:

- **Path** — SONET and SDH are capable of carrying traffic for a number of upper layers, and ATM is only one of those layers. Each upper layer uses its own *Path* through the SONET/SDH layer.
- **Line** — A *line* is the whole path between one ATM device and the adjacent ATM switch or ATM end-station.
- **Section** — When ATM is used for telephone networks, a *line* may cover a large distance, requiring optical repeaters to boost the signal along its way. The part of a *line* between an optical repeater and the adjacent repeater or switch is known as a *section*.

SONET STS-3c

Synchronous Optical Network (SONET) is the physical layer most often associated with ATM. SONET provides, through a framing structure, the mechanism for the transport of ATM cells. Data can be transferred at 155.52Mbps.

SDH STM-1

SDH STM-1 is a physical layer similar to the SONET layer, but with some differences in frame fields. SDH STM-1 is the physical layer commonly used in Europe.



The physical layer and ATM layers in the network provide simple performance monitoring functions between ATM devices; providing basic information about the health of the link. These functions are known as "Operation and Maintenance (OAM)" functions.



3

VIRTUAL LAN CONCEPTS

This chapter provides a brief overview of *Virtual LAN (VLAN)* concepts, and describes how to extend VLANs into the ATM network.



This user guide does not describe how to create or configure VLANs. VLAN configuration is described in the user guide that accompanies your Switch.

What is a Virtual LAN (VLAN)?

A *Virtual LAN (VLAN)* is a flexible, location and topology independent group of end-stations communicating as if they are on a common physical LAN.

You can create VLANs that closely correspond to how your network and business functions. For example, marketing personnel in different physical locations could be part of one VLAN and finance personnel could be in another VLAN.

VLANs provide the following benefits:

- VLANs make moves and changes simple.
- As each VLAN is a common broadcast domain, you can erect firewalls against broadcast storms.
- VLANs improve security.

For a full description of VLAN functionality, refer to the user guide that accompanies your Switch.

Creating Inter-switch VLANs

You can create inter-switch VLANs using *Virtual LAN Trunks (VLTs)* on Fast Ethernet connections, as shown in Figure 3-1.

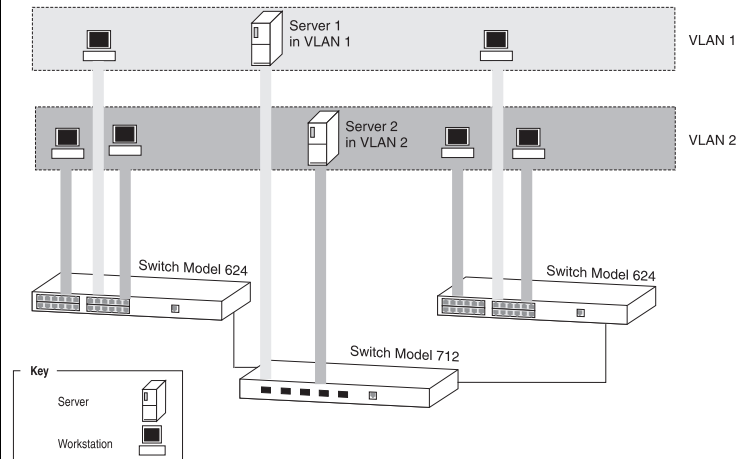


Figure 3-1 Inter-switch VLANs

Extending VLANs into the ATM Network

You can use LAN Emulation to define and extend VLANs seamlessly through the ATM network, as shown in the example in Figure 3-3.

Traffic from one *Emulated LAN (ELAN)* is not seen on another ELAN as they are logically separate domains. For this reason, when you plan your network, you should consider what ELANs you require, and how the VLANs will map to these ELANs.

The ATM Module has a LEC for each of the Switch's 16 VLANs, and each VLAN/LEC can be mapped onto an *Emulated LAN (ELAN)*. In this way, Ethernet traffic is mapped to an ELAN by a VLAN-to-LEC association. The mapping of VLANs to ELANs is shown in Figure 3-2.

When an Ethernet device attached to a Switch generates traffic, the Switch forwards the frames to the appropriate port.

A unicast frame is only forwarded to a port if the address of the destination device is known to be on that port and the destination port is in the same VLAN as the source port. If a unicast frame is forwarded to the ATM port, the ATM port uses the destination MAC address to identify the ATM connection to use.

A broadcast or multicast frame is forwarded to all ports in the same VLAN as the source port. If a frame is received by the ATM port, the ATM port forwards it to the BUS for the associated VLAN.

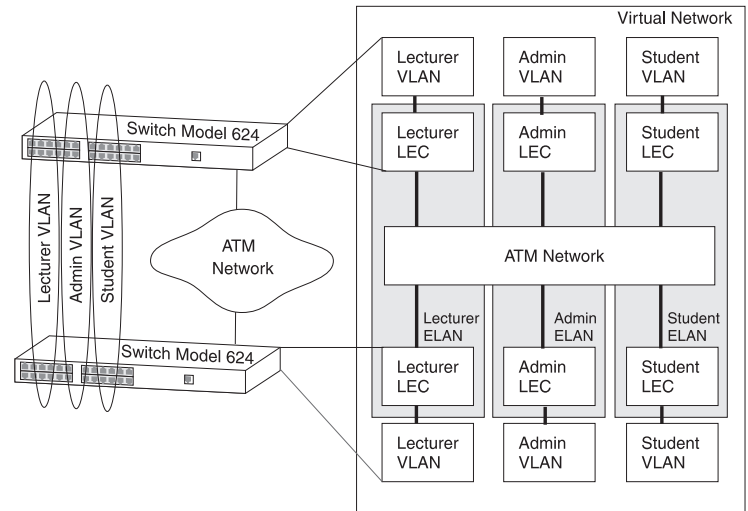


Figure 3-2 VLAN to ELAN Mapping

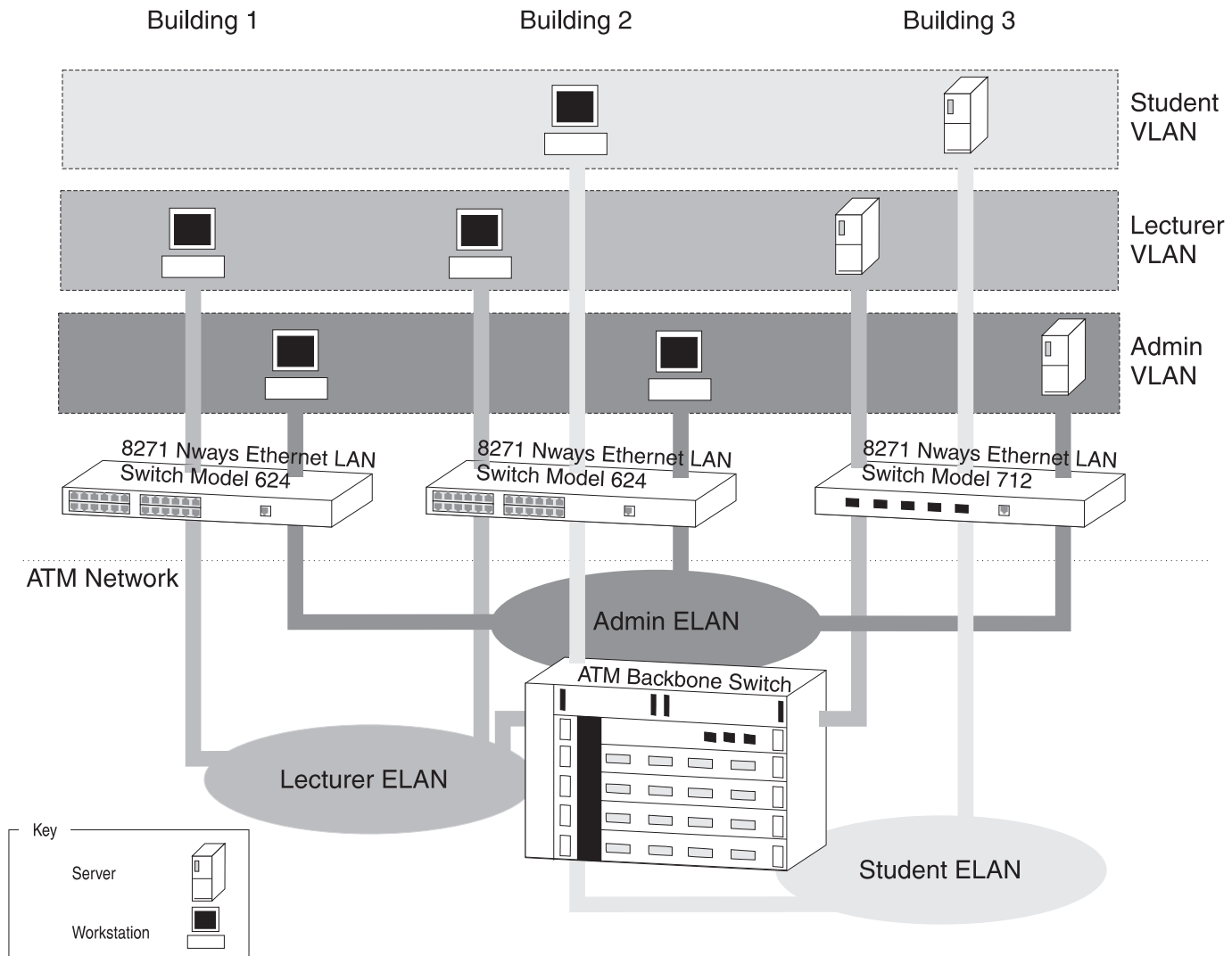


Figure 3-3 Extending VLANs into the ATM Network.



This chapter takes you through the process of planning your network. Topics include:

- Planning and tracking your network configuration.
- ATM Configuration Rules.
- Extending *Virtual LANs (VLANs)* into the ATM network.
- ATM connection types.

Planning Your Network

Before installing your ATM devices you should spend some time planning your network structure. This section lists some of the points you should consider.

- **Are routes defined within your ATM network so that your ATM devices can connect to your LAN Emulation services?**

Examine your existing network topology and decide if further configuration is required. In particular, you should consider the location of your LAN Emulation services.

- **Does your existing ATM network have sufficient resources?**

Consider the capacity of:

- Your ATM Switches, and the number of additional connections your ATM device requires.
- Your LAN Emulation services, and the number of additional *LAN Emulation Clients (LECs)* your ATM edge-device will attempt to join.

- **Can your ATM devices communicate with each other?**

- Ensure that all of your ATM equipment is using the same line framing and signalling protocols.
- Ensure that all inter-switch routes are configured correctly.

- **How do you intend to manage the ATM network?**

Can the network manager communicate with the ATM devices you wish to manage? Check the routing tables.

- **Does your network meet safety specifications?**

You should always follow safety requirements and ensure that your device environment meets all technical specifications.



For the ATM Module these requirements are specified in Appendix A. For other devices, refer to the user guides that accompany those devices.

- **Does your network conform to the ATM configuration rules?**

Make sure that your network meets the configuration rules described in "ATM Configuration Rules".

ATM Configuration Rules

There are several things that you should consider before configuring your network:

- **Your cables and equipment must meet all of the technical specifications.**

The ATM cable you connect to the ATM Module, must conform to the Multi-Mode Fiber (MMF-PMD) standard defined by ANSI x.3-166-1992.

3Com supports 62.5/125mm multi-mode fiber (MMF-PMD) cable. The maximum inter-station distance (including device-to-network connectors) should not exceed 2km (1.25 miles).

- **Allow for attenuation (weakening of signal) when calculating cable lengths.**

- **Ensure that you have sufficient bandwidth.**

Refer to Appendix C, "ATM Module Technical Specifications" for more details.



You cannot connect an IBM 8271 Nways Ethernet LAN Switch ATM OC-3c Module to another IBM 8271 Nways Ethernet LAN Switch ATM OC-3c Module; this is due to the signalling requirements used by ATM and LANE. There must be a standards-based ATM Switch between the two modules for them to operate correctly.

Extending VLANs Through the ATM Network

When setting up VLANs and extending them into the ATM network you should consider the following:

- **What logical network domains, VLANs, do you wish to set up?**

Traffic from one *Emulated LAN (ELAN)* will not be seen on another ELAN (unless a router is used), as they are logically separate domains. For this reason you should consider:

- What ELANs you require.
- How the VLANs will map to the ELANs.
- If you need to route between any of your ELANs.

- **Will you have sufficient ELAN resources?**

When calculating the resources you require, you should consider the number of:

- ELANs that your LAN Emulation services can support.
- VLANs/ELANs that each edge-device can support.

- Virtual circuits required.
- MAC addresses that can be held in the device LAN Emulation ARP Table.

When a *LAN Emulation Client (LEC)* joins an ELAN, up to five control connections may be required before any data is transferred over a separate data connection (VCC). Each time a LEC connects to another LEC a further connection is required. You should keep this in mind when calculating the number of connections you require.

The ATM Module provides the following resources:

- Up to 16 LECs to extend VLANs into the ATM network over ELANs.
- 512 Virtual Circuits to/from the ATM network.
- 1024 remote MAC Addresses.



The ATM Module supports only 16 LECs, but this does not limit your network to 16 ELANs.

- **Are the LAN Emulation services configured correctly?**

Is the LAN Emulation service that the *LAN Emulation Client (LEC)* is going to join configured correctly?

For example, if your network uses a *LAN Emulation Client Server (LECS)*, does the LECS know about the LES, and is the LES active? Have you supplied a valid ELAN name?



Configuring the LECS and LES is outside of the scope of this user guide. Consult the user guide that accompanies the device implementing the LECS or LES.

Alternatively, if your LEC will not be using a LECS and is being configured manually, ensure that:

- The LES address that the LEC is using has been correctly entered via the local management screens.
- The LES is active.

For the ATM Module, you can enter these settings using the Port Configuration screen described in “Displaying an ATM Connection”, on page 8-10.

ATM Connections Within Your Network

ATM connections in your ATM network can be established dynamically by the *Signalling* protocol (*Switched Virtual Circuit*), or through management (*Permanent Virtual Circuit*).



The ATM Module does not support PVC connections. All ATM Module connections are SVCs. This network concepts section includes PVC configuration concepts for completeness.

- **Switched Virtual Circuits (SVC)** — SVCs are set up dynamically by the signalling protocol. SVCs require very little configuration, and only use the resources you need. For these reasons, SVCs are commonly used in the LAN environment.
- **Permanent Virtual Circuits (PVC)** — You may need to use a PVC within your network when a remote edge-device does not support *Switched Virtual Circuits*. For example, remote edge-devices in *Wide Area Networks (WANs)* often use PVCs.

Figure 4-1 shows an example of a network configuration where a remote edge-device does not support LAN Emulation based on SVCs (it only supports PVC LAN Emulation).

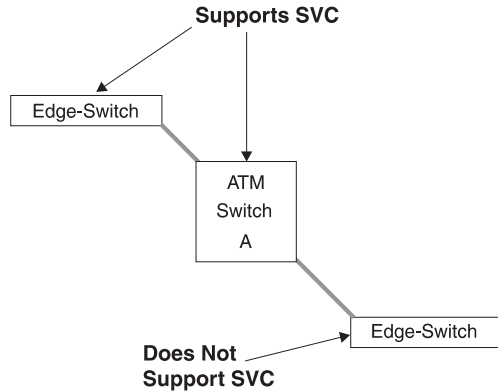


Figure 4-1 SVC Signalling Not Supported in Remote Edge-device

This chapter provides examples of possible network configurations using the ATM Module. If you are unfamiliar with ATM, you should read this chapter in conjunction with Chapter 4, "Putting Your ATM Network Together".

ATM Backbone in the Building

This section gives an example of an ATM backbone within a single building, as shown in Figure 5-1.

In this case, the Ethernet Switch on each floor is provided with a high speed (155Mbps) full duplex link to the backbone. Using ATM as a backbone technology removes bottlenecks by providing scalable bandwidth, low-latency, high-speed data switching.

Ethernet VLANs can be extended into the ATM network using *Emulated LANs (ELANs)*. Ethernet packets are then switched between Ethernet to ATM transparently.

As well as providing a fast switched backbone between Ethernet LANs, ATM equipped file servers and services may be directly attached to the ATM network; giving improved performance to the Ethernet desktop.

Further advantages are gained in multi-media applications, due to ATM's built-in quality of service.

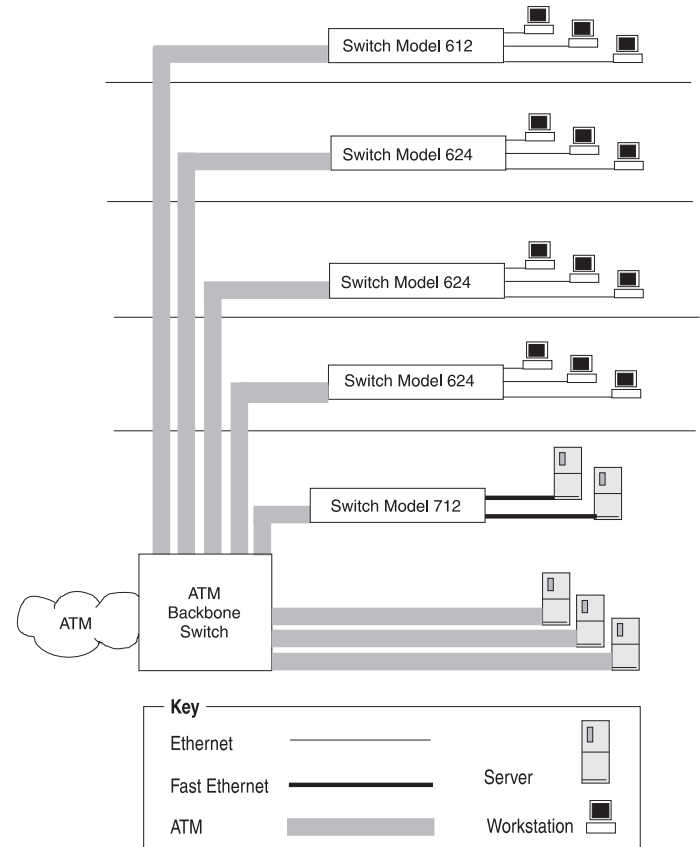


Figure 5-1 ATM Backbone in the Building

Campus Configuration

The section gives an example of ATM within a campus environment. The diagram shown in Figure 5-2 on page 5-3 demonstrates a balance between cost and performance requirements.

Building A shows how you can concentrate IBM 8721 Nways Ethernet LAN Switch Model 612 and 624 devices using an IBM 8271 Nways Ethernet LAN Switch Model 712. All traffic internal to Building A is switched over Fast Ethernet. In addition, an ATM link to the campus backbone provides high speed access to remote services.

Building B shows how you can configure a building in a cost efficient manner, while retaining connectivity to the campus ATM network.

Only one ATM Module is required to connect the IBM 8271 Nways Ethernet LAN Switch Model 624 and Switch Model 524 devices to the ATM network. This provides connectivity for 48 Ethernet ports to the ATM backbone.

Building C shows you a building similar to Building A, but with additional campus-wide, high performance access to directly connected ATM servers.

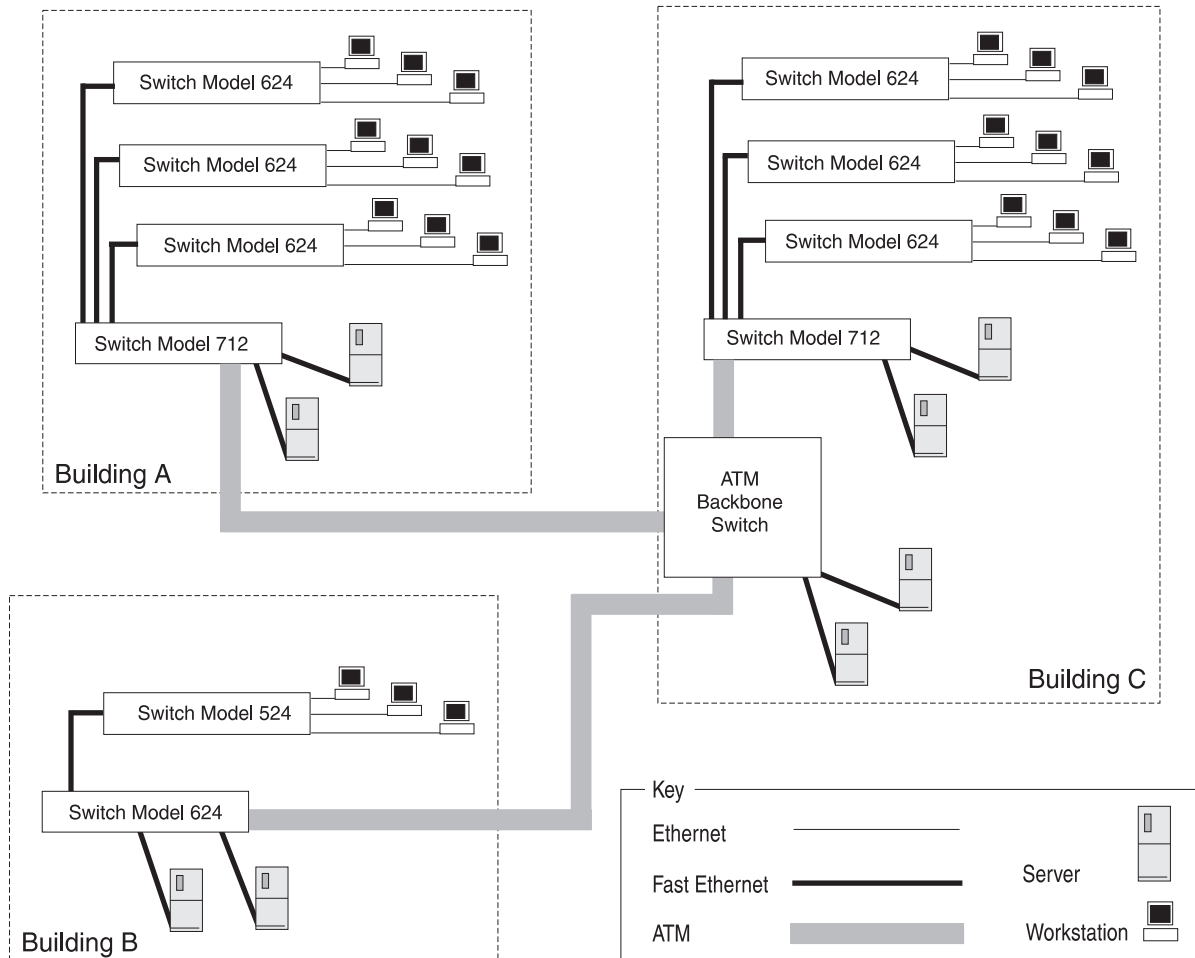


Figure 5-2 Campus and Cost Sensitive Network

Making a Building Resilient to Network Failure

You can build resilience into your building backbone as shown in Figure 5-3. The provision of resilient links protects your network against cable and network failure by using a main and a standby link. Should the main link fail, a standby link automatically takes over the function of the main link.

In this example, the ATM Module fiber link provides the main link in the resilient link pair, and the Fast Ethernet fiber or copper link acts as the standby link.

This configuration ensures that all devices have access to a high-speed backbone connection at all times.

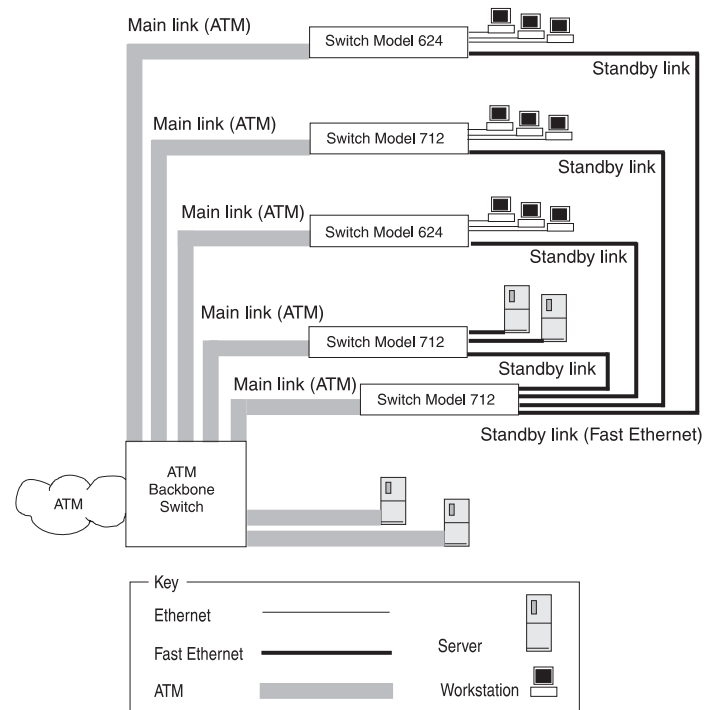


Figure 5-3 Resilient Link Configuration

Following Safety Information



ATTENTION: Only hold the ATM Module by the edges to avoid damage from static. Do not touch the top or bottom of the circuit board.



DANGER: Before installing or removing any components of a device, or carrying out any maintenance work, you must read the safety information provided in Appendix A, "Safety Information" of this guide.



Danger: Avant d'installer ou de retirer les composants d'une unité, ou de procéder à une opération de maintenance, vous devez prendre connaissance des consignes de sécurité figurant à l'annexe A, "Consignes de sécurité" du présent manuel.



Achtung: Vor dem Installieren oder Entfernen von Komponenten einer Einheit, bzw. vor dem Ausführen von Wartungsarbeiten unbedingt die Sicherheitshinweise in Anhang A, "Sicherheitshinweise", dieses Handbuchs lesen.



Gevaar! Alvorens een component van een apparaat te installeren of te verwijderen, of alvorens een onderhoudstaak uit te voeren, moet u de veiligheidsrichtlijnen lezen in Appendix A, "Safety Information", van deze handleiding.



Perigo: Antes de instalar ou remover qualquer componente de um dispositivo, ou executar qualquer trabalho de manutenção, você deve ler as informações sobre segurança fornecidas no Apêndice A, "Informações de Segurança" deste guia.



Fare: Læs sikkerhedsforskrifterne i tillæg A, "Safety Information", i denne vejledning, inden du installerer eller afmonterer en enheds komponenter eller udfører vedligeholdelsesopgaver.



Gevaar: Voordat u onderhoudswerk uitvoert of componenten van een apparaat installeert of verwijdert, dient u eerst de veiligheidsvoorschriften te lezen in Appendix A, "Safety Information" van deze handleiding.



Pericolo: Prima di installare o di rimuovere qualunque componente di un dispositivo e prima di eseguire qualunque intervento di manutenzione, bisogna leggere le informazioni relative alla sicurezza fornite nell'Appendice A di questaguida.



Fare: Før du installerer eller fjerner komponenter i en enhet eller utfører vedlikeholdsarbeid, må du lese sikkerhetsinformasjonen i Appendix A, "Safety Information" i denne boken.



Perigo: Antes de instalar ou remover qualquer componente de um dispositivo ou de executar

qualquer trabalho de manutenção, deve ler o conteúdo do Apêndice A, " Informações sobre Segurança", deste manual.



Peligro: Antes de instalar o extraer cualquier componente de un dispositivo, o realizar cualquier trabajo de mantenimiento, debe leer la información de seguridad incluida en el Apéndice, " Información de Seguridad" de esta guía.



FARA: Läs avsnittet " Safety Information" i Appendix A i det här dokumentet innan du utför underhållsarbete eller installerar/demonterar komponenter.



VAARA: Ennen kuin asennat laitteeseen osia tai irrotat niitä siittä tai teet huoltotoimia, lue tämän julkaisun liitteessä A, " Safety Information", olevat turvaohjeet.



危険:

在安装或移动设备部件, 和对设备进行维修之前, 你必须仔细阅读本手册附录A中的"安全信息".



OPASNOST !

Prije montaže ili demontaže dijelova iz uređaja, ili servisiranja. Obavezno pročitati informaciju o sigurnosti u dodatku A.



Nebezpe í:

P ed instalací nebo odstran ěním libovolné komponenty ze za řízen ě nebo p ed provád ěním údržby si musíte p e říst bezpe nostní informace z této publikace (Appendix A, "Safety Information").



Κίνδυνος:

Πριν εγκαταστήσετε ή αφαιρέσετε οποιοδήποτε εξάρτημα μιας συσκευής, ή κάνετε οποιοδήποτε ενέργειες συντήρησης, θα πρέπει να διαβάσετε τις πληροφορίες ασφάλειας στο Παράρτημα Α, "Safety Information" αυτού του οδηγού.



VIGYÁZAT, VESZÉLY!

A készülék bármely elemének telepítése vagy leszerelése, illetve bármilyen fenntartási tevékenység előtt, Önnek el kell olvasnia a jelen útmutató "A" Függelékében lévő biztonsági információkat.



危険 :

部品の取り付けや取り外しなどの保守作業を行う場合は、このマニュアルの付録A『安全に正しくお使いいただくために』を作業を開始する前に必ずお読みください。



위험:

구성요소를 설치하고 제거하거나, 유지 보수 작업을 수행하기 전에, 이 책자의 부록 A, "안전 정보"에 나와 있는 안전 정보를 읽으십시오.



Niebezpieczeństwo:

Przed zainstalowaniem lub usunięciem jakiegokolwiek komponentu urządzenia lub przeprowadzeniem czynności związanych z obsługą urządzenia należy przeczytać Dodatek A, "Uwagi dotyczące bezpieczeństwa".



Опасно:

Перед установкой или удалением какого-либо элемента устройства и проведением технического обслуживания необходимо ознакомиться с информацией по технике безопасности, приведенной в Приложении А, "Информация по технике безопасности".



Nebezpe enstvo:

Pred inštaláciou alebo odobratí ktorej ko vek jednotky, alebo inej práce spojené s daným zariadením, musíte si pre íta bezpe nostné predpisy v Appendixe A, "Bezpe nostné predpisy" v tejto knihe.



nevarnost !

Preden instalirate ali odstranite neko komponentno iz naprave ali kadar izvajate vzdrževalna dela, morate prebrati navodila za varno uporabo, navedena v Dodatku A "Varnostne informacije" tega navodila.



危険 :

安裝及移除裝置上的任何元件, 或執行保養工作之前, 請先閱讀本手冊附錄 A 中的安全資訊。

Device Support

The ATM Module allows you to connect your IBM 8271 Nways Ethernet LAN Switch to an ATM network. Switches that support the ATM Module are listed in the "Release Notes" that accompany your ATM Module.

Pre-installation Procedure

This section describes the procedures you need to perform before installing the ATM Module.

Check the Power Supply

Before installing the ATM Module ensure that you have sufficient power supply to power the Switch and ATM Module. Refer to the Release Notes for details about power supplies.

Installation

This section describes how to install the ATM Module using the example of an IBM 8271 Nways Ethernet LAN Switch Model 624 device. Installation is similar for all devices compatible with this ATM Module.

- 1 If the Switch is connected to the network, turn off the power to the switch and disconnect the switch from the main power supply and the network.
- 2 Place the Switch on a flat, clean, hard, working surface.
- 3 Locate and remove the blanking plate which covers the ATM Module slot. Retain the blanking plate and the screws for future use.

Refer to the manual which accompanies your Switch to locate the slot where the ATM Module is located.

- 4 Use the guide rails within the Switch slot to align the ATM Module. The location of the guide rails and the correct positioning of the ATM Module is shown in Figure 6-1.
- 5 Slide the ATM Module into the slot without touching the top or bottom of the circuit board. Ensure that the module is pushed fully into the unit.
- 6 Use the thumb screws attached to the ATM Module to fix the module firmly into place.
- 7 Connect the Switch to the ATM network as described in "Connecting a cable to the ATM Port" on page 6-5.
- 8 Power up the Switch as described in "Powering Up the Switch" on page 6-5
- 9 Follow the post-installation checks, as described in "Post-Installation Checks" on page 6-5.

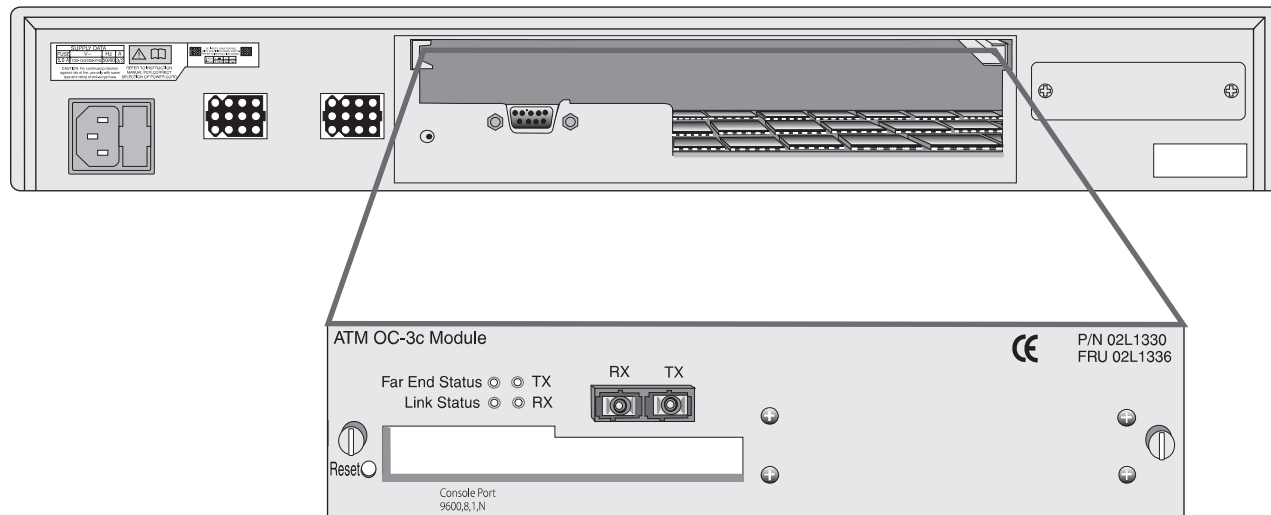


Figure 6-1 Fitting the ATM Module

Connecting a cable to the ATM Port

- 1 Ensure that the cable you wish to connect to the port meets the correct specification. For cable specifications, refer to “ATM Cable Specification” on page C-1.
- 2 Each end of the fiber cable has a transmit (Tx) and receive (Rx) connector. Connect the Rx connector to the port’s Tx socket. Connect the Tx connector to the port’s Rx socket. Do the same at the other end of the connection.

Powering Up the Switch

The Switch does not have an On/Off button, so the only way to power up the Switch is to connect it to the main power supply using a power cable.

Connecting a power supply and safety information is described in the user guide that accompanies your Switch.

Power On Self Test (POST)

When powered up, the Switch and ATM Module enter a *Power On Self Test (POST)*. The type of tests performed depend on how POST has been configured for the Switch. Two types of POST are available:

- **Normal POST** — a basic confidence check which takes between 10 and 20 seconds to complete, and includes:
 - Checksum tests of boot and system areas of *Flash* memory.
 - System memory tests.
 - MAC address verification test.

- System timer test.
- *CAM (Contents Addressable Memory)* tests.
- Console Port tests.
- Internal packet forwarding tests.
- Switch and ATM Module *ASIC (Application Specific Integrated Circuit)* tests.
- Switch and ATM Module ASIC memory tests.
- ATM Module interface tests.
- ATM Module packet forwarding tests.
- **Extended POST** — more extensive testing which takes between 50 and 225 seconds to complete and includes all of the *Normal POST* tests plus more extensive system memory and ASIC memory tests.

When a new Switch is powered-up for the first time, it performs a *Normal POST*, which is the default setting.

If you suspect that there is a problem with your device which has not been detected by the *Normal POST*, run the *Extended POST*. Configuring POST is described in the user guide that accompanies your Switch.

The LEDs used to indicate POST failure and other post-installation checks are described in “Post-Installation Checks”.

Post-Installation Checks

This section describes the LEDs and basic checks that you can use to verify your installation, and to ensure that the Switch and ATM Module are operating correctly.

LED Summary

This section describes the LEDs that provide status and troubleshooting information. Table 6-1 lists the Switch LEDs, and Table 6-2 lists ATM Module LEDs.

Table 6-1 LEDs on the Switch

LED Name	Color/State	Indicates
MGMT (On the front of the Switch)	Green	Switch and ATM Module are operating normally.
	Green flashing	Switch or ATM Module is either downloading software or initializing, (which includes a <i>Power On Self Test</i>).
	Yellow	Switch has failed its <i>Power On Self Test (POST)</i> .
	Yellow flashing	ATM Module failed its <i>Power On Self Test (POST)</i> .
	OFF	No power to the Switch.
Module (On the front of the Switch)	Green	ATM port enabled; link present.
	Green flashing	ATM port disabled; link present.
	Green (long on, short off)	This LED will flash until all configured LECs have successfully joined their ELANs.
	Yellow	ATM agent software is not installed correctly, or the ATM Module has failed its POST (if the MGMT LED is flashing yellow).
	Yellow flashing	Switch has not recognized the ATM Module.
	OFF	The ATM Module is not installed, or a link is not present on the ATM port, or the ATM Switch is not on.

Table 6-2 LEDs on the ATM Module

LED Name	Color/State	Indicates
Far End Status (On ATM Module)	Green	The ATM Switch has not detected an error on the ATM Module's <i>transmit</i> link.
	OFF (and Link Status LED is Green)	The ATM Switch at the far end of the connection has detected a problem with the ATM Module's <i>transmit</i> connection, and notified the ATM Module. For example, the <i>transmit</i> half of the ATM Module's cable has been disconnected at either the ATM Module end or ATM Switch end of the connection.
	OFF (and Link Status LED is OFF)	The cable between the ATM Module and ATM Switch has been disconnected.
Link Status (On ATM Module)	Green	A link is present on the ATM port, and the port is receiving valid SONET frames.
	OFF	The Link is not present on the ATM Port.
TX (On ATM Module)	Yellow	The ATM port is transmitting Ethernet, LANE, Signalling or control frames.
	OFF	The ATM port is not transmitting cells.
RX (On ATM Module)	Yellow	The ATM port is receiving data cells.
	OFF	The ATM port is not receiving incoming cells.

Checking the Power Supply

Check the MGMT LED on the Switch. If the MGMT LED is not lit there is a power supply problem. Try the following troubleshooting procedures:

- 1 Check that the power supply is plugged into the device, using a power outlet that is known to be working.
- 2 Check that the main power supply switch on the wall is set to the ON position.
- 3 Check and if necessary change the fuse on the Switch or plug, and then power-up the Switch. Refer to the user guide that accompanies your Switch for details about fuses and safety instructions.
- 4 Replace the power cable with a cable known to be working, and power-up the Switch.
- 5 Contact Technical Support. Refer to Appendix E.

Checking that the ATM Module is Installed Correctly

Power up the Switch and check that the Module LED (or Downlink Status LED) on the front of the Switch is lit green.

If the MGMT LED is not lit green, you should remove and then re-install the ATM module.

You can confirm that the ATM Module is installed correctly by accessing the local management screens, as described in "Logging On" on page 7-3. If the ATM Module is installed correctly, the ATM CONFIGURATION option appears in the Main Menu.

If the ATM CONFIGURATION option does not appear:

- You may have an incompatible version of the software. Refer to the "Release Notes" for details of which version of the software should be downloaded.
- It could be that the ATM Module is still initializing. If the ATM Module is still initializing, the MGMT LED flashes green.

Checking the Physical Connections

This section assumes that the ATM Module is correctly installed.

Check that the Link Status and Far End Status LEDs on the ATM Module are lit green. If one or both of the LEDs is not lit, there is a problem with the physical connection. Follow the troubleshooting information below:

- 1 Ensure that both devices are powered-up, and that the ports at both ends of the link are enabled.
- 2 Ensure that the cable is securely connected to the port at both ends of the link.
- 3 Check each end of the cable to ensure that each of the fiber connectors is correctly connected. If your cable connectors can be reversed, you may need to reverse the TX and RX cable connectors at one end of the link.



Some cable connectors have been designed so that they cannot be fitted incorrectly. Never use excessive force to connect cables.

- 4 Remove any objects obstructing the cable and straighten out any kinks in the cable.
- 5 If you suspect that the fiber optic connector is dirty, refer to “Cleaning Dirty Fiber Optic Connectors” on page D-24.
- 6 Check that your cable meets the specifications described in “ATM Cable Specification” on page C-1.
- 7 Replace the cable, and check the Link Status LED again.
- 8 Contact IBM Technical Support; refer to Appendix E.



ACCESSING MANAGEMENT FEATURES

The menu-driven user interface built into the device is known as the *VT100* or *Local Management interface*. The VT100 management interface has a forms-based structure with pre-defined security levels, enabling access to be restricted to particular users.

Accessing and navigating the local screens is described in the manual which accompanies your IBM 8271 Nways Ethernet LAN switch.

Screen Map

Figure 7-1 on page 7-2 provides a map of available local management screens. The screens shaded gray appear when the ATM Module is installed. If these screens do not appear, your ATM Module is not installed correctly.

Keyboard Shortcuts

There are several special characters or combinations of keyboard characters that allow you to navigate within the screens.

[Ctrl] + [K] displays a list of the available key strokes.

Correcting Text Entry

Use [Delete] on a VT100 terminal or [Backspace] on a PC. This moves the cursor one space to the left and deletes a character.



If you are using Telnet or a terminal emulation program you may find that some of the Control keys do not operate or that they activate other functions. Check carefully in the manual accompanying your Telnet or terminal emulation software before using the Control keys.

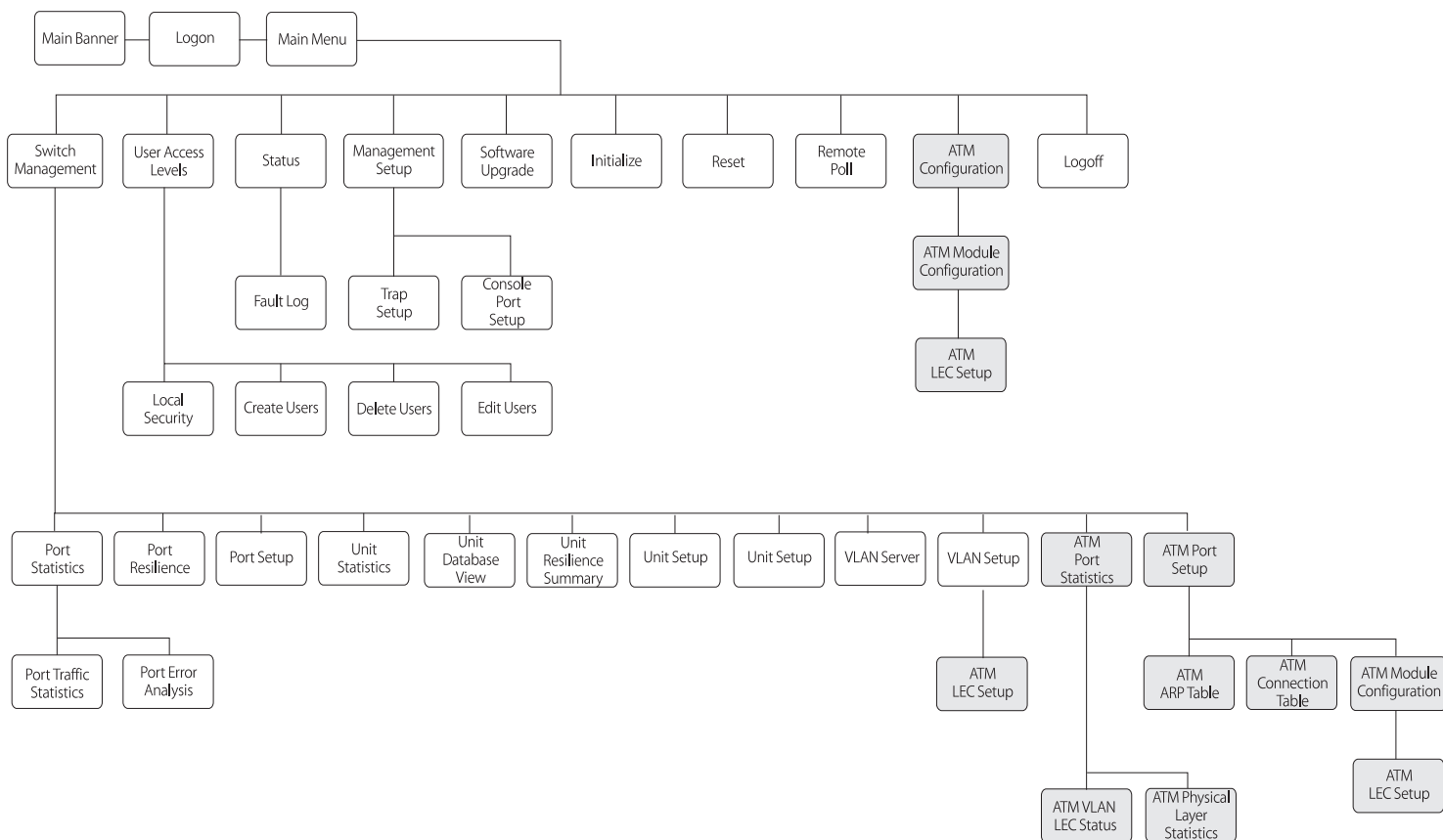


Figure 7-1 Screen Map

Logging On

- 1 Connect your terminal to the Console port using a cross-over cable for a serial line connection.
- 2 At your terminal, press [Return] two or more times until the Main Banner is displayed, as shown in Figure 7-2.

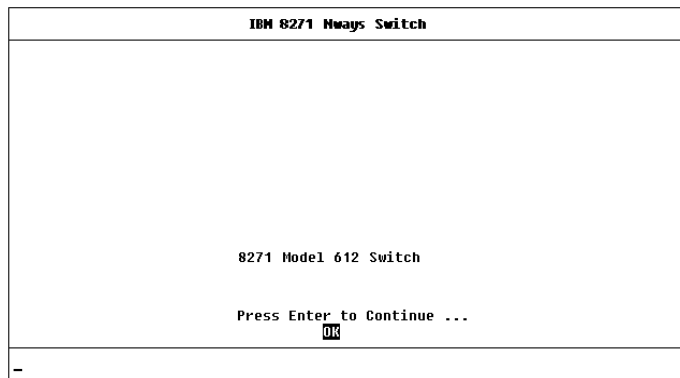


Figure 7-2 Main Banner

The Console port will automatically detect the line-speed (baud rate), and use the following default settings:

- auto-baud
- 8 character size (data bits)
- 1 stop bit
- no parity

Character size, stop bit, flow control, and parity values cannot be changed.

If your terminal is already setup with these values, the Main Banner will appear as soon as power-up is complete.

- 3 At the Main Banner, press [Return] to display the Logon screen, as shown in Figure 7-3.

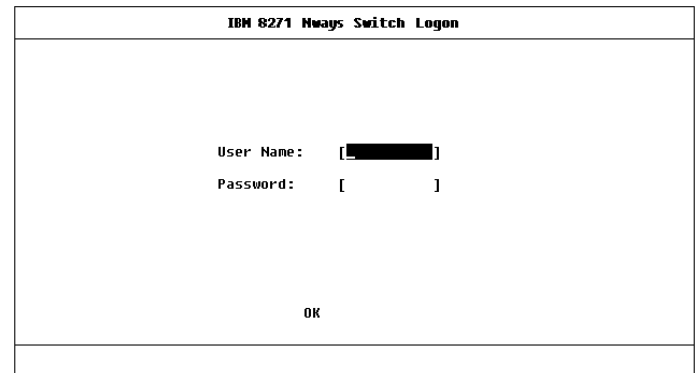


Figure 7-3 Logon Screen

- 4 Type in your user name and password. Note that they are both case-sensitive:
 - If you are logging on for the first time (after installation or initialization), use a default user name and password to match your access requirements. We recommend that you use the default user *security* so that you can access all functions. The default users are shown in Table 7-1 on page 7-4.
 - If you have been assigned a user name, access level and password, type in these details.

Table 7-1 Default Users

User Name	Default Password	Access Level
monitor	monitor	monitor — this user can view, but not change settings on the screens they can access.
manager	manager	manager — this user can view and change the operational parameters (but not the special/security features) on the screens they can access.
security	security	security — this user can view and change all manageable parameters on the screens they can access.
admin	(no password)	security — this user can view and change all manageable parameters on the screens they can access.

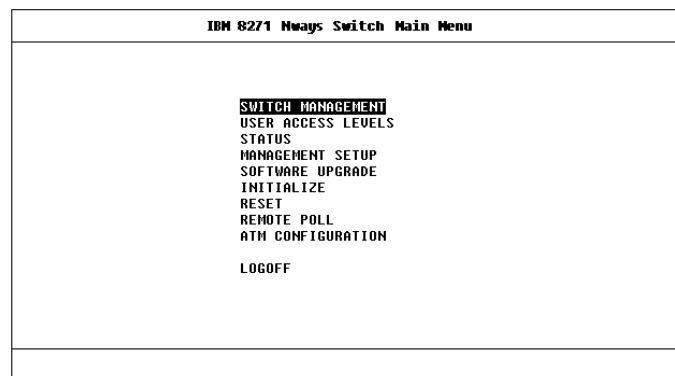
To find out which ATM screens can be accessed for each of the security levels, refer to Appendix B, "Screen Access Rights".

For access rights to Switch screens, see the user guide that accompanies your Switch.

When you have logged on, the Main Menu screen is displayed, as shown in Figure 7-4.

Logging Off

When you have finished using the facility, select the LOGOFF option from the bottom of the Main Menu. If you accessed the facility using a Telnet session or modem, the connection will be closed automatically.

**Figure 7-4** Main Screen

Automatic Logout

There is a built-in security timeout on the VT100 interface. If you do not press any keys for three minutes, a message warns you that the inactivity timer is about to expire. If you do not press a key within 10 seconds, the timer will expire and the screen will be locked; any displayed statistics will continue to be updated. When you next press any key, the display changes to the Auto Logout screen.

The Auto Logout screen asks you to enter your password again. If the password is correctly entered, the screen that was active when the timer expired is re-displayed. If you make a mistake entering your password, you are returned to the Logon screen.

8

MANAGING THE ATM MODULE

This chapter describes how to manage the ATM Module. If you wish to view statistics, refer to Chapter 9, "Monitoring the ATM Module".

Figure 8-1 shows the screen map. Management features are shown in gray to help you locate the screen you need.

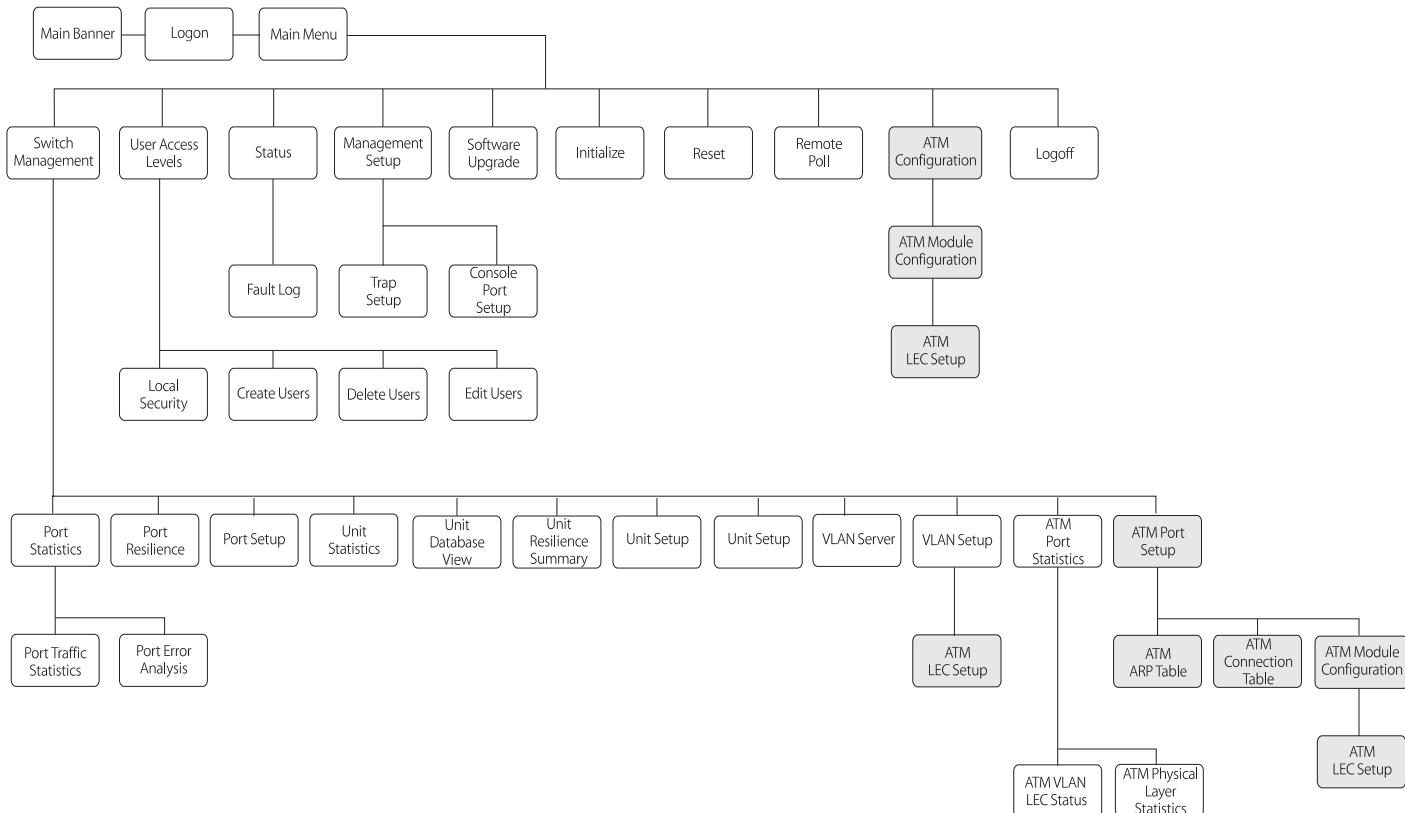


Figure 8-1 Management Screen Map

Configuring an ATM Port

The ATM Module Configuration Screen shows the settings and standards used by the ATM Module to communicate with other devices on the ATM network.



It is unlikely that you will need to change the value of these settings once they have been set.



ATTENTION: *If you need to change the value of any of the settings, you may experience a temporary loss of communication while the device resets. If you do not need to make any changes, select the CANCEL button and not the OK button. Selecting the OK button resets the device.*

The ATM Module Configuration screen can be accessed from the Main Menu or from the ATM Port Setup screen:

- Select the ATM CONFIGURATION option from the Main Menu.
- Alternatively, if you are already in the ATM Port Setup Screen, as described in “ATM Port Setup” on page 8-6, you can select the CONFIG button.

An example of the ATM Module Configuration screen is shown in Figure 8-2.

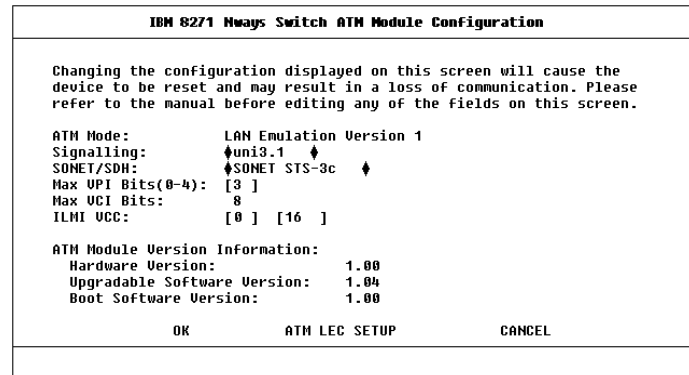


Figure 8-2 ATM Module Configuration Screen



Ensure that the ATM Module and the ATM Switch it is connected to are set up to use the same signalling and SONET/SDH standards. The two devices should also use the same ILMI VCC and compatible values for MAX VPI Bits and MAX VCI Bits. If the devices do not use the same standards, they cannot communicate with each other.

The following fields are shown on the screen:

ATM Mode Shows the *ATM Mode* of operation, which is set to *LAN Emulation Version 1*. The *ATM Mode* cannot be changed in this release.

Signalling Specifies the *User-to-Network Interface (UNI) Signalling* protocol used to communicate with other devices. Select either *uni3.0* or *uni3.1* standards. The default is *uni3.1*.

SONET/SDH Specifies the framing used. Select either *SONET STS-3c* or *SDH STM-1*. The default is *SONET STS-3c*.

The **MAX VPI Bits** and **MAX VCI Bits** fields described below, are used to determine how many bits can be used within each cell header to define the value of the VPI and VCI. The value of the VPI and VCI fields identify the connection.



MAX VPI Bits can be used to identify which WAN connection to use. If you have several remote sites (London, Manchester and Leeds) you can specify a unique VPI value which identifies traffic going to that site. For example, the VPI value for London could be = 1, Manchester could be = 2, and Leeds could be = 3.

There are 11 bits available to be shared between the VPI and VCI. The default is 3 VPI bits and 8 VCI bits. You should not normally need to change the default settings. The adjacent ATM Switch can read the settings of these fields via ILMI and normally negotiates with the devices to use the lowest common denominator. If the ATM Switch is non-standard, you may need to amend the *MAX VPI Bits (0-4)* field.

MAX VPI Bits (0-4) Shows the number of bits available in the cell header that can be used to determine the value of the VPI. Up to 4 bits are available for use. The number of bits set offers a range of possible values for the VPI (as shown within Table 8-1).

Table 8-1 VPI and Bit Settings

Desired Value of VPI	Number of bits required
0	0
0 or 1	1
within the range 0-3	2
within the range 0-7	3 (default)
within the range 0-15	4

Max VCI Bits The number of bits available for the VCI is calculated automatically, using the following equation:

$\text{MAX VCI Bits} = (11 \text{ minus the value of Max VPI Bits})$

ILMI VCC This number identifies the connection used for *Interim Local Management Interface (ILMI)* requests. The first field identifies the *Virtual Path* and the second field identifies the *Virtual Channel*.



You should only change the ILMI VCC if the ATM switch connected to ATM Module does not use the default ILMI VCC (VPI = 0, VCI = 16).

VCC connections with values 0 (zero) to 31 are reserved for standard connections and you should avoid using these values wherever possible.

Hardware Version Shows the version number of the ATM Module hardware.

Upgradable Software Version Shows the version number of agent software stored on the ATM Module (in *Flash EPROM*).

Boot Software Version This is the version number of the boot software stored on the ATM Module.



You should keep a copy of these version numbers, in case you need to contact IBM technical support.

ATM LEC SETUP This button takes you to the ATM LEC Setup Screen (as shown in Figure 8-3) which allows you to extend VLANs into the ATM network.

Extending VLANs into the ATM Network

This section describes how to extend VLANs into the ATM network. The ATM port can be in one or more VLANs. Each VLAN is associated with a LEC on the ATM Module, and each LEC is mapped to an ATM ELAN.

There are two ways to access the ATM LEC Setup screen:

- Select the ATM CONFIGURATION option from the Main Menu. The ATM Module Configuration screen is displayed, as shown in Figure 8-2 on page 8-2. Select the ATM LEC SETUP button.
- Alternatively, if you are already in the ATM Port Setup Screen, as described in “ATM Port Setup” on page 8-6, you can select the CONFIG button to display the ATM Module Configuration screen. An example of the ATM Configuration screen is shown in Figure 8-2 on page 8-2. Select the ATM LEC SETUP button.

An example of the ATM LEC Setup screen is shown in Figure 8-3.

Figure 8-3 ATM LEC Setup Screen



Each time you complete the entry fields for a VLAN you must select APPLY to apply the changes. As soon as you select a different VLAN using the VLAN field any edits not already applied, using the APPLY button, are lost.

To set up an ATM VLAN:

- 1 Select the VLAN that you wish to configure. Enter the number associated with the VLAN in the designated field. VLAN to LEC mappings are shown in “ATM Port Setup” on page 8-6. The default VLAN is VLAN 1, the *admin* VLAN.



You cannot configure VLAN 15 or VLAN 16 when these VLANs are being used for Auto-Select VLANs and Spanning Tree, respectively.

- 2 If the VLAN is to be connected to an ELAN, select *Yes*. If you do not wish the VLAN to be connected to an ELAN, select *No*.
- 3 If there is a LECS controlling ELANs on your network, it should automatically supply the LES address for the ELAN, and you should select the *LECS* option.

Only select the *Manual* option if:

- A LECS is not in use on the network, or
- The LECS is unaware of the existence of the ELAN to be joined, or
- You do not wish the LEC to join a LES controlled by a specific LECS.

If *Manual* is selected, the LES address field is displayed on the screen, and you should enter the ATM address of the LES associated with the selected VLAN/ELAN.

- 4 Enter the name of the ELAN that the VLAN is to join. The ELAN must have already been set up in the ATM network and be operational.
- 5 Select the **APPLY** button.



*If the LEC associated with the VLAN is active when **APPLY** is selected, it will temporarily become inactive while the changes are applied, and you may experience a brief loss of communication on that connection.*

Displaying all VLANs

If you wish to display the VLAN membership for all ports on the Switch, complete the following steps. If you wish to configure VLANs for the ATM Module you should use the ATM VLAN Setup screen, as described in "Extending VLANs into the ATM Network" on page 8-4.

- 1 Select the **SWITCH MANAGEMENT** option from the Main Menu. The Switch Management screen is displayed, as shown in Figure 8-4.

IBM 8271 Hways Switch Management	
Management Level:	◆Port◆
Port ID (default 1):	[]
Enter port number:1..24, 25(Module), 26(100BASE-TX).	
STATS	RESILIENCE SETUP CANCEL

Figure 8-4 Switch Management Screen

- 2 For the *Management Level* field, select the *VLAN* option and press the [TAB] key. The screen shown in Figure 8-5 on page 8-6 is displayed.
- 3 Select the **SETUP** button to display the VLAN Setup screen.

An example of the VLAN Setup screen is shown in Figure 8-6 on page 8-6.

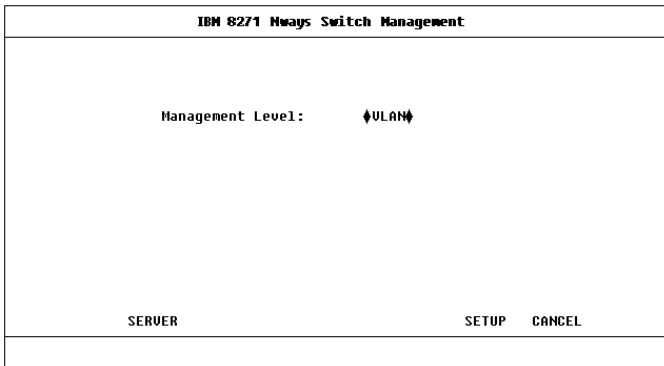


Figure 8-5 VLAN Selected Screen

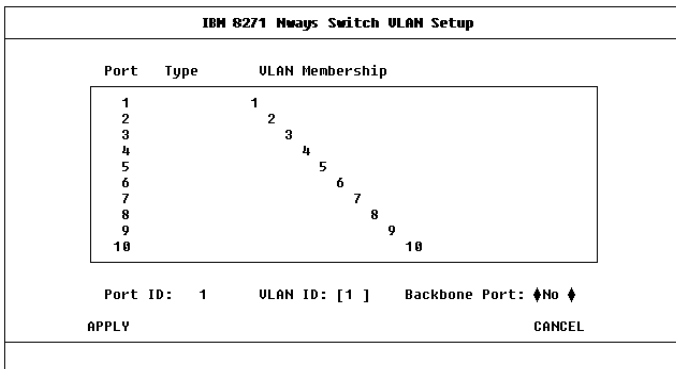


Figure 8-6 Switch VLAN Setup Screen

Use [Ctrl]+[D] keys to scroll down the list box to view the rest of the list, including the ATM port.

The ATM port is shown as *ATM* in the *Type* field, or as *ATM Bp* if it has been set up as a backbone port.

ATM Port Setup

The ATM Port Setup screen allows you to switch the ATM port on or off, and provides status information about the state of the port, and the LECs associated with each of the VLANs. To display the screen:

- 1 From the Main Menu select SWITCH MANAGEMENT. The Switch Management screen is displayed, as shown in Figure 8-4 on page 8-5.
- 2 For the *Management Level* field, select the *Port* option.
- 3 Ensure that the ATM port number is entered in the *Port ID* field. For example the ATM port is:
 - Port **13** on an IBM 8271 Nways Ethernet LAN Switch Model 612 and IBM 8271 Nways Ethernet LAN Switch Model 712
 - Port **25** on IBM 8271 Nways Ethernet LAN Switch Model 624 and IBM 8271 Nways Ethernet LAN Switch Model 524
- 4 Select the SETUP button to display ATM port setup information. An example of the ATM Port Setup screen is shown in Figure 8-7 on page 8-7.

IBM 8271 Mways Switch ATM Port Setup				
Port:	25			
Port Speed:	155 Mbps	Port State:	◆Enable◆	
Link State:	Present	Lost Links:	0	
ULAN LEC States				
=====				
1:	LEC Active	2:	LEC Active	
3:	LEC Active	4:	LEC Active	
5:	LEC Active	6:	LEC Active	
7:	LEC Active	8:	LEC Active	
9:	LEC Active	10:	LEC Active	
11:	LEC Active	12:	LEC Active	
13:	LEC Active	14:	LEC Active	
15:	LEC Active	16:	LEC Active	
OK	CONFIG	ARP TABLE	CONNECTION TABLE	CANCEL

Figure 8-7 ATM Port Setup Screen

The screen shows the following fields:

Port Identifies the selected port.

Port Speed Shows the speed of the port connection.

Port State Allows you to turn the port on and off. If you wish to allow traffic to pass through this port, select the *Enable* option. To prevent traffic passing through the port, select *Disable*.

Link State Indicates whether the communication link connected to the port is capable of transmitting and receiving traffic. The states are:

Present — the link is capable of transferring traffic; if the ports are also turned on (*enabled*).

Not Available — the link is not capable of transferring traffic.

If the link is *Not Available* and both devices are powered-up and operational, there is a physical problem with your connection. For information about the cause of problems and possible solutions, see Table 8-2.

Table 8-2 Link State Troubleshooting Summary

Problem	Solution
The connectors at either end of the link have come loose, or been accidentally pulled out.	Ensure that the cable is securely connected to the port at both ends of the link.
The port at the far end of the link is <i>disabled</i> .	Enable the far end port.
If you have fiber cable with connectors that can be reversed; the two connectors at one end of the fiber cable may be plugged into the port the wrong way around.	Check that each cable connector is connected to the correct port socket. You may need to reverse the TX and RX cable connectors at one end of the link.
The cable is caught under a heavy object or become bent out of shape.	Remove any obstructions and straighten out any kinks in the cable.
The connector itself is physically damaged.	Contact your repair center for advice. Refer to Appendix E, "Technical Support and Service" for more details.

To transmit traffic the port must have a *Port State* of *Enabled* and the *Link State* must be *Present*.

Lost Links The number of times a link was unable to transmit traffic, that is, the number of times (since the device was reset) that the *Link State* became *Not Available*.

LEC States Shows the status of the LEC for each VLAN. The state can be:

LEC Active — traffic is passing through the LEC.

LEC Inactive — traffic is not passing through the LEC.

LEC Not in Use — you have decided not to connect this VLAN to the ATM network. The VLAN may still be in operation within the Switch.

CONFIG This button takes you to the ATM Module Configuration screen, which allows you to monitor and set the standards used by the ATM Module to communicate with other ATM devices. The ATM Module Configuration screen is described in “Configuring an ATM Port” on page 8-2.

ARP TABLE This button takes you to the ARP Table screen, which allows you to displays the ATM and MAC addresses on remote devices. The ARP Table screen is described in “Mapping Far End MAC Addresses” on this page.

CONNECTION TABLE This button takes you to the ATM Connection Table screen, which allows you to display ATM connection details. The ATM Connection Table is described in “Displaying an ATM Connection” on page 8-10.

Mapping Far End MAC Addresses

To communicate with a device, the software must be able to map the MAC address of the destination device to the destination edge-device's ATM address.

This mapping is normally performed by the LEC, and for the vast majority of devices you do not need to map MAC addresses to ATM addresses.

The MAC address and ATM address mappings are stored in the LAN Emulation *ARP Table* (which should not be confused with the IP ARP Table).

To access the ATM ARP Table screen access the ATM Port Setup screen, as described in “ATM Port Setup” on page 8-6, and then select the ARP TABLE button. An example of the ATM ARP Table screen is shown in Figure 8-8.

IBM 8271 Nways Switch ATM ARP Table			
ULAN:	[1]	Port:	25
Far MAC Address	Far ATH Address (Network:Host:Selector)		Type
08004e085b44	47000000000000000000000000000000:08004e0b8a57:00		Dynamic
08004e0b8a57	47000000000000000000000000000000:08004e0b8a57:00		Dynamic
08004e11e917	47000000000000000000000000000000:08004e11e917:00		Dynamic
FFFFFFFFFFFF	47000000000000000000000000000000:00c0da601074:00		Dynamic
Far MAC Address	Far ATH Address		
[]	[]]	
FIND ATH ADDRESS	REFRESH	INSERT	DELETE CANCEL

Figure 8-8 ATM ARP Table Screen

VLAN Allows you to select a VLAN, and display address information about remote systems connected to that VLAN.

Port Identifies the selected port.

Far MAC Address Shows the MAC Address on the edge-device at the far end of the connection.

Far ATM Address Shows the ATM Address for the LEC on the edge-device at the far end of the connection.

Type The address entry can be:

Permanent — The address entries are retained even if the device is reset or a power-off/on cycle occurs. All entries made through this screen are stored as Permanent entries.

Dynamic — The address entries are aged out after a set period of time.

Static — The address entries are discarded when the switch is reset.

The following fields are used in conjunction with the buttons at the bottom of the screen:

Far MAC Address Allows you to type in the MAC address of end-stations in the network.

Far ATM Address Allows you to type in the ATM address of the far end LEC associated with the far end MAC address.

FIND ATM ADDRESS This button allows you to locate the ATM address mapped to a specified MAC address.

REFRESH This button updates the view of the ARP Table to include the latest available information.

INSERT This button allows you to create a MAC Address to ATM address mapping in the ARP Table.

DELETE This button allows you to delete a MAC address to ATM address mapping in the ARP Table.

Creating a MAC Address to ATM Entry

An easy way to edit an entry is to select a similar entry from the listbox using the spacebar. The far end ATM and MAC addresses of that entry are shown in the edit fields. You can then edit the addresses (without losing or changing the original entry) and select the INSERT button to create a new entry.

If you cannot select an entry in the listbox (because you are creating the first entry), use the following method:

- 1 In the *Far MAC Address* field, type in the MAC address of the device to be added to the database.
- 2 In the *Far ATM Address* field, type in the far end ATM address.
- 3 Select the INSERT button.

Finding an Address Entry

- 1 In the *Far MAC Address* field, type in the MAC address associated with the ATM address you are trying to locate.
- 2 Select the FIND ATM ADDRESS button. An asterisk (*) is shown next to the entry in the database listbox.

Updating Address Entries

To view up-to-date ARP Table entries, select the REFRESH button.

Deleting an Address Entry

- 1 Within the listbox, use the spacebar to select the entry you wish to delete.
- 2 Select the DELETE button.

Displaying an ATM Connection

This section describes how to create and view ATM connections in the ATM Connection Table.

To access the ATM Connection Table screen, access the ATM Port Setup screen, as described in “ATM Port Setup” on page 8-6, and then select the CONNECTION TABLE button. An example of the ATM Connection Table screen is shown in Figure 8-9.

IBM 8271 Nways Switch ATM Connection Table				
Port:	25			
VPI:VCI	End	ATM Address (Network:Host:Selector)	Type	
<00:0005>				Reserved
<00:0016>				Reserved
<00:0036>	Far	47 000000000000000000000000:00c0da601074:02		Outgoing
<00:0036>	Near	47 000000000000000000000000:08004e08ebf8:04		Outgoing
<00:0041>	Far	47 000000000000000000000000:00c0da601074:02		Incoming
<00:0041>	Near	47 000000000000000000000000:08004e08ebf8:04		Incoming
<00:0046>	Far	47 000000000000000000000000:00c0da601074:02		Outgoing
<00:0046>	Near	47 000000000000000000000000:08004e08ebf8:04		Outgoing

VPI:VCI	[] []
FIND ATM ADDRESS	REFRESH CANCEL

Figure 8-9 ATM Connection Table Screen

The following fields apply to the listbox:

Port Identifies the selected port.

VPI:VCI Identifies the ATM connection by showing the Virtual Path Identifier and Virtual Circuit Identifier.

End Identifies whether the near or far end LEC ATM address is displayed. The options are:

Near — the details are for the LEC in the ATM Module.

Far — the details are for the LEC at the far end of the connection, for example a LEC in an ATM Switch or attached ATM device.

ATM Address Shows the ATM address of LEC for either the ATM Module or the ATM Switch.

If *Near* is shown in the *End* field, the address is the address of the LEC in the ATM Module.

If *Far* is shown in the *End* field, it is the address of the LEC in the ATM Switch or attached ATM device at the far end of the connection.

Type shows the connection type. The connection types can be:

Incoming — the switched virtual circuit was set up by the Far End LEC.

Outgoing — the switched virtual circuit was set up by the Near End LEC.

Reserved — a permanent virtual circuit has been set up.

VPI:VCI Allows you to specify the ATM connection by typing in the *Virtual Path Identifier* and *Virtual Channel Identifier* labels. Alternatively, you can use the spacebar to select and copy a VPI:VCI entry from the listbox.

FIND ATM ADDRESS This button allows you to find an ATM Address.

REFRESH This button allows you to update the view of ATM connection details.

Finding an ATM Connection

- 1 In the VPI:VCI field, type in the ATM Connection you wish to view.
- 2 Select the FIND ATM ADDRESS button.

Updating Address Entries

To view up-to-date ATM Connection Table details, select the REFRESH button.

Setting Up Resilient Links

You can protect a critical communication link against failure by ensuring that, should the main communication link fail, a standby duplicate communication link immediately and automatically takes over the task of the main link.

Each main and standby link pair is referred to as a *resilient link pair*.

- If you wish to setup an ATM port as part of a resilient link, the other port in the resilient link must be a *Virtual LAN Trunk* (a member of all VLANs).
- Typically the ATM Module port is paired with a Fast Ethernet port on the ATM Switch.

Every 2 minutes the Switch checks the resilient links to ensure that the fastest link is the Main (active) link in the resilient link pair. If the fastest link is not the Main (active) link, the Switch automatically makes it the Main (active) link, on the condition that:

- There have not been any *Lost Links* within the last 2 minutes on the faster link that will become the Main (active) link.
- The faster link has been up for 2 minutes.

See the guide which accompanies your Switch for more details about setting up resilient links.

Upgrading Software

The ATM Module has its own software which is upgraded independently of the Switch software.

You may need to upgrade the software on the ATM Module or Switch if IBM produces a new version of the code, or if the existing code has somehow become corrupted.

The replacement software image must be held or placed on a local server which supports the *Trivial File Transfer Protocol (TFTP)*.

Select the SOFTWARE UPGRADE option from the Main Menu. An example of the Software Upgrade screen is shown in Figure 8-10.

IBM 8271 Hways Switch Software Upgrade		
Destination:	◆ ATM Module	◆
File Name:	[lsat100.slx]
Server Address:	[191.1.1.15]
This operation will reset the device once the upgrade has been completed.		
IP address Format d.d.d.d		
IPX address Format AABBCDD:AABBCDDEEFF		
OK CANCEL		

Figure 8-10 Software Upgrade Screen

Complete the following fields:

Destination Specify the type of device which you wish to receive the upgraded software. If you are upgrading the software on the ATM Module, select the ATM Module option.

File Name Specify the name of the upgrade file held on the server for this type of device.

Server Address Specify the IP (or IPX) address of the server holding the upgrade file.



If the upgrade is interrupted, due to a power failure for example, when the device powers up again, the MGMT LED is lit green and flashes to indicate that an upgrade is taking place, and the Module LED on the Switch is lit Yellow. The device attempts to download the last specified software image file.

When the OK button is selected, the status of the upgrade is displayed. The following error and status messages are available:

Error Messages

This section lists error messages that may appear if an error occurs while downloading a new software image, and suggests solutions to the problem.

File Not Found

The file you require is not on the specified TFTP server. You need to specify a different TFTP server or transfer the file you require to the correct directory on the TFTP server and try again.

Access Violation

You do not have access permissions to this file or directory. Ensure that the access permissions are changed.

Load server failed to respond

Communication with the TFTP server could not be established. Ensure that the workstation on which the TFTP server is set up is operating and that the network connection has been set up correctly.

The download could not be started because of a lack of resources

You are trying to download a file which requires more memory than is available.

The record length differs from that implied by the value of the record length field.

The file you want to download may have been corrupted. You should obtain a valid file and try again.

The record type is not recognized

The file you want to download may have been corrupted, or is not the correct type of file for the selected device. You should obtain a valid file and try again.

Record checksum error

The file you want to download has been corrupted. In this case you should either retry with the current file, or obtain a valid file and try again.

The device type in the file is incorrect

The file you are trying to download is not suitable for the selected device. Ensure that you select either a different file or a different device, before you try again.

The software image is not suitable for this version of the hardware

The file you are trying to download is not suitable for the selected device. Ensure that you select either a different file or a different device, before you try again.

Timeout

The operation to download the software failed after the operation timed-out. This may be due to a poor network connection, so try again.

If you see any other messages you should make a note of the message and contact your supplier.

Status Messages

This section lists status messages that can appear when you download new software images to a device.

Active

The file is currently being downloaded to the selected device. Allow time for the download to complete.

Download successful

The file you chose to download to the selected device was downloaded successfully.

Load Paused

The download failed and another attempt will be made. The download may have failed due to network re-configuration.

9

MONITORING THE ATM MODULE

This chapter describes how to monitor the status and performance of your ATM Module.

Figure 9-1 shows the screen map. Monitoring screens are shaded gray to help you locate the screens you need.

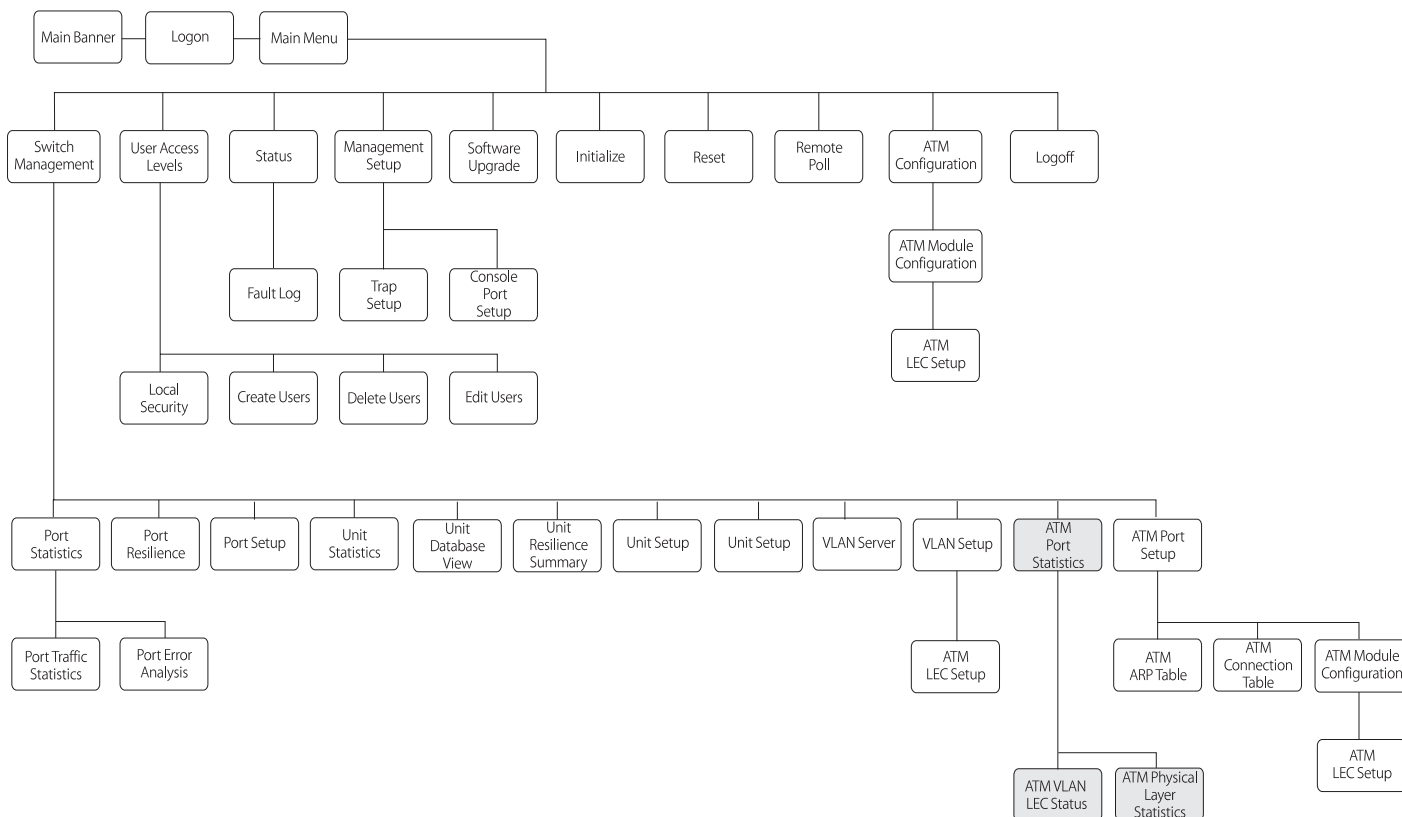


Figure 9-1 Status Monitoring Screen Map

Statistics Overview

This section provides a brief overview of the additional statistics that are available when you install an ATM Module. Refer to the user guide that accompanies the Switch for information about the statistics that are provided by the Switch software.

Table 9-1 groups the available statistics into logical categories, and tells you where each statistic is located.

Table 9-1 Statistics and Status Summary

Monitoring	Use
Backbone To estimate the amount of traffic down the backbone.	ATM Port Statistics screen: <ul style="list-style-type: none"> ■ Transmit Bandwidth Used ■ Receive Bandwidth Used
Physical Connection To check that the physical connection is operational.	ATM Physical Layer Statistics screen: <ul style="list-style-type: none"> ■ Errored Seconds (Near) ■ Errored Seconds (Far) ■ Severe Errored Sec (Near) ■ Severe Errored Sec (Far) ■ Coding Violations (Near) ■ Coding Violations (Far) ■ Unavailable Seconds (Near) ■ Unavailable Seconds (Far) ATM Port Statistics screen: <ul style="list-style-type: none"> ■ Receive Errors

Table 9-1 Statistics and Status Summary

Monitoring	Use
VLAN/ELAN To monitor the state of the LEC to LES set up process.	ATM VLAN LEC Status Screen: <ul style="list-style-type: none"> ■ LEC State ■ LEC ELAN Name ■ LEC ATM Address ■ Last LEC Failure Reason ■ LEC Operation at Failure
To monitor Ethernet traffic on the VLAN.	<ul style="list-style-type: none"> ■ Frames Received ■ Frames Transmitted ■ Octets Received ■ Octets Transmitted
ATM To monitor ATM traffic.	ATM Port Statistics screen: <ul style="list-style-type: none"> ■ Cells Received ■ Cells Transmitted ■ Errored Cells ■ Bad VCC Received
AAL5 To monitor AAL5 traffic.	ATM Port Statistics screen: <ul style="list-style-type: none"> ■ Frames Received ■ Frames Transmitted ■ Octets Received ■ Octets Transmitted ■ Errored Frames ■ Discarded Frames

ATM Module statistics screens are updated every 2 seconds to show the latest information.

ATM Port Statistics

The ATM Port Statistics screen provides a top level summary of traffic levels on the ATM Port. You can use the summary to estimate the amount of traffic on your network backbone, and to check the health of the incoming connection. Statistics are grouped into:

- ATM Port Bandwidth use and incoming connection health.
- AAL5 layer health and use.
- ATM layer health and use.

To view the ATM Port statistics:

- 1 Select the SWITCH MANAGEMENT option from the Main Menu. The Switch Management screen is displayed, as shown in Figure 9-2.

IBM 8271 Hways Switch Management	
Management Level:	↕Port↕
Port ID (default 1):	[]
Enter port number:1..24, 25(Module), 26(100BASE-TX).	
STATS	RESILIENCE SETUP CANCEL

Figure 9-2 Switch Management Screen

- 2 Enter the number of the ATM port in the *Port ID* field.

- 3 Select the STATS button to display the ATM Port Statistics screen.
- 4 An example of the ATM Port Statistics screen is shown in Figure 9-3.

IBM 8271 Hways Switch ATM Port Statistics			
Port ID:	25		
Transmit Bandwidth Used:	26%		
Receive Bandwidth Used:	26%		
Receive Errors:	0%		
AAL5 Layer:			
Frames Received:	4126444042	Octets Received:	2097613219
Frames Transmitted:	4108019450	Octets Transmitted:	918467436
Errored Frames:	0	Discarded Frames:	138237
ATM Layer:			
Cells Received:	68112710	Errored Cells:	0
Cells Transmitted:	31261943	Bad UCC Received:	0
CLEAR SCREEN COUNTERS	LEC	PHYSICAL	CANCEL

Figure 9-3 ATM Port Statistics Screen



The figures shown for each statistic on this screen include ATM management traffic and normal Ethernet traffic.

The ATM Port Statistics screen displays the following fields:

Port ID Identifies the currently selected port.

Transmit Bandwidth Used Shows the percentage of available transmit bandwidth that is currently being used by transmit cells.

Receive Bandwidth Used Shows the percentage of available receive bandwidth that is currently being used by received cells.

Receive Errors Shows the percentage of cells received that have errors. For example, cells received with corrupted header information (*Header Error Control – HEC*).

Receive Errors indicate that there is something wrong with the link, and you should check for the following faults:

- Weak transmitter. Contact your supplier or Technical Support, as described in Appendix E.
- The optic fiber cable is too long or does not meet other technical specifications. Check the cable against the technical specification given in Appendix C, “ATM Module Technical Specifications”.
- The optic fiber connectors are dirty. To clean the connectors, follow the instructions given in “Cleaning Dirty Fiber Optic Connectors”, on page D-24.
- If there is no traffic on the port, but there are Receive Errors, the SONET *Scramble* techniques on the ATM Module and ATM Switch are probably incompatible. Ensure that the SONET standards used are the same for the ATM Module and the ATM Switch.

The screen also shows the AAL5 layer statistics. AAL is a set of protocols that translate user traffic from higher-layer applications/protocols into small, fixed size cells, and reassembles them into the higher level frame format at the destination device. The ATM Module supports AAL5. The screen shows the following AAL5 Layer statistics:

Frames Received The number of frames received per second at the AAL5 interface for all traffic types (data and control).

Frames Transmitted The number of frames transmitted per second at the AAL5 interface for all traffic types (data and control).

Errored Frames The number of frames received that contain an error.

Octets Received The number of Ethernet octets received at the AAL5 interface.

Octets Transmitted The number of Ethernet octets transmitted at the AAL5 interface.

Discarded Frames The number of frames discarded at the AAL5 interface due to lack of resources.

The screen also shows the following ATM statistics:

Cells Received The number of ATM cells received by the port.

Cells Transmitted The number of ATM cells transmitted per second by the port.

Errored Cells The number of ATM cells that contain an error, for example, cells that have *Header Error Control (HEC)* errors.

Bad VCC Received The number of cells received where the specified connection is not recognized by the ATM Module (that is, the connection is not shown in the ATM Module Connection Table).

The following buttons are available on this screen:

CLEAR SCREEN COUNTERS To make it easier to note the changes in statistic values, you can use this button to reset the value of statistics shown on the screen to zero. Resetting the values shown on the screen does not reset the statistic values stored on this device.

LEC This button takes you to the ATM VLAN LEC Status screen, which allows you to monitor the health of LECs and identifies the cause of any connection failures. The ATM VLAN LEC Status screen is described in "ATM VLAN LEC Status" on this page.

PHYSICAL This button takes you to the Physical Layer Statistics Screen, which allows you to monitor the health of the physical connection, and is more useful in a WAN environment. The Physical Layer Statistics Screen is described in "ATM Physical Layer Statistics" on page 9-10.

ATM VLAN LEC Status

The ATM VLAN LEC Status screen shows LEC statistics for the ATM port. You can use the status information to monitor the health of a VLAN's LEC and to track down the cause of any problems. You can also monitor the amount of Ethernet traffic on the selected VLAN.

To access VLAN statistics, first access the ATM Port Statistics screen, as described in "ATM Port Statistics" on page 9-3, and then select the LEC button.

An example of the ATM VLAN LEC Status screen is shown in Figure 9-4.

IBM 8271 Nways Switch ATM VLAN LEC Status			
Port ID:	25		
Select the VLAN to be monitored in the field below:			
VLAN:	[1]		
LEC State:	Active		
LEC ELAN Name:	elan4212_0		
LEC ATM Address:	47000000000000000000000000000000:08004e08ebf8:00		
Last LEC Failure Reason:	None		
LEC Operation at Failure:	None		
Frames Received:	483905118	Octets Received:	905586714
Frames Transmitted:	462252145	Octets Transmitted:	3814474626
CLEAR SCREEN COUNTERS		CANCEL	

Figure 9-4 ATM VLAN LEC Status Screen

Port ID Identifies the currently selected port.

VLAN Allows you to select the VLAN you wish to monitor. The default is VLAN 1. If you wish to review the state of all VLANs on the ATM Module, see "ATM Port Setup" on page 8-6.

LEC State Shows the state of the LEC to LES communication. The states are shown in Table 9-2.

Table 9-2 LEC State Summary

LEC State	Description
Active	The LEC is in use.
Inactive	The LEC is not in use. The LEC may be inactive because it has not been able to establish communication with the LES and BUS, or because the ATM port has been disabled by management.
Not in Use	You have specified that the LEC is not required at the present time.

LEC ELAN Name Shows the name of the ELAN that the VLAN/LEC has joined.

LEC ATM Address Shows the ATM Address of the LEC associated with the selected VLAN.

Last LEC Failure Reason If the LEC configuration fails, the last know failure state is shown. The failure state can be used to identify the cause of the failure. The failure state and possible causes are shown in Table 9-3.

Table 9-3 Last LEC Failure Reason

State	Possible Causes	Possible Solutions
None	The LEC is either inactive or has successfully completed the operation.	None required.
Timeout A task could not be completed within its allotted time frame.	The software has been set up to use a LECS, but a LECS is either not present on the network or broken.	If there is a LECS on your network, ensure that it is operational and on part of the network that can be accessed by the ATM Module. If a LECS is not present on the network, you must enter the LES Address for each ELAN manually using the ATM VLAN Setup Screen (see "Extending VLANs into the ATM Network" on page 8-4).
	The LES for the ELAN is not functioning correctly	Contact Technical Support.
Undefined Error An error has occurred but no cause can be identified.	Unknown.	Contact Technical Support.
Version Not Supported LANE 1.0 not supported.	The LANE services you are trying to connect to, do not support LANE version 1.0.	Ensure that the LANE Services use LANE 1.0.
(continued)		

Table 9-3 Last LEC Failure Reason

State	Possible Causes	Possible Solutions
Invalid Request Parameters The LES/LECS has rejected a request from the LEC because the request parameters were incompatible with the ELAN.	The LEC may be requesting a resource that is on an ELAN which has a different LAN type to the LEC. The frame size used could be wrong.	Check the underlying media for both the ELAN and the LEC requesting the service. Check the frame sizes being used.
Duplicate LAN Destination A destination source MAC address duplicates a previously registered MAC address.	The LES has received a request from a LEC which contains a MAC address already registered to another LEC on the same ELAN. You may have accidentally entered the same MAC addresses twice.	Ensure that MAC addresses are unique.

Table 9-3 Last LEC Failure Reason

State	Possible Causes	Possible Solutions
Duplicated ATM Address A source ATM address duplicates a previously registered ATM address.	The LES has received a request from a LEC which contains an ATM address already registered to another LEC on the same ELAN. For example, if a LES is faulty, when a LEC disconnects from the LES, the LES might fail to register the change. When the LEC tries to rejoin the LES, the LES still has that LEC's ATM address in its database, and thinks that two devices have the same ATM address. You may have accidentally entered the same ATM addresses twice.	Ensure that ATM addresses are unique. Check the LES database for duplicate addresses.

(continued)

Table 9-3 Last LEC Failure Reason

State	Possible Causes	Possible Solutions
Insufficient Resources	Too many connections have been requested and the tables used by the LES may be full, and the connection cannot be set up.	You may wish to consider extending or restructuring your network.
There are insufficient resources to grant a request.	The ATM Switch is busy and cannot provide LECS functionality.	Use a separate ATM Switch for LECS functionality.
	There is a mismatch between the VPI/VCI range supported by adjacent ATM devices.	Make the MAX VPI/VCI Bits compatible.
	Example: If Switch A supports VPI/VCI values 7:511 and Switch B only supports values up to 7:255, when Signalling tries to set up a connection using the VPI/VCI value 7:256, Switch B rejects the connection.	
Access Denied	The LEC is trying to join an ELAN that it is not allowed to access.	Check your LANE Services setup.
The LES has denied the LEC access to the ELAN for security reasons.		
(continued)		

Table 9-3 Last LEC Failure Reason

State	Possible Causes	Possible Solutions
Invalid Requestor ID	There is a problem with the LEC software.	Contact 3Com Support.
	<i>The LEC Identifier (LECID) is not zero, or is not recognized as this LEC's LECID.</i>	
Invalid LAN Destination	You may have configured an illegal Local Administration Address.	Check that the Local Administration Address is valid.
You are trying to register a multicast address with the LES.		Local Administration Address setup is beyond the scope of this guide.
Invalid ATM Address	The ATM address field may have been corrupted or not in the correct format.	Contact your supplier or 3Com Technical Support.
Source or destination ATM address is not in a recognized format.	For example, it may be in E.164 when OSI N-SAP address coding is required.	
No Configuration	The MAC address may be invalid.	Check that each MAC address on your network is unique.
The LECS/LES does not recognize the LEC or the requested ELAN	The LEC may be requesting a resource that is on an ELAN which has a different LAN type to the LEC.	Check the LAN type used.
	You may have entered an invalid ELAN name.	Check that the ELAN name is correct, and the ELAN has been set up correctly.

Table 9-3 Last LEC Failure Reason

State	Possible Causes	Possible Solutions
LE_CONFIGURE Error This state may be given to refuse a service without giving a specific reason.	The information provided by the LEC may be invalid. You may have entered an invalid ELAN name.	As this state is used to indicate a range of problems, you should check the other states and solutions described in this table. If this does not resolve the problem contact 3Com Technical Support. Check that the ELAN name is correct, and the ELAN has been set up correctly.
Insufficient Information The LEC has not provided sufficient information to allow the LECS to assign it to a specific ELAN.	The MAC address may be invalid. The LEC may be requesting a resource that is on an ELAN which has a different LAN type to the LEC. You may have entered an invalid ELAN name.	Check that each MAC address on your network is unique. Check the LAN type used. Check that the ELAN name is correct, and the ELAN has been set up correctly.

LEC Operation at Failure Identifies the operation that was being carried out when the LEC setup failed. This field should be used in conjunction with the Last LEC Failure Reason to identify the cause of the problem. The possible operations are shown in Table 9-4.

Table 9-4 LEC Operation at Failure

Operation	Description
None	There are no known operation failures.
Calling LECS	The LEC is trying to connect to the LECS to receive LANE configuration information.
Reading Configuration from LECS	The LEC receives configuration information from the LECS in preparation for joining the LES.
Joining LES	The LEC is trying to join the ELAN by registering itself with the LES that controls that ELAN. When the LEC has joined the LES, it is given a unique <i>LAN Emulation Client Identifier (LECID)</i> , knows the Emulated LAN's maximum frame size, and knows its LAN type (either Ethernet or Token Ring).
Initial Registration	After joining, a LEC can register any number of MAC addresses and/or Route Descriptors (for Token Ring implementations).
Connecting to BUS	In order to establish a connection to the <i>Broadcast and Unknown Server (BUS)</i> the LEC requires the broadcast address. It requests the broadcast address from the LES.
Operational	The LEC is now part of the ELAN.

Frames Received The number of Ethernet frames received by the LEC.

Frames Transmitted The number of Ethernet frames transmitted by the LEC.

Octets Received The number of Ethernet octets received by the LEC.

Octets Transmitted The number of Ethernet octets transmitted by the LEC.

If you see the following symptoms, there may be a problem at the ATM Switch end of the connection:

The LEC is *active* and the *LEC Operation at Failure* is *None*, but the frames or octets counters are showing zero.



If you have followed the troubleshooting instructions in this section and within Appendix D, and you still have a problem, contact IBM Technical Support. Refer to Appendix E for details.

The following button is available on this screen:

CLEAR SCREEN COUNTERS To make it easier to note the changes in statistic values, you can use this button to reset the value of statistics shown on the screen to zero. Resetting the values shown on the screen does not reset the statistic values stored on this device.

ATM Physical Layer Statistics

The Physical Layer Statistics screen shows *SONET STS-3c* and *SDH STM-1* error statistics. These statistics are used to track down problems with the physical connection, and are more useful in a WAN environment.

To access Physical Layer statistics, first access the ATM Port Statistics screen, as described in "ATM Port Statistics" on page 9-3, and then select the PHYSICAL button.

An example of the Physical Layer Statistics screen is shown in Figure 9-5 on page 9-11, and the statistics are described in the following text.

Port Identifies the currently selected port.

OCD State Shows the *Out of Cell Delineation (OCD)* state. The OCD State is set to *Fail* when seven consecutive cells have had Header Error Control violations. This implies that the cell has been corrupted and that there is probably a hardware problem with the ATM Module or ATM Switch.

The OCD State is only set to *OK* when six good cells are received by the ATM Module followed by approximately 10 seconds of good signal from the ATM fiber optic cable.

IBM 8271 Hways Switch ATM Physical Layer Statistics			
Port:	25		
OCD State:	OK		
Current Sample:	157 out of 900 Seconds Elapsed		
Sample Counter	Path	Line	Section
=====	====	====	=====
Errored Seconds (Near):	0	0	0
Errored Seconds (Far):	0	0	
Severe Errored Sec (Near):	0	0	0
Severe Errored Sec (Far):	0	0	
Coding Violations (Near):	0	0	0
Coding Violations (Far):	0	0	
Unavailable Seconds (Near):	0	0	
Unavailable Seconds (Far):	0	0	
CANCEL			

Figure 9-5 Physical Layer Statistics

Current Sample Specifies the number of seconds elapsed within the current sampling period.

SONET/SDH counters are accumulated over a period of 15 minutes (900 seconds). At the end of the 15 minute sampling period, the software stores the results of the current sampling period, and resets the values shown on the screen to zero.



The results of the previous 96 sampling periods can be accessed through the SONET MIB using a MIB Browser.

Physical Layer statistics are broken down into the following layers:

- **Path** — The Path Layer deals with the mapping of ATM cells to SONET or SDH frames. The ATM Module supports 1 path.
- **Line** — The Line Layer provides synchronization and multiplexing functions for the Path Layer across the physical medium.
- **Section** — The Section Layer deals with framing, scrambling, and section error monitoring.

Physical Layer errors are measured in units called *Seconds*: each *Second* is a second in time.

In the following statistics a *second* is considered errored if it contains a *Coding Violation*.

A *coding violation* occurs when the parity check in the SONET or SDH frame indicates that the cell payload has been corrupted.

A *second* is considered severely errored if it contains 16 *coding violations* for a path or section, or 32 *coding violations* for a line counter.

A *second* is unavailable if 10 continuous severely errored *seconds* are seen at the ATM interface. A *second* becomes available again, when 10 consecutive *seconds* are received that are not severely errored.

The following statistics are available:

Errored Seconds (Near) The number of errored *seconds* at the ATM Module end of the connection.

Errored Seconds (Far) The number of *seconds* at the ATM Switch end of the connection.

Severe Errored Sec (Near) The number of severely errored *seconds* at the ATM Module end of the connection.

Severe Errored Sec (Far) The number of severely errored *seconds* at the ATM Switch end of the connection.

Coding Violations (Near) The number of *coding violations* that have occurred at the ATM Module end of the connection.

Coding Violations (Far) The number of *coding violations* that have occurred at the ATM Switch end of the physical connection.

Unavailable Seconds (Near) The number of *seconds* that were unavailable at the ATM interface on the ATM Module.

Unavailable Seconds (Far) The number of *seconds* that were unavailable at the ATM interface on the ATM Switch.

Using Physical Layer Statistics to Troubleshoot

This section describes how to use the physical layer statistics to track and resolve problems.

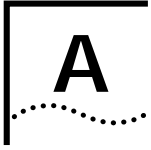
If no values are shown on the screen, the problem probably lies with the ATM Switch rather than the ATM Module. Follow the troubleshooting information in the user guide that accompanies your ATM Switch.

High values usually indicate that the SONET standards are incompatible, or that there is a fault on the cable. Use the following troubleshooting suggestions to try and resolve the problem:

- 1 Check that the ports at both end of the link are *enabled*.
- 2 Check that the cable is securely connected to the port at both ends of the link.
- 3 Check each end of the cable to ensure that each of the fiber connectors is correctly connected. If you have connectors that can be reversed, you may need to reverse the TX and RX cable connectors at one end of the link.
- 4 Make sure that the cable does not exceed the cable length or other technical specifications. Check the cable against the technical specification given in Appendix C.
- 5 Remove any obstructions and straighten out any kinks in the cable.
- 6 If you suspect that the fiber optic connector is dirty, refer to "Cleaning Dirty Fiber Optic Connectors" on page D-24.

- 7 If you suspect that the fiber optic cable is not working, replace the cable with a cable known to be working, and check the Link Status LED.
- 8 Check that the cable has not been accidentally plugged into an FDDI connector at one end of the connection.
- 9 Check that the ATM Module and ATM Switch are using compatible transmit clocking options.
- 10 Check that the Line Rate settings on the two devices are compatible.
- 11 If there is still a problem, contact your repair center for advice. For more details, refer to Appendix E.





SAFETY INFORMATION

You must read the following safety information before carrying out any installation or removal of components, or any maintenance procedures on the Switch.

Safety Notices

Safety notices are printed throughout this manual. **DANGER** notices warn you of conditions or procedures that can result in death or severe personal injury. **CAUTION** notices warn you of conditions or procedures that can cause personal injury that is neither lethal nor extremely hazardous.

World Trade Safety Information

Some countries require the safety information contained in publications to be presented in their national languages. Before using an English-language publication to set up, install, or operate this IBM product, you first should become familiar with the related safety information.



DANGER: Before you begin to install this product, read the safety information in *Caution: Safety Information – Read This First*, SD21-0030. This booklet describes safe procedures for cabling and plugging in electrical equipment.



Varning — livsfara: Innan du börja installera den här produkten bör du läsa säkerhetsinformationen i dokumentet *Varning: Säkerhetsföreskrifter – Läs detta först*, SD21-0030. Där beskrivs hur du på ett säkert sätt ansluter elektrisk utrustning.



Fare: Før du begynner å installere dette produktet, må du lese sikkerhetsinformasjonen i *Advarsel: Sikkerhetsinformasjon – Les dette først*, SD21-0030 som beskriver sikkerhetsrutinene for kabling og tilkobling av elektrisk utstyr.



Fare: Før du installerer dette produkt, skal du læse sikkerhedsforskrifterne i *NB: Sikkerhedsforskrifter – Læs dette først*, SD21-0030. Vejledningen beskriver den fremgangsmåde, du skal bruge ved tilslutning af kabler og udstyr.



Gevarr: Voordat u begint met de installatie van dit product, moet u eerst de veiligheidsinstructies lezen in de brochure *PAS OP! Veiligheidsinstructies – Lees dit eerst*, SD21-0030. Hierin wordt beschreven hoe u elektrische apparatuur op een veilige manier moet bekabelen en aansluiten.



Gevarr: Voordat u begint met het installeren van dit produkt, dient u eerst de veiligheidsrichtlijnen te lezen die zijn vermeld in de publikatie *Caution: Safety Informtion – Read This First*, SD21-0030. In dit boekje vindt u veilige procedures voor het aansluiten van elektrische apparatuur.



Vorsicht: Bevor mit der Installation des Produktes begonnen wird, die Sicherheitshinweise in *Achtung: Sicherheitsinformationen – Bitte zuerst lesen*, IBM Form SD21-0030. Diese Veröffentlichung beschreibt die Sicherheitsvorkehrungen für das Verkabeln und Anschließen elektrischer Geräte.



Danger: Avant d'installer le présent produit, consultez le livret *Attention: Informations pour la sécurité – Lisez-moi d'abord*, SD21-0030, qui décrit les procédures à respecter pour effectuer les opérations de câblage et brancher les équipements électriques en toute sécurité.



Danger: Avant de procéder à l'installation de ce produit, lisez d'abord les consignes de sécurité dans la brochure *ATTENTION: Consignes de sécurité – A lire au préalable*, SD21-0030. Cette brochure décrit les procédures pour câbler et connecter les appareils électriques en toute sécurité.



Pericolo: prima di iniziare l'installazione di questo prodotto, leggere le informazioni relative alla sicurezza riportate nell'opuscolo *Attenzione: Informazioni di sicurezza – Prime informazioni da leggere* in cui sono descritte le procedure per il cablaggio ed il collegamento di apparecchiature elettriche.



Perigo: Antes de iniciar a instalação deste produto, leia as informações de segurança *Cuidado: Informações de Segurança – Leia Primeiro*, SD21-0030. Este documento descreve como efectuar, de um modo seguro, as ligações eléctricas dos equipamentos.



Peligro: Antes de empezar a instalar este producto, lea la información de seguridad en *Atención: Información de Seguridad – Lea Esto Primero*, SD21-0030. Este documento describe los procedimientos de seguridad para cablear y enchufar equipos eléctricos.



Perigo: Antes de começar a instalar este produto, leia as informações de segurança contidas em *Cuidado: Informações Sobre Segurança – Leia Isto Primeiro*, SD21-0030. Esse folheto descreve procedimentos de segurança para a instalação de cabos e conexões em equipamentos elétricos.



VARRA: Ennen kuin aloitat tämän tuotteen asennuksen, lue julkaisussa *Varoitus: Turvaohjeet – Lue tämä ensin*, SD21-0030, olevat turvaohjeet. Tässä kirjasessa on ohjeet siitä, miten sähkölaitteet kaapeloidaan ja kytketään turvallisesti.



Uwaga: Przed rozpoczęciem instalacji produktu należy zapoznać się z instrukcją: "Caution: Safety Information - Read This First", SD21-0030. Zawiera ona warunki bezpieczeństwa przy podłączaniu do sieci elektrycznej i eksploatacji.



Vigyázat: Mielőtt megkezdi a berendezés üzembe helyezését, olvassa el a Caution: Safety Information – Read This First, SD21-0030 könyvecskében leírt biztonsági információkat. Ez a könyv leírja, milyen biztonsági intézkedéseket kell megtenni az elektromos berendezés huzalozásakor illetve csatlakoztatásakor.



Pozor: Preden zaenete z instalacijo tega produkta prebertte poglavje: 'Opozorilo: Informacije o varnem rokovanju - preberi pred uporabo,' SD21-0030. To poglavje opisuje pravilne postopke za kabliranje,



危險：安裝本產品之前，請先閱讀 "Caution: Safety Information--Read This First" SD21-0030 手冊中所提供的安全注意事項。這本手冊將會說明使用電器設備的纜線及電源的安全程序。



Upozornění: než zahájíte instalaci tohoto produktu, přečtěte si nejprve bezpečnostní informace v pokynech „Bezpečnostní informace“ č. 21-0030. Tato brožurka popisuje bezpečnostní opatření pro kabeláž a zapojení elektrického zařízení.



위험: 이 제품을 설치하기 전에 반드시 "주의: 안전 정보-시작하기 전에" (SD21-0030) 에 있는 안전 정보를 읽으십시오.



ОСТОРОЖНО: Прежде чем устанавливать этот продукт, прочтите Инструкцию по технике безопасности в документе "Внимание: Инструкция по технике безопасности -- Прочсть в первую очередь", SD21-0030. В этой брошюре описаны безопасные способы каблирования и подключения электрического оборудования.



Nebezpečnostvo: Pred inštaláciou výrobku si prečítajte bezpečnosť predpisy v Výstraha: Bezpečnosť predpisy - Prečítaj ako prvé, SD21-0030. V tejto brožúrke sú opísané bezpečnosť postupy pre pripojenie elektrických zariadení.



危險：
開始安裝此產品之前，請先閱讀安全資訊。

注意：
請先閱讀 - 安全資訊 SD21-0030
此冊子說明插接電器設備之電纜線的安全程序。



情報処理装置等電波障害自主規制協議会 (VCCI) 表示

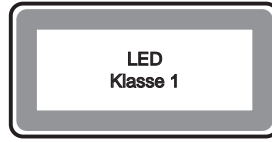
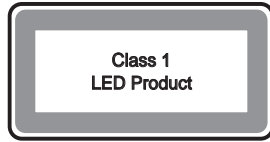
この装置は、第一種情報装置(商工業地域において使用されるべき情報装置)で商工業地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会(VCCI)基準に適合しております。

従って、住宅地域またはその隣接した地域で使用すると、ラジオ、テレビジョン受信機等に受信障害を与えることがあります。

取扱説明書に従って正しい取り扱いをして下さい。



Opasnost: Prije nego što počnete sa instalacijom produkta, pročitajte naputak o pravilima o sigurnom rukovanju u Upozorenje: Pravila o sigurnom rukovanju - Prvo pročitaj ovo, SD21-0030. Ovaj privitak opisuje sigurnosne postupke za priključivanje kabela i priključivanje na električno nabaianie.

**ATTENTION**

DANGER: Installation and removal of the unit must be carried out by qualified personnel only.



DANGER: L'installation et l'enlèvement de l'unité doivent être faits seulement par le personnel qualifié.



DANGER: Ein- und Ausbau des Gerätes ist nur von Fachpersonal vorzunehmen.



Gevaar! De eenheid mag alleen worden geïnstalleerd of verwijderd door bevoegde personen.



Perigo: A instalação e remoção da unidade deve ser feita apenas por pessoal especializado.



Fare! Installation og afmontering af enheden skal udføres afuddannet personale.



Gevaar: Installatie en verwijdering van de eenheid moet uitsluitend worden uitgevoerd door getraind personeel.



Verra: Yksikön saavat asentaa ja irrottaa vain tähän koulutetut henkilöt.



Pericolo: L'installazione e la rimozione dell'unità devono essere eseguite esclusivamente da personale specializzato.



Fare: Det er bare kvalifisert personale som kan installere og ta ut enheten.



Perigo: A instalação e a remoção da unidade devem ser efectuadas apenas por pessoal qualificado.



Peligro: La instalación y extracción de la unidad debe efectuarse únicamente por personal cualificado.



Fara: Installation och flyttning av enheten måste utföras av utbildad personal.



设备的安装和移动必须由有资格的人员来操作。



Postavljanje i demontažu ovog uređaja mora obaviti stručno osposobljena osoba.



Neodstraja ujte desky modul , pokud je p ipojeno napájení.



Η εγκατάσταση και αφαίρεση της συσκευής πρέπει να γίνεται μόνο από ειδικευμένο προσωπικό.



Az egység telepítését és leszerelését csak szakképzett személyzet végezheti.



この装置の取り付け、取り外しはサービス技術員以外は実施しないでください。



장치를 설치하고 제거하는 것은 자격이 있는 사람이 수행해야 합니다.



Jednostkę może instalować i deinstalować jedynie wykwalifikowany personel.



Монтаж и демонтаж оборудования должен выполнять только квалифицированный персонал.



Inštalácia jednotky alebo jej premiestnenie musí byť uskutočnená za pomoci kvalifikovanej osoby.



Instalacija oziroma izklop naprave smejo izvajati samo usposobljene osebe.



安裝或移動本裝置的工作必須經由專業人員來執行。



DANGER: This unit operates under SELV conditions (Safety Extra Low Voltage) according to IEC 950, the conditions of which are maintained only if the equipment to which it is connected is also operational under SELV.



DANGER: Cette unité marche sous les conditions SELV (Safety Extra Low Voltage) conformément à IEC 950, ces conditions sont maintenues seulement si le matériel auquel elle est branchée, est aussi en exploitation sous SELV.



DANGER: Das Gerät wird mit Sicherheits-Kleinspannung nach IEC 950 (SELV = Safety Extra Low Voltage) betrieben. Angeschlossen werden können nur Geräte, die ebenfalls nach SELV betrieben werden.



Gevarr: Deze eenheid werkt onder SELV (Safety Extra Low Voltage) volgens IEC 950, waarvan de voorwaarden alleen behouden blijven indien de apparatuur waarop het is aangesloten, ook onder SELV werkt.



Perigo: Esta unidade funciona sob condições SELV (Safety Extra Low Voltage) de acordo com IEC 950 mas, essa situação é mantida apenas se o equipamento ao qual ela está conectada também funcionar sob a condição SELV.



Fare! Denne enhed fungerer ved svagstrøm i henhold til betingelserne IEC 950. Disse betingelser overholdes kun, hvis det udstyr, enheden er sluttet til, også fungerer ved svagstrøm.



Gevaar: Deze eenheid werkt onder extra lage spanning (SELV, Safety Extra Low Voltage) volgens norm IEC 950. Er wordt uitsluitend aan deze norm voldaan zolang de apparatuur waarmee de eenheid is verbonden, ook werkt onder SELV.



Vaara: Tämä yksikkö sisältää kansainvälisen turva-standardin IEC 950 mukaisia SELV (Safety Extra Low Voltage) -suojajännitepiirejä. Yksikkö täyttää standardissa kuvatut ehdot vain, jos laite, johonyksikkö liitetään, käyttää SELV-piirejä.



Pericolo: Questa unità funziona in condizioni di bassissima tensione di sicurezza (SELV, Safety Extra Low Voltage) secondo l'IEC 950. Tali condizioni sono rispettate solo se anche l'apparecchiatura a cui l'unità è collegata funziona in SELV.



Fare: Dette utstyret drives med strøm fra kretser med ekstra lav spenning (SELV-kretser) i henhold til standarden IEC 950. Denne spenningen opprettholdes kun dersom utstyret som det er koblet til, også drives av såkalte SELV-kretser.



Perigo: Esta unidade funciona sob condições SELV (Safety Extra Low Voltage - Tensão Muito Baixa, de Segurança), de acordo com a norma IEC 950. O estabelecido nesta norma só poderá ser mantido se o equipamento ao qual a unidade for ligada também funcionar sob aquelas condições SELV.



Peligro: Esta unidad opera bajo condiciones SELV (Safety Extra Low Voltage / Voltaje Extra Bajo de Seguridad) de acuerdo a la norma IEC 950, si bien tales condiciones únicamente se mantienen si el equipo al que se conectan es asimismo operacional bajo SELV.



Fara: Den här enheten arbetar under villkoren för kyddsklenspanning (Safety Extra Low Voltage) enligt IEC 950. Dessa villkor uppfylls endast om utrustning till vilken enheten ansluts också arbetar med kyddsklenspanning.



设备遵守IEC 950 标准,在SELV(Safety Extra Low Voltage安全超低电压)条件下操作.设备所连接的并维持的条件也仅仅只能是在SELV条件下才可操作.



Ovaj uređaj radi pod SELV uvjetima (Safety Extra Low Voltage) prema propisu IEC 950. Stoga se ovaj uređaj može spajati samo sa drugim uređajem koji također radi pod SELV uvjetima.



设备遵守IEC 950 标准,在SELV(Safety Extra Low Voltage安全超低电压)条件下操作.设备所连接的并维持的条件也仅仅只能是在SELV条件下才可操作.



Η συσκευή αυτή λειτουργεί υπό συνθήκες SELV (Safety Extra Low Voltage) σύμφωνα με την προδιαγραφή IEC 950, οι συνθήκες της οποίας τηρούνται μόνο αν ο εξοπλισμός με τον οποίον συνδέεται λειτουργεί επίσης υπό συνθήκες SELV.



Ez az egység biztonsági feszültségű (SELV) áramköri feltételek alatt üzemel, az IEC 950 (MSZ EN 60950) szabványnak megfelelően. Ezek a feltételek csak akkor maradnak fenn, ha a kapcsolódó berendezés szintén biztonsági feszültségű (SELV) áramkörként működik.



この装置は I E C (国際電気標準会議) 9 5 0 の S E L V (Safety Extra Low Voltage) の条件のもとで稼働しますが、もし他の機器を接続した場合はその機器が S E L V の条件を満たしているときに限ります。



본 장치는 IEC 950에 따라 SELV 조건(Safety Extra Low Voltage) 하에서 작동하며, 연결된 장비도 SELV하에서 작동할 수 있는 경우에만 조건이 유지보수됩니다.



Jednostka pracuje pod napięciem SELV (Safety Extra Low Voltage - Bezpiecznie niskie napięcie), zgodnym z warunkami IEC 950, spełnionymi jedynie wówczas, gdy sprzęt do którego jest podłączona działa również pod tym napięciem.



Это устройство работает по стандарту IEC 950 в условиях Безопасно низкого напряжения (SELV) только при условии, что все оборудование в цепи отвечает стандартам SELV.



Táto jednotka pracuje pod bezpečným napätím podľa IEC 950, ale len v prípade, že zariadenie, ku ktorému je pripojená tak isto pracuje pod bezpečným napätím

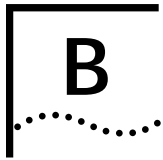


Naprava deluje pod pogoji SELV zaščite (Zaščita z Varnostno Malo Napetostjo) vskladu z IEC 950. Pogoji delovanja so zagotovljeni samo v primeru, če naprava, na katero je priključena, deluje tudi pod zaščito z malo napetostjo.



本装置必須在 SELV (安全特低壓) 的條件下操作。
(根據 IEC 950，唯有連接本裝置的設備也在 SELV 的條件下操作，方可確保本裝置的操作環境正確無誤。)





SCREEN ACCESS RIGHTS

This appendix lists the security access level you must have to be able to access the ATM Module local management screens, and lists the type of action that can be performed for each security level.



This appendix only covers screens specifically associated with ATM functionality. Refer to the user guide which accompanies your IBM 8271 Nways Ethernet LAN Switch for additional screen access rights.

The general actions that can be performed by users for each of the security access levels is as follows:

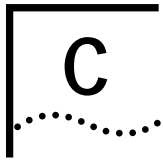
Security/Specialist — read and write
Manager — read and write
Monitor/Secure Monitor — read only

Table B-1 shows the access rights required for each of the ATM screens.

Table B-1 Access Rights

Screen	Available to access level...
ATM Module Configuration	Manager Security
ATM LEC Setup	Security Manager
ATM ARP Table	Manager Monitor Security
ATM Port Setup	Manager Monitor Security
ATM Connection Table	Manager Monitor Security
ATM Physical Layer	Manager Monitor Security
ATM Port Statistics	Manager Monitor Security
ATM VLAN LEC Status	Manager Monitor Security





ATM MODULE TECHNICAL SPECIFICATIONS

Environmental Specifications

The environmental specifications for the ATM Module are shown in Table C-1.

Table C-1 Environmental Specifications

Operating Temperature	0 to 50° C / 32 to 122°F
Operating Humidity	10–95% relative humidity, non-condensing
Standards	EN60068 (IEC68)
Safety	
Agency Certifications	UL 1950, EN60950, CSA 22.2 No. 950, ECMA 97
Electromagnetic Emissions (Agency Certification)	EN55022 Class B, FCC Part 15 Class A, C108.8-M1983 Class A, EN 50082-1 (IEC801 Parts 2-5), EN60555 Part 2

ATM Cable Specification

In addition to adhering to your local standards, all cables must conform to:

The American National Standard ATM Physical Layer Medium Dependent (PMD) standard, ISO.166-1990, American National Standards Institute.

The ATM cable you connect to the ATM Module must conform to the Multi-Mode Fiber (MMF-PMD) standard defined by ANSI x.3-166-1992.

IBM supports 62.5/125mm Multi-Mode Fiber (MMF-PMD). The maximum inter-station distance (including device-to-network connectors) should not exceed 2 kilometers (1.25 miles).

Table C-2 on page C-2 shows the cable specifications for standard multi-mode cabling.

Table C-2 Standard Multi-mode Cable Specifications

Specification	Description
Core	62.5 μ m diameter
Cladding	125 μ m diameter nominal 122 μ m minimum 128 μ m maximum
Numerical aperture	0.275
Maximum attenuation	11dB (including 1dB allowed for reflection and dispersion penalties)
Modal bandwidth	500 MHz.km
Maximum distance between nodes	2km (1.25 miles)
Output power (from transceiver)	-20dB minimum -14dB maximum
Receiver power	-31dB minimum sensitivity -14dB maximum sensitivity



Maximum attenuation includes attenuation and the loss induced by other components such as connectors, splices, and the mating of unlike fiber types. Although some 2km (1.25 miles) cables have a total attenuation of less than 11dB, the 2km (1.25 miles) inter-station distance must be maintained to comply with modal bandwidth requirements.

The maximum attenuation value in this table is based on a cable diameter of 62.5, 80 or 100mm.

Table C-3 shows the alternative Multi-Mode fiber types that can be used.

Table C-3 Alternative Multi-mode Cable Specifications

Core (μ m)	Cladding (μ m)	Numerical Aperture
50	125	0.20
50	125	0.22
85	125	0.28
100	140	0.29

If you are using fiber with a diameter of 50mm and have IBM 8271 Nways Ethernet LAN Switch equipment at both ends of the link, substitute 8.0dB for the maximum attenuation. If IBM 8271 Nways Ethernet LAN Switch equipment is only at one end, substitute 6.0dB for the maximum attenuation value.

If you are using equipment at the end of the link from a vendor other than IBM, you must perform a separate loss budget analysis. Contact the vendor(s) for values to use in your analysis.

Does the Cable Provide Sufficient Bandwidth?

Bandwidth for multi-mode fiber is referred to as modal bandwidth because it varies with the modal field (or core diameter) of the fiber.

Modal bandwidth is specified in units of MHz.km, which indicates the amount of bandwidth supported by the fiber for a 1km (0.625 miles) distance. Your cable must have a Modal bandwidth of 500MHz, which allows the cable to support end-to-end bandwidth of 250MHz at the maximum 2km (1.25 miles) distance.

To check that the bandwidth of your fiber is within an acceptable range:

- 1 Divide the amount of bandwidth available according to the fiber specification by the total length of fiber (km).
- 2 If the result is lower than 250MHz, the link may be prone to bit errors. You should shorten the length of the fiber or use a different fiber until the result of the calculation reaches 250MHz.

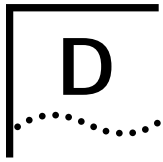
Example:

A cable with modal bandwidth of 500 MHz.km will have 250 MHz of bandwidth at 2km (1.25 miles).

The same cable would have a 500MHz of bandwidth at 1km (0.625 miles).

A fiber cable with a bandwidth specification of 200 MHz.km would have only 100MHz of bandwidth at 2km (1.25 miles), which would not support ATM. In this case, another type of fiber which has a bandwidth of 155MHz would be required.





TROUBLESHOOTING

How to Use this Guide to Troubleshoot

This troubleshooting section describes how to identify the cause of a problem and suggests possible solutions. Troubleshooting has been divided into four sections.

- **Using LEDs**

LEDs on the Switch and ATM Module provide valuable status information that can be used for troubleshooting. You may find it useful to familiarize yourself with these LEDs before reading the troubleshooting suggestions in the following sections.

- **Identify the Problem**

Use this section when you do not know the cause of the problem.

- **Solving a known Problem**

Use this section when you have detected a problem, and want to look up possible solutions. You should read this troubleshooting information in conjunction with the troubleshooting provided in the user guide that accompanies your Switch.

- **Cleaning Dirty Fiber Optic Connectors**

This section tells you how to clean the fiber optic connectors on the ATM Module and connecting cables.



If you have problems that are not addressed by troubleshooting information in this guide, contact IBM Technical Support, or your service person. For Technical Support information refer to Appendix E.

Using LEDs

Table D-1 describes the LEDs on the Switch, and Table D-2 describes the LEDs on the ATM Module.

Table D-1 LEDs on the Switch

LED Name	Color/State	Indicates
MGMT (On the front of the Switch)	Green	Switch and ATM Module are operating normally.
	Green flashing	Switch or ATM Module is either downloading software or initializing, (which includes a <i>Power On Self Test</i>).
	Yellow	Switch has failed its <i>Power On Self Test (POST)</i>
	Yellow flashing	ATM Module failed its <i>Power On Self Test (POST)</i> .
	OFF	No power to the Switch.
Module (On the front of the Switch)	Green	ATM port enabled; link present.
	Green flashing	ATM port disabled; link present.
	Green (long on, short off)	This LED will flash until all configured LECs have successfully joined their ELANs.
	Yellow	ATM agent software is not installed correctly, or the ATM Module has failed its POST (if the MGMT LED is flashing yellow).
	Yellow flashing	Switch has not recognized the ATM Module.
	OFF	The ATM Module is not installed, or a link is not present on the ATM port, or the ATM Switch is not on.

Table D-2 LEDs on the ATM Module

LED Name	Color/State	Indicates
Far End Status (On ATM Module)	Green	The ATM Switch has not detected an error on the ATM Module's <i>transmit</i> link.
	OFF (and Link Status LED is Green)	The ATM Switch at the far end of the connection has detected a problem with the ATM Module's <i>transmit</i> connection, and notified the ATM Module. For example, the <i>transmit</i> half of the ATM Module's cable has been disconnected at either the ATM Module end or ATM Switch end of the connection.
	OFF (and Link Status LED is OFF)	The cable between the ATM Module and ATM Switch has been disconnected.
Link Status (On ATM Module)	Green	A link is present on the ATM port, and the port is receiving valid SONET frames.
	OFF	The Link is not present on the ATM Port.
TX (On ATM Module)	Yellow	The ATM port is transmitting Ethernet, LANE, Signalling or control frames.
	OFF	The ATM port is not transmitting cells.
RX (On ATM Module)	Yellow	The ATM port is receiving data cells.
	OFF	The ATM port is not receiving incoming cells.

Identifying the Problem

This section describes how to identify problems, and suggests possible solutions. Flow diagrams have been used to summarize the process, and each step shown in the flow diagrams is described in more detail in the text.

This section assumes that the following conditions have been met:

- The ATM Module has been installed correctly, as described in Chapter 6, "Installing and Setting Up the Module".
- The device is "alive" when pinged, and can be accessed through the local management screens.
- Both the ATM Module and the ATM Switch or attached ATM device are using the same physical standard; either *SONET STS-3c* or *SDH STM-1*.

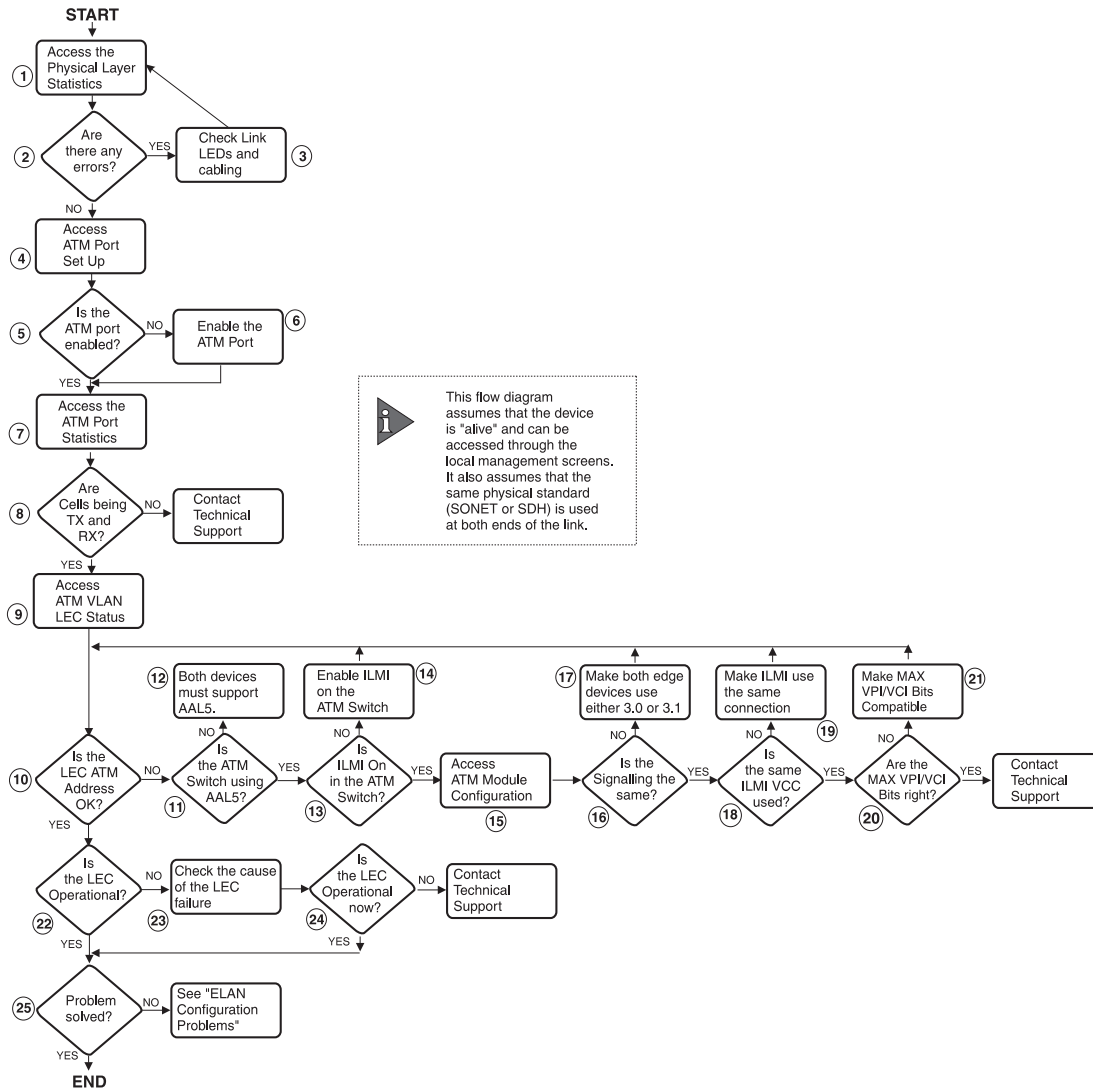


Figure D-1 Troubleshooting Flow Diagram

The numbered steps in this section relate to the numbered steps shown in Figure D-1.

1

Access the Physical Layer Statistics Screen

- a Select the SWITCH MANAGEMENT option from the Main Menu. The Switch Management screen is displayed.
- b Ensure that the Port option is selected in the Management Level field.
- c Ensure that the ATM port number is entered in the Port ID field. For example the ATM port is:
 - Port **13** on an IBM 8271 Nways Ethernet LAN Switch Model 612 and IBM 8271 Nways Ethernet LAN Switch Model 712
 - Port **25** on an IBM 8271 Nways Ethernet LAN Switch Model 624 and IBM 8271 Nways Ethernet LAN Switch Model 524
- d Select the STATS button. The ATM Port Statistics screen is displayed.
- e Select the PHYSICAL button to display the SONET or SDH physical layer statistics. An example of the Physical Layer Statistics screen is shown in Figure D-2.

IBM 8271 Nways Switch ATM Physical Layer Statistics			
Port:	25		
OCD State:	OK		
Current Sample:	157 out of 900 Seconds Elapsed		
Sample Counter	Path	Line	Section
=====	====	====	=====
Errored Seconds (Near):	0	0	0
Errored Seconds (Far):	0	0	0
Severe Errored Sec (Near):	0	0	0
Severe Errored Sec (Far):	0	0	0
Coding Violations (Near):	0	0	0
Coding Violations (Far):	0	0	0
Unavailable Seconds (Near):	0	0	0
Unavailable Seconds (Far):	0	0	0
CANCEL			

Figure D-2 ATM Physical Layer Statistics

2

Are there Physical Layer Errors?

- a If the OCD State field is set to *Fail*, there is a problem with the physical connection.
- b If there are a lot of errors, there is a problem with the physical connection.

Is the error rate high?

Yes — go to step 3.

No — go to step 4.

3

Check the Physical Connections

Check that the Link Status and Far End Status LEDs on the ATM Module are ON and lit green. If one or both of the LEDs is not lit, there is a problem with the physical connection. Follow the troubleshooting information below:

- a Ensure that both devices are powered-up, and that the ports at both ends of the link are enabled.
- b Ensure that the cable is securely connected to the port at both ends of the link.
- c Check each end of the cable to ensure that each of the fiber connectors is correctly connected. If your connectors can be reversed, you may need to reverse the TX and RX cable connectors at one end of the link.
- d Remove any objects obstructing the cable and straighten out any kinks in the cable.
- e If you suspect that the fiber optic connector is dirty, see "Cleaning Dirty Fiber Optic Connectors" in this section.
- f Check that your cable meets the specifications described in "ATM Cable Specification" on page C-1
- g Replace the cable with a cable known to be working, and check the Link Status LED again.
- h If there is still a problem, contact your repair center for advice. For more details, see Appendix E.

4

Access the ATM Port Setup Screen

- a Select the SWITCH MANAGEMENT option from the Main Menu. The Switch Management screen is displayed.
- b Ensure that the *Port* option is selected in the *Management Level* field.
- c Ensure that the ATM port number is entered in the *Port ID* field. For example the ATM port is:
 - Port **13** on an IBM 8271 Nways Ethernet LAN Switch Model 612 and IBM 8271 Nways Ethernet LAN Switch Model 712
 - Port **25** on an IBM 8271 Nways Ethernet LAN Switch Model 624 and IBM 8271 Nways Ethernet LAN Switch Model 524
- d Select the SETUP button to display ATM port setup information. An example of the The ATM Port Setup screen is shown in Figure D-3.

IBM 8271 Nways Switch ATM Port Setup			
Port:	25		
Port Speed:	155 Mbps	Port State:	Enable
Link State:	Present	Lost Links:	0
ULAN LEC States			

1:	LEC Active	2:	LEC Active
3:	LEC Active	4:	LEC Active
5:	LEC Active	6:	LEC Active
7:	LEC Active	8:	LEC Active
9:	LEC Active	10:	LEC Active
11:	LEC Active	12:	LEC Active
13:	LEC Active	14:	LEC Active
15:	LEC Active	16:	LEC Active
OK	CONFIG	ARP TABLE	CONNECTION TABLE CANCEL

Figure D-3 ATM Port Setup Screen

5

Is the ATM Port Enabled?

Is the *Port State* field set to *Enable*?

Yes — go to step 7.

No — go to step 6.

6

Enable the ATM Port

- a Set the *Port State* field to *Enable*.
- b Select the OK button.

7

Access the ATM Port Statistics Screen

- a Select the SWITCH MANAGEMENT option from the Main Menu. The Switch Management screen is displayed.
- b Ensure that the *Port* option is selected in the *Management Level* field.
- c Ensure that the ATM port number is entered in the *Port ID* field.
- d Select the STATS button. The ATM Port Statistics screen is displayed. An example of the Port Statistics screen is shown in Figure D-4.

IBM 8271 Always Switch ATM Port Statistics			
Port ID:	25		
Transmit Bandwidth Used:		26%	
Receive Bandwidth Used:		26%	
Receive Errors:		0%	
AAL5 Layer:			
Frames Received:	4126444042	Octets Received:	2097613219
Frames Transmitted:	4108019450	Octets Transmitted:	918467436
Errored Frames:	0	Discarded Frames:	130237
ATM Layer:			
Cells Received:	68112710	Errored Cells:	0
Cells Transmitted:	31261943	Bad UCC Received:	0
CLEAR SCREEN COUNTERS	LEC	PHYSICAL	CANCEL

Figure D-4 ATM Port Statistics

8

Are Cells being transmitted and received?

ATM generates a continuous stream of cells. If the ATM port has been set up correctly, you should always see cells being transmitted and received on the ATM port (regardless of whether you are transmitting or receiving data).

Check the *Cells Received* and *Frames Transmitted* statistics to see if there is ATM traffic on the connection.

Is there ATM traffic on the port?

Yes — go to step 9.

No — Contact Technical Support.

9

Access the ATM VLAN LEC Status Screen

- a From the Main Menu select the SWITCH MANAGEMENT option. The Switch Management screen is displayed.
- b Ensure that the *Port* option is selected in the *Management Level* field.
- c Ensure that the ATM port number is entered in the *Port ID* field.
- d Select the STATS button. The ATM Port Statistics screen is displayed.
- e Select the LEC button to display the ATM VLAN LEC Status screen. An example of the ATM VLAN LEC Status screen is shown in Figure D-5.

IBM 8271 Nways Switch ATM VLAN LEC Status			
Port ID:	25		
Select the VLAN to be monitored in the field below:			
VLAN:	[1]		
LEC State:	Active		
LEC ELAN Name:	e1an4212_0		
LEC ATM Address:	47000000000000000000000000000000:08004e08ebf8:00		
Last LEC Failure Reason:	None		
LEC Operation at Failure:	None		
Frames Received:	483905118	Octets Received:	90586714
Frames Transmitted:	462252145	Octets Transmitted:	3814474626
CLEAR SCREEN COUNTERS		CANCEL	

Figure D-5 ATM VLAN LEC Status Screen

10

Is the LEC ATM Address Valid for the Default VLAN?

Check that the ATM address in the LEC ATM Address field is valid. For example, if the first part of the address (the network prefix) is all zeros the ATM Switch has not registered the ATM Module's LEC.

You can confirm that the ATM address of the LEC for the default VLAN is registered by checking the registered address table on the adjacent ATM Switch.

Is the ATM address valid and registered with the ATM Switch?

Yes — go to step 22.

No — go to step 11.

11

Is the ATM Switch Using AAL5?

It is very unlikely that your network has been configured to use incompatible devices, but to rule out the possibility, check that the ATM Switch uses the AAL5 protocol.

Does the ATM Switch also use AAL5?

Yes — go to step 13.

No — go to step 12.

12

Both Devices Must be AAL5 Compliant

The ATM Module is compatible with AAL5 ATM devices. If the ATM Switch connected to the ATM Module does not support AAL5, you will not be able to get the two devices to communicate. Re-configure your network to ensure that the ATM devices are compatible.

13

Is ILMI Turned On?

Some devices enable you to turn the *Interim Local Management Interface (ILMI)* on and off. ILMI on the ATM Module is set to ON and cannot be configured through the local management screens.

Check the user guides that accompany your ATM Switch, to see if you can configure ILMI, and check to see if it is turned on.

Is ILMI turned on at the ATM Switch?

Yes — go to Step 15.

No — go to Step 14.

14

Turn ILMI On

Turn ILMI on at the ATM Switch. Refer to the user guide that accompanies your ATM Switch.

15

Access the ATM Module Configuration Screen

From the Main Menu select the ATM CONFIGURATION option. An example of the ATM Module Configuration screen is shown in Figure D-6.

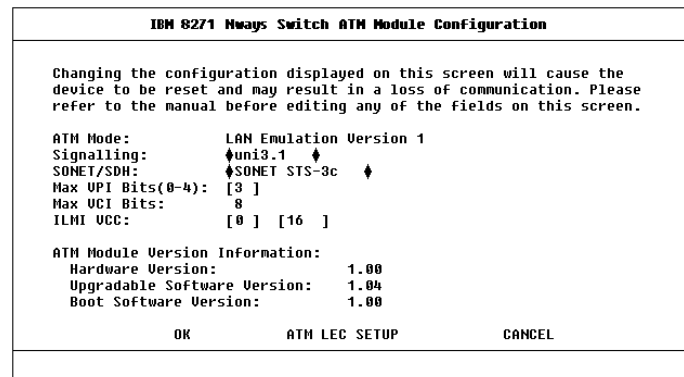


Figure D-6 ATM Module Configuration Screen

16

Is Signalling Compatible?

Signalling must be the same on both devices, and must be either 3.0 or 3.1. The default on the ATM Module is 3.1.

Is the Signalling compatible?

Yes — go to 18.

No — go to 17.

17

Make Signalling Compatible

Ensure that the *Signalling* mode is the same on the ATM Module and the ATM Switch.

18

Is the ILMI Connection Set Up Correctly?

To communicate with each other, edge-devices must use the same *Interim Local Management Interface (ILMI)* connection.

On the ATM Module the ILMI connection is specified in the *ILMI VCC* field, as shown in Figure D-6 on page D-9.

Consult the user guide that accompanies the ATM Switch to find out where the ILMI connection is specified.

Is the ILMI connection the same for the ATM Module and the ATM Switch?

Yes — go to step 20.

No — go to step 19.

19

Make ILMI VPI/VCI Same at Both Ends of the Link

Ensure that the ILMI VPI and VCI values are the same on both the ATM Module and the relevant ATM Switch port.

In most cases you should probably use the standard ILMI VPI/VCI values: VPI = 0, VCI = 16.

20

Are the MAX VPI and VCI Bits Compatible?

To communicate with each other, edge-devices must use compatible *MAX VPI Bits* and *MAX VCI Bits* settings. The *MAX VPI Bits* and *MAX VCI Bits* settings determine how many bits are used within each cell header to define the value of the VPI and VCI. The VPI and VCI values identify the connection.

Some ATM devices automatically negotiate the number of bits used for the VPI and VCI fields. In this situation you would only change the number of bits if you want to increase the number of bits used by both ATM devices.

On the ATM Module these settings are shown on the ATM Module Configuration screen, see Figure D-6 on page D-9. The default setting for *MAX VPI Bits* is 3, and 8 for *MAX VCI Bits*.

Refer to the ATM Switch user guide to find out how to locate these settings on your ATM Switch.

Are the settings compatible?

Yes — If you are still experiencing problems, contact Technical support.

No — go to step 21.

21

Make the MAX VPI and VCI Bits Compatible

Ensure that the *MAX VPI Bits* and *MAX VCI Bits* settings are compatible.

22

Is the LEC Operational?

Using the ATM VLAN LEC Status screen, described in step 9, check the *Last LEC Failure Reason*.

Is the *Last LEC Failure Reason* field set to *None*?

Yes — the LEC is operational. Go to step 25.

No — go to step 23.

23

Why has the LEC Operation Failed?

There are two fields on the ATM VLAN LEC Status screen, described in step 9, that can be used to troubleshoot LEC failure problems. The *LEC Operation at Failure* field identifies the operation that was taking place when the LEC failed to successfully join the Emulated LAN Services. The *Last LEC Failure Reason* field identifies the probable cause of the problem.

Use Table D-3, in conjunction with Table D-4 on page D-12 to try and resolve the problem.

Table D-3 LEC Operation at Failure

Operation	Description
None	There are no known operation failures.
Calling LECS	The LEC is trying to connect to the LECS to receive LANE configuration information.
Reading Configuration from LECS	The LEC receives configuration information from the LECS in preparation for joining the LES.
Joining LES	The LEC is trying to join the ELAN by registering itself with the LES that controls that ELAN. When the LEC has joined the LES, it is given a unique <i>LAN Emulation Client Identifier (LECID)</i> , knows the Emulated LAN's maximum frame size, and knows its LAN type (either Ethernet or Token Ring).
Initial Registration	After joining, a LEC can register any number of MAC addresses and/or Route Descriptors (for Token Ring implementations).
Connecting to BUS	In order to establish a connection to the <i>Broadcast and Unknown Server (BUS)</i> the LEC requires the broadcast address. It requests the broadcast address from the LES.
Operational	The LEC is now part of the ELAN.

Table D-4 Last LEC Failure Reason

State	Possible Causes	Possible Solutions
None	The LEC is either inactive or has successfully completed the operation.	None required.
Timeout A task could not be completed within its allotted time frame.	The software has been set up to use a LECS, but a LECS is either not present on the network or broken.	If there is a LECS on your network, ensure that it is operational and on part of the network that can be accessed by the ATM Module. If a LECS is not present on the network, you must enter the LES Address for each ELAN manually using the ATM VLAN Setup Screen (see "Extending VLANs into the ATM Network" on page 8-4).
	The LES for the ELAN is not functioning correctly	Contact Technical Support.
Undefined Error An error has occurred but no cause can be identified.	Unknown.	Contact Technical Support.
Version Not Supported LANE 1.0 not supported.	The LANE services you are trying to connect to, do not support LANE version 1.0.	Ensure that the LANE Services use LANE 1.0.

(continued)

Table D-4 Last LEC Failure Reason (continued)

State	Possible Causes	Possible Solutions
Invalid Request Parameters	The LEC may be requesting a resource that is on an ELAN which has a different LAN type to the LEC.	Check the underlying media for both the ELAN and the LEC requesting the service.
The LES/LECS has rejected a request from the LEC because the request parameters were incompatible with the ELAN.	The frame size used could be wrong.	Check the frame sizes being used.
Duplicate LAN Destination	The LES has received a request from a LEC which contains a MAC address already registered to another LEC on the same ELAN.	Ensure that MAC addresses are unique.
A destination source MAC address duplicates a previously registered MAC address.	You may have accidentally entered the same MAC addresses twice.	

(continued)

Table D-4 Last LEC Failure Reason (continued)

State	Possible Causes	Possible Solutions
Duplicated ATM Address	The LES has received a request from a LEC which contains an ATM address already registered to another LEC on the same ELAN.	Ensure that ATM addresses are unique. Check the LES database for duplicate addresses.
A source ATM address duplicates a previously registered ATM address.	For example, if a LES is faulty, when a LEC disconnects from the LES, the LES might fail to register the change. When the LEC tries to rejoin the LES, the LES still has that LEC's ATM address in its database, and thinks that two devices have the same ATM address. You may have accidentally entered the same ATM addresses twice.	

(continued)

Table D-4 Last LEC Failure Reason (continued)

State	Possible Causes	Possible Solutions
Insufficient Resources	Too many connections have been requested and the tables used by the LES may be full, and the connection cannot be set up.	You may wish to consider extending or restructuring your network.
There are insufficient resources to grant a request.	The ATM Switch is busy and cannot provide LECS functionality. There is a mismatch between the VPI/VCI range supported by adjacent ATM devices.	Use a separate ATM Switch for LECS functionality. Make the MAX VPI/VCI Bits compatible.
	Example: If Switch A supports VPI/VCI values 7:511 and Switch B only supports values up to 7:255, when Signalling tries to set up a connection using the VPI/VCI value 7:256, Switch B rejects the connection.	
Access Denied	The LEC is trying to join an ELAN that it is not allowed to access.	Check your LANE Services setup.
The LES has denied the LEC access to the ELAN for security reasons.		

(continued)

Table D-4 Last LEC Failure Reason (continued)

State	Possible Causes	Possible Solutions
Invalid Requestor ID	There is a problem with the LEC software.	Contact Technical Support.
The LEC Identifier (LECID) is not zero, or is not recognized as this LEC's LECID.		
Invalid LAN Destination	You may have configured an illegal Local Administration Address.	Check that the Local Administration Address is valid.
You are trying to register a multicast address with the LES.		
Invalid ATM Address	The ATM address field may have been corrupted or not in the correct format.	Contact your supplier or Technical Support.
Source or destination ATM address is not in a recognized format.		
For example, it may be in E.164 when OSI N-SAP address coding is required.		
No Configuration	The MAC address may be invalid.	Check that each MAC address on your network is unique.
The LECS/LES does not recognize the LEC or the requested ELAN		
The LEC may be requesting a resource that is on an ELAN which has a different LAN type to the LEC.		
You may have entered an invalid ELAN name.		
Check that the ELAN name is correct, and the ELAN has been set up correctly.		

(continued)

Table D-4 Last LEC Failure Reason (continued)

State	Possible Causes	Possible Solutions
LE_CONFIGURE Error	The information provided by the LEC may be invalid.	As this state is used to indicate a range of problems, you should check the other states and solutions described in this table. If this does not resolve the problem contact Technical Support.
This state may be given to refuse a service without giving a specific reason.		
Check that the ELAN name is correct, and the ELAN has been set up correctly.		
You may have entered an invalid ELAN name.		
Insufficient Information	The MAC address may be invalid.	Check that each MAC address on your network is unique.
The LEC has not provided sufficient information to allow the LECS to assign it to a specific ELAN.		
The LEC may be requesting a resource that is on an ELAN which has a different LAN type to the LEC.		
You may have entered an invalid ELAN name.		
Check that the ELAN name is correct, and the ELAN has been set up correctly.		

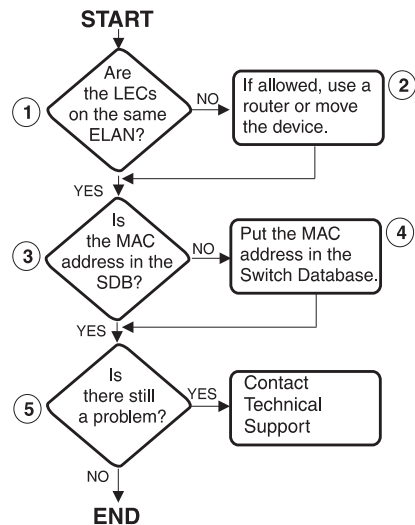
24

Is the LEC Operational Now?**Yes** — Go to step 25.**No** — Contact Technical Support. Refer to Appendix E.

25

Has the Problem been Solved?**Yes** — No further action is required.**No** — There may be a configuration problem with your network, see “ELAN Configuration Problems”.**ELAN Configuration Problems**

Figure D-7 shows a flow diagram to help you resolve problems associated with *Emulated LAN (ELAN)* configuration. The steps shown in the flow diagram are described in detail in the following text.

**Figure D-7** ELAN Configuration Flow Diagram

1

Are the LECs on the Same Emulated LAN?

Check that the LECs on the ATM devices that wish to communicate are on the same Emulated LAN, and that they are on the same LAN technology. If the LECs are not on the same ELAN and LAN type, they will not be able to communicate (except through the use of a routing protocol).

Are the LECs on the same ELAN and LAN type?

Yes — go to step 3.**No** — go to step 2.

2

Re-map or Route the LEC

Devices will not be able to communicate with each other if they are on different ELANs or use different LAN types, for example, if one device is on a Fast Ethernet LAN and the other is on a Token Ring LAN.

Check that you really wish the end-devices to communicate with each other and that they use the same LAN type. If the answer is yes you should either move one of the LECs or use routing, as described below:

Move one of the LECs

Move one of the LECs onto the same ELAN as the other LEC. On the ATM Module you can assign a LEC to a different ELAN as follows:

- a Select the ATM CONFIGURATION option from the Main Menu. The ATM Module Configuration screen is displayed, as shown in Figure D-6. Select the ATM LEC SETUP button.

An example of the ATM LEC Setup screen is shown in Figure D-8.

- b Select the VLAN associated with the LEC that you wish to move.
- c Either enter the ATM address of the LES that the LEC is going to join, or select LECS.
- d In the ELAN name field, enter the name of the ELAN that the LEC is now to join and select the APPLY button.

IBM 8271 Mways Switch ATM LEC Setup	
Select APPLY after configuring the LEC parameters for each VLAN. Selecting another VLAN will discard any edits that have not saved using APPLY	
Select the VLAN to be configured:	[1]
Is this VLAN to be connected to an ELAN?	◆Yes◆
Is the LES Address to be entered manually or obtained from the LECS?	◆LECS◆
Enter the name of the ELAN that this VLAN is to join:	[admin]
APPLY	CANCEL

Figure D-8 ATM VLAN LEC Setup

Use routing

Devices on one Emulated LAN can only communicate with devices on another Emulated LAN using routing protocols. Routing is outside the scope of this user guide. Consult the user guide that accompanies your router.

3

Is the MAC Address in the Switch Database?

If the MAC Address of a device connected to an Ethernet port on the Switch is not entered in the Switch Database, none of the LECs on the Switch can act as a proxy for that device. All LE_ARP requests will fail to locate the MAC address, and the requesting LEC will not be able to map an ATM address to that MAC address.

If a LEC fails to map an ATM address to a MAC address, locate the device with that MAC address.

Is the MAC address in the Switch Database of the Switch connected to the device with that MAC address?

Yes — Go to step 5.

No — Go to step 4.

4

Enter the MAC Address in the Switch Database

There are several reasons why the MAC address is not in the Switch Database:

- The Switch Database is full.
- The entry may have timed-out.
- There may have been a problem with the physical connection between the device and the Ethernet port on the Switch.

Identify the problem, and ensure that the MAC address is added to the Switch Database.

5

Is There Still a Problem?

Yes — Contact Technical Support. Refer to Appendix E.

No — No further action is required.

Solving Known Problems

Use this section if you have already pin-pointed the problem, and wish to look up possible solutions. Solutions are presented as a series of tables, and each table relates to a logical problem area:

- Power Supply problems
- *Power On Self Test (POST)* failure
- Cable connection problems
- ATM problems
- VLAN or ELAN problems

Power Supply Problems

Table D-5 Power Supply Problems

Problem	Possible Causes	Possible Solutions
Switch does not power up	<ul style="list-style-type: none"> ■ Insufficient power supply to the Switch ■ System is not receiving power ■ Power supply malfunction ■ Blown fuse 	<ul style="list-style-type: none"> ■ If the Switch does not power-up correctly when the ATM Module is installed, you may require a different power supply. Refer to the Release Notes for information about IBM power supplies. ■ Check that the power supply is plugged into the device and power outlet. ■ Check that the main power supply switch on the wall is set to the ON position. ■ Check, and if necessary change, the fuse. Refer to the user guide that accompanies your Switch for details about changing fuses and safety instructions. ■ Replace the power cable. ■ Contact IBM Technical Support.
Switch powers up but then shuts itself down after a few minutes	<ul style="list-style-type: none"> ■ Insufficient power supply. ■ Wiring closet is too hot ■ Vents are blocked ■ System fans are not operating 	<ul style="list-style-type: none"> ■ If the Switch powered-up correctly before the ATM Module was installed, there may be insufficient power available to power the Switch under heavy traffic conditions. Refer to the Release Notes. ■ Check that the room temperature does not exceed 50°C (122°F), and that the Switch is positioned correctly so that it has adequate ventilation. <p>If the temperature exceeds the recommendations, lower the thermostat and wait for the room to reach the correct temperature range.</p> <p>Restart the Switch. If the Switch turns itself off again, contact IBM Technical Support.</p>
Circuit breaker trips	<ul style="list-style-type: none"> ■ External wiring problem ■ Power supply failure 	<ul style="list-style-type: none"> ■ Turn the Switch off. <p>Check with your local electricity supplier or company electrician that there is not an external electricity problem.</p> <p>If you suspect the problem is caused by an IBM device, contact IBM Technical Support.</p>

Power On Self Test (POST) Failure

Table D-6 Power On Self Test (POST) Failure

Problem	Possible Causes	Possible Solutions
Switch Fails Power On Self Test (POST) MGMT LED is Yellow	<ul style="list-style-type: none"> ■ The version of software on your Switch is not correct. ■ There is a hardware problem with the Switch. 	<ul style="list-style-type: none"> ■ Upgrade the version of software on the Switch. ■ Contact Technical Support.
ATM Module Fails Power ON Self Test (POST) MGMT LED is Yellow flashing	<ul style="list-style-type: none"> ■ The version of software on your ATM Module is not correct or has become corrupted. ■ There is a hardware problem with the ATM Module. 	<ul style="list-style-type: none"> ■ Upgrade the version of software on the ATM Module. ■ Contact Technical Support.

Cable Connection Problems

Table D-7 Cable Connection Problems

Problem	Possible Causes	Possible Solutions
<p>Link Status LED indicates that there is a problem with a link.</p>	<ul style="list-style-type: none"> One or both of the ATM ports forming the connection are turned off (disabled). 	<ul style="list-style-type: none"> Ensure that both ports are enabled.
<p>Far End Status LED indicates that there is a problem with the ATM Module's transmit connection.</p>	<ul style="list-style-type: none"> The cable at either end of the link has become loose or accidentally disconnected. The two connectors at one end of the fiber cable may be plugged into the port the wrong way around. The fiber optic is caught under a heavy object or become bent out of shape. The cable connector may be dirty. The cable may be broken. The connector itself is physically damaged. 	<ul style="list-style-type: none"> Ensure that the cable is securely connected to the port at both ends of the link. Check each end of the cable to ensure that each of the fiber connectors is correctly connected. You may need to reverse the TX and RX cable connectors at one end of the connection. Remove any obstructions and straighten out any kinks in the cable. If you suspect that the fiber optic connector is dirty, refer to "Cleaning Dirty Fiber Optic Connectors" in this chapter. Replace the cable, and check the LED again. Contact your repair center for advice. For more details, refer to Appendix E.

ATM Problems

Table D-8 ATM Problems

Problem	Possible Causes	Possible Solutions
<p>The ATM Connection Table is only showing reserved ATM Connections</p> <p>Symptoms:</p> <ul style="list-style-type: none"> ■ The VLAN LEC Status screen, described in "ATM VLAN LEC Status" on page 9-5, shows that the LEC is <i>Inactive</i> and there is no network prefix for the LEC ATM address. 	<ul style="list-style-type: none"> ■ The ATM Switch connected to the ATM Module is using a different VPI:VCI value for ILMI. 	<ul style="list-style-type: none"> ■ Check that the devices at both ends of the connection are using the same ILMI VPI:VCI. ■ Check version of signalling in use. The ATM Switch must use version 3.0 or 3.1 to be able to communicate with the ATM Module.

VLAN or ELAN Problems

Table D-9 VLAN or ELAN Problems

Problem	Possible Causes	Possible Solutions
<p>The configured LECs cannot communicate with each other</p> <p>Possible symptom: The <i>Last LEC Failure Reasons</i>, described in Table D-4 on page D-12, is <i>LE_CONFIGURE</i> or similar error type.</p>	<ul style="list-style-type: none"> ■ The devices that need to communicate are not in the same VLAN/ELAN. 	<ul style="list-style-type: none"> ■ Check that the ELAN name has been set up correctly. ■ Check LAN Emulation supported on the ATM Switch. The ATM Switch must use LAN Emulation Version 1.0. ■ Check that the correct VPI/VCI are used and that there they have not been mismatched. Refer to "<i>Intermittent failure of a configured LEC to connect to the LECS or LES</i>" below. ■ Ensure that both LECs are within the same VLAN/ELAN. LECs not in the same VLAN/ELAN can only communicate using a router.
<p>Insufficient Resources</p>	<ul style="list-style-type: none"> ■ Excessive traffic is overloading the ATM device, and it does not have sufficient resources to assign new connections. ■ A LEC requires a separate connection for each LEC with which it needs to communicate. If you try to bring up all of the connections at the same time, the ATM Module may run out of connections. 	<ul style="list-style-type: none"> ■ You may need to reconfigure or restructure your network. For example, you may wish to use a separate ATM Switch for LECS functionality. ■ Do not try to bring up too many connections at the same time. ■ You may need to reconfigure or restructure your network.

Table D-9 VLAN or ELAN Problems

Intermittent failure of a configured LEC to connect to the LECS or LES

Symptom:

- Insufficient resource error message.
- LECs fail but seem to automatically recover.

- The MAX VPI Bits and MAX VCI Bits settings are incompatible between ATM devices. For example, if auto-configuration is not enabled, and the MAX VPI/VCI Bits have been set up incorrectly.
- Each ATM device supports a separate and sometimes different pre-set range of VPI/VCI values. When Signalling tries to set up the VPI/VCI values for a connection, it automatically suggests the next available value in a pre-set range of values supported by the source Switch. If the adjacent ATM Switch does not support these values, it rejects the connection, and an insufficient resource error message is displayed.

Example:

If Switch A supports VPI/VCI values 7:511 and Switch B only supports values up to 7:255, when Signalling tries to set up a connection using the VPI/VCI value 7:256, Switch B rejects the connection.

Identify the connection that is causing the problem. The following steps should be carried out in order:

- 1 Check that the MAX VPI/VCI Bits are compatible on the edge-device to ATM Switch User-to-Network interface (UNI).
- 2 Check that the MAX VPI/VCI Bit settings are compatible on all devices between the edge-device and the LECS.
- 3 Check that the MAX VPI/VCI Bit settings are compatible on all ATM devices between the LEC and the LES.

When you have identified the connection, manually reconfigure the VPI/VCI values to make them compatible.



If you have problems that are not addressed by troubleshooting information in this guide, contact Technical Support, or your service person. For Technical Support information refer to Appendix E.

Cleaning Dirty Fiber Optic Connectors



To prevent dirt and dust from collecting on the fiber optic connectors, avoid touching all surfaces after cleaning the connectors, and keep all unused ports covered.

Fiber optic transceivers are sensitive optical devices that need to be handled carefully. If dirt collects on the fiber optic connectors, you may notice the following:

- The Link Status LED (for the receive fiber) on the ATM Module does not light.
- The Far End Status LED does light.
- Degraded performance on that port, indicated by an increase in the Errors Received statistic counter. The Errors Received statistic counter is described in “ATM Port Statistics” on page 9-3.

To clean fiber optic connectors on the ATM Module:

- 1 Remove any accumulated dust or debris from the connector by blowing canned air over all surfaces.

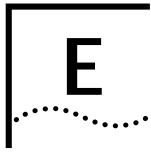
Do not use commercial compressed air or house air, because of the risk of oil contamination.

- 2 Reconnect the cable to the port to see if the dusting corrected the problem.

If the LED still indicates a problem, clean the cable connectors.

To clean the cable connectors:

- 1 Gently wipe the port with a lint-free, non-abrasive swab.
- 2 Gently wipe the connectors with a lint-free, non-abrasive wipe or pad.



TECHNICAL SUPPORT AND SERVICE

This appendix provides contacts for help if you have questions about the IBM 8271 Nways Ethernet LAN Switch products or if the IBM 8271 Nways Ethernet LAN Switch products are not working correctly. It also explains how to access the IBM electronic sites to obtain the latest versions of microcode and release notes.

Electronic Support

This section explains how to access the IBM electronic site to obtain the latest version of microcode, drivers, and software by using the Internet World Wide Web, FTP, or the IBM BSS.

WWW

`http://www.networking.ibm.com/`

This is the IBM Networking home page. From here, you can access product announcements, publications, and other information regarding hardware and software updates, and a technical support information database. The direct path to the support area is:

`http://www.networking.ibm.com/nes/neshome.html`

FTP

`lansupport.raleigh.ibm.com`

IBM Bulletin Board System

Using a modem you can access the IBM BSS to obtain the latest versions of software. Set your modem and communications software to:

- 8 data bits
- no parity
- 1 stop bit

Dial one of the following numbers:

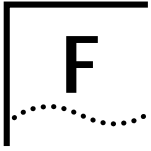
- United States: (919) 517-0001
- Toronto (905) 316-4255
- Vancouver: (604) 664-6464
- Montreal: (514) 938-3022

Voice Support

IBM Network Hardware support: 1-800-772-2227. Follow the menu prompts for Network Hardware.

For support outside of the United States, please contact your IBM marketing representative or IBM reseller.





NOTICES, TRADEMARKS, AND WARRANTIES

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any of IBM's intellectual property rights may be used instead of the IBM product, program, or service. Evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, are the user's responsibility.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Licensing, IBM Corporation, 500 Columbus Avenue, THORNWOOD NY 10594 USA.

Trademarks

The following terms are trademarks of the IBM Corporation in the United States or other countries or both:

IBM, Nways

SmartAgent is a registered trademark, and PACE is a trademark, of 3Com Corporation.**

VT100 is a trademark of Digital Equipment Corporation.

Novell is a registered trademark of Novell, Incorporated. IPX is a trademark of Novell, Incorporated.

Other company, product, and service names, which may be denoted by a double asterisk (**), may be trademarks or service marks of others.

Statement of Limited Warranty

The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you originally purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. If you have any questions, contact IBM or your reseller.

Machine: IBM 8271 Nways Ethernet LAN Switch ATM OC-3c Module

Warranty Period*: 1 Year

*Contact your place of purchase for warranty service information.

Production Status

Each Machine is manufactured from new parts, or new and used parts. In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's warranty terms apply.

The IBM Warranty for Machines

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications. The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your receipt is the Date of Installation, unless IBM or your reseller informs you otherwise.

During the warranty period IBM or your reseller, if authorized by IBM, will provide warranty service under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

For IBM or your reseller to provide warranty service for a feature, conversion, or upgrade, IBM or your reseller may require that the Machine on which it is installed be 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many of these transactions involve the removal of parts and their return to IBM. that are provided on an exchange basis. You represent that all removed parts are genuine and unaltered. A part that replaces a removed part will assume the warranty service status of the replaced part.

If a Machine does not function as warranted during the warranty period, IBM or your reseller will repair or replace it with one that is at least functionally equivalent, without charge. The replacement may not be new, but it will be in good working order. If

IBM or your reseller is unable to repair or replace the Machine, you may return it to your place of purchase and your money will be refunded.

If you transfer a Machine to another user, warranty service is available to that user for the remainder of the warranty period. You should give your proof of purchase and this Statement to that user. However, for machines which have a life-time warranty, this warranty is not transferable.

Warranty Service

To obtain warranty service for the Machine, you should contact your reseller or call IBM. In the United States, call IBM at 1-800-IBM-SERV (426-7378). In Canada, call IBM at 1-800-465-6666. You may be required to present proof of purchase.

IBM or your reseller will provide certain types of repair and exchange service, either at your location or at IBM's or your reseller's service center, to restore a Machine to good working order.

When a type of service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item. Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alter-

ations, and attachments not under warranty service. You also agree to ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange.

You agree to:

- 1 obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
- 2 where applicable, before service is provided —
 - a follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provide,
 - b secure all programs, data, and funds contained in a Machine, and
 - c inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, a Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Extent of Warranty

IBM does not warrant uninterrupted or error-free operation of a Machine.

The warranties may be voided by misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, removal or alteration of Machine or parts identification labels, or failure caused by a product for which IBM is not responsible.

THESE WARRANTIES REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. IN THAT EVENT SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD.

Limitation of Liability

Circumstances may arise where, because of a default on IBM's part or other liability (including negligence and misrepresentation), you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), IBM is liable only for:

- 1 Damages for bodily injury (including death) and damage to real property and tangible personal property; and
- 2 The amount of any other actual direct damages or loss, up to the greater of US\$100,000 or the charges (if recurring, 12 months' charges apply) for the Machine that is the subject of the claim.

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR LOSSES OR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS OR SAVINGS), EVEN IF IBM OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU.

This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

Electronic Emission Notices

Federal Communications Commission (FCC) Statement

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. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canadian Department of Communications (DOC) Compliance Statement

This equipment does not exceed Class A limits per radio noise emissions for digital apparatus, set out in the Radio Interference Regulation of the Canadian Department of Communications. Operation in a residential area may cause unacceptable interference to radio and TV reception requiring the owner or operator to take whatever steps are necessary to correct the interference.

Avis de conformité aux normes du ministère des Communications du Canada

Cet équipement ne dépasse pas les limites de Classe A d'émission de bruits radioélectriques pour les appareils numériques, telles que prescrites par le Règlement sur le brouillage radioélectrique établi par le ministère des Communications du Canada. L'exploitation faite en milieu résidentiel peut entraîner le brouillage des réceptions radio et télé, ce qui obligerait le propriétaire ou l'opérateur à prendre les dispositions nécessaires pour en éliminer les causes.

European Union (EU) Statement

This product is in conformity with the protection requirements of EU Council Directive 89/336.EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class B Information Technology Equipment according to CISPR22/European Standard EN 55022. The limits for Class B equipment were derived for typical residential environments to provide reasonable protection against interference with licensed communication devices.

Zulassungsbescheinigung Laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 30. August 1995 (bzw. der EMC EG Richtlinie 89/336)

Dieses Gerät ist berechtigt in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die IBM Corporation. Deutschland Informationssysteme GmbH, 70548 Stuttgart.

Informationen in Hinsicht EMVG Paragraph 3 Abs. (2) 2:

Das Gerät erfüllt die Schutzanforderungen nach EN.50082-1 und EN 55022 Klasse B.

EN 50082-1 Hinweis:

“ Wird dieses Geräte in einer industriellen Umgebung betrieben (wie in EN 50082-2 festgelegt), dann kann es dabei eventuell gestört werden. In solch einem Fall ist der Abstand bzw. die Abschirmung zu der industriellen Störquelle zu vergrößern.

Anmerkung:

Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den IBM Handbüchern angegeben, zu installieren und zu betreiben.

Properly shielded and grounded cables and connectors must be used in order to reduce the potential for causing interference to radio and TV communications and to other electrical or electronic equipment. Such cables and connectors are available from IBM authorized dealers. IBM cannot accept responsibility for any interference caused by using, other than recommended cables and connectors

Japanese Voluntary Control Council for Interference (VCCI) Statement Class B

This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this equipment is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

Korean Communications Statement

Please note that this device has been approved for business purpose with regard to electromagnetic interference. If you find this is not suitable for your use, you may exchange it for a non-business purpose one.

대한민국 통신문

이 기기는 업무용으로 전자파 적합증을 받은 기기이오니 X까지 또는 사용하지는 이 점을 주의해서 바라며, 민와 같은 구입하였을 때에는 구입한 곳에서 비업무용으로 교환해서 바라립니다.

Information To The User

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the equipment with respect to the receiver.
- Move the equipment away from the receiver.
- Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

How to Identify and Resolve Radio-TV Interference Problems

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

In order to meet FCC emissions limits, this equipment must be used only with cables which comply with IEEE 802.3.

GLOSSARY

AAL

ATM Adaptation Layer — A set of protocols that translate user higher-layer protocols into ATM cell format. The AAL is divided into the Convergence Sublayer (CS) and the Segmentation and Reassembly (SAR) sublayer.

ANSI

American National Standards Institute. A United States technology standards organization.

ARP

Address Resolution Protocol — See LE_ARP.

ASIC

Application Specific Integrated Circuit.

ATM

Asynchronous Transfer Mode — A connection oriented transmission protocol based on fixed length cells (packets) of 53 bytes (including a 5-byte cell header) in length.

The ATM concept was defined by ANSI and ITU (formerly CCITT) for carrying a complete range of user traffic, including voice, data and video signals, on any User-To-Network Interface (UNI).

ATM Forum

A consortium of organizations representing vendors, manufacturers, carriers, service providers, universities, research groups, consultants and users.

The ATM Forum recommends and defines specifications for ATM standards, promotes industry cooperation in the implementation of ATM technologies, and encourages the use of ATM products and services.

ATM Switch

An ATM device responsible for switching the cells.

B-ISDN

Broadband Integrated Services Digital Network — A protocol platform to support the integrated, high-speed transmission of data, audio and video in a seamless fashion. ATM emerged as a suitable transport standard.

BUS

Broadcast and Unknown Server — A server that forwards multicast, broadcast and unknown destination address traffic to the LECs attached to the Emulated LAN.

Byte

An Octet or 8 bits of data.

Cell

Basic ATM transmission unit. It is a 53-byte packet, consisting of a 5-byte header and a 48-byte payload. User traffic is segmented into cells at the source and reassembled at the destination.

Cell Header

The 5-byte ATM cell header contains control information regarding the destination path and flow control.

More specifically it contains the following fields: GFG, VPI, VCI, PTI, CLP and HEC.

CLP

Cell Loss Priority — A 1-bit field in the ATM cell header that corresponds to the loss priority of a cell. Lower priority (CLP = 1) cells can be discarded under congestion situations.

connectionless

Communications service where packets are transferred from source to destination without the need for a pre-established connection.

connection oriented

Communications service where an initial connection between the end points (source and destination) must be set up prior to data transmission. ATM and Frame Relay are Connection Oriented.

E.164

An 8-byte address format. In ATM it is typically used in public networks and it is provided by the telecommunication carriers, while 20-byte NSAP (Network Service Access Point) format addresses are used within private networks.

EFCI

Explicit Forward Congestion Indication — A 1-bit field in the PTI that contains information about whether congestion at an intermediate node has been experienced. The EFCI bit is set when a threshold (for example, buffer contents) has been exceeded.

ELAN

Emulated LAN — See *LAN Emulation*.

firewall

Isolation of LAN segments from each other to protect data resources and help manage traffic.

Flash EPROM

EPROM (Erasable Programmable Read-Only Memory) technology providing non-volatile storage that can be electrically erased in the circuit and reprogrammed; developed by Intel and licensed to other semi-conductor companies.

Flow Control

A method used in networking for congestion avoidance and traffic regulation.

GFC

Generic Flow Control — A 4-bit field in the ATM cell header in order to support multiplexing functions. Its default value is '0000', when the GFC protocol is not enforced. The GFC mechanism is intended to support simple flow control in ATM connections.

HEC

Header Error Control or Header Error Check — A 1-byte field in the cell header used for the header error detection and correction. Due to the importance of the information contained in the header, HEC is a useful and important field.

ILMI

Interim Local Management Interface — Published by the ATM Forum, this standard provides extra diagnostic, monitoring and configuration services at the User-to-Network Interface (UNI). It uses the Simple Network Management Protocol (SNMP) and a MIB.

LAN Emulation (LANE)

A technique that specifies the interfaces and protocols needed for providing LAN-supported functionality and connectivity in an ATM Environment. LANE allows existing LAN protocols to interoperable with the ATM protocols, interfaces and devices.

LE_ARP

LAN Emulation Address Resolution Protocol — The ARP used in LAN Emulation for binding a requested ATM address to the MAC address.

LEC

LAN Emulation Client — Typically located in an ATM end-system (for example, an ATM Module or ATM Switch), its task is to maintain address resolution tables and to forward data traffic. It is uniquely associated with an ATM address.

LECS

LAN Emulation Configuration Server — A server whose main function is to provide configuration information to a LEC (such as the ELAN it belongs to or its LES).

LES

LAN Emulation Server — A server that provides support for the LAN Emulation address resolution protocol (LE_ARP). The LECs register their own ATM and MAC addresses with the LES. A LES is uniquely identified by an ATM address.

link

Physical connection between two nodes in a network. It can consist of a data communication circuit or a direct channel (cable) connection.

MIB

Management Information Base — A data structure that defines objects for referencing variables such as integers and strings. In general, it contains information regarding a network's management and performance, for example, traffic parameters.

multiplex

In this user guide, multiplexing means to take packets from several sources and interleave them into one connection. For example, packets from data, voice, and video sources can be fed down one connection.

NNI

Network Node Interface — Sometimes known as Network-to-Network Interface.

OAM

Operations and Maintenance — A set of administration and supervisory actions regarding network performance monitoring, failure detection and system protection. Special type cells are used to carry OAM-related information.

Octet

8 bits or 1 byte.

OC-n

Optical Carrier-n — The physical interface for transmission over optical fiber at n times 51.84Mbps (for example, OC-3 is at 155.52Mbps, OC-12 at 622.08Mbps, OC-48 at 2.488Gbps).

Payload

Part of the ATM cell, it contains the actual information to be carried, and occupies 48 bytes. Also see PTI.

PTI

Payload Type Identifier — A 3-bit cell header field for encoding information regarding AAL and EFCI.

PVC

Permanent Virtual Circuit — A virtual connection established by network management between two points that is permanently available.

routing

A network management function responsible for forwarding packets from their source to their destination. A number of routing algorithms exist to suit different network topologies and requirements.

SAR

Segmentation and Reassembly — Partitions (segments) information frames into cells at the source and reassembles these cells back into information frames at the destination. These activities occur at the lower half of the AAL. It inserts the data from the information frames into the cell. It adds any necessary header or trailer bits to the data and passes the 48-octet to the ATM Layer. Each AAL type has its own SAR format. At the destination, the cell payload is extracted and converted to the appropriate information frame.

SDH

Synchronous Digital Hierarchy — A hierarchy that determines signal interfaces for very high speed digital transmission over optical fiber links.

SNMP

Simple Network Management Protocol — A standard defined for handling management information.

SONET

Synchronous Optical Network — An ANSI-defined standard for high speed and high quality digital optical transmission. It has been recognized as the North American standard for SDH.

SVC

Switched Virtual Circuit — A connection where control signalling is used to dynamically establish the connection and remove it when no longer required. For example, telephone lines, ISDN and X.25.

Telnet

An asynchronous, virtual terminal protocol that allows for remote access.

UME

User-to-Network Interface Management Entity — Software at the UNIs for providing the ILMI functions.

UNI

User-to-Network Interface — The interface between the user and the ATM switch.

UNI 2.0

ATM Forum UNI specification for the physical and ATM Layers, the ILMI, OAM and PVC support.

UNI 3.0

An upgrade of UNI 2.0. with traffic control for the Peak Cell Rate parameter and the operation over current transmission systems as some of the additional features.

UNI 3.1

A corrected version of UNI 3.0, this specification also includes Service Specific Connection-Oriented Protocol (SSCOP) for error detection and correction.

UNI 4.0

This UNI specification refers to signalling issues.

VC

Virtual Channel — Describes unidirectional flow of ATM cells between connection (switching or end-user) points that share the common identifier number (VCI).

Virtual Connection — A connection established between end-users (source and destination), where packets are forwarded along the same path and bandwidth is not permanently allocated until it is used.

Virtual Circuit — A connection set up across the network between a source and destination where a fixed route is chosen for the entire session and bandwidth is dynamically allocated.

VCC

Virtual Channel Connection — The end-to-end connection between two ATM end users is known as the Virtual Channel Connection. Also defined as a concatenation of virtual channel link. The VCC used is identified using two labels: the Virtual Path Identifier and the Virtual Channel Identifier.

VCI

Virtual Channel Identifier — A 16-bit value in the ATM cell header that provides a unique identifier for the virtual channel (VC) that carries that particular cell.

Virtual Channel

See *VC*.

VLAN

Virtual Local Area Network — A group of location and topology independent devices that communicate as if they are on the same physical LAN.

VLT

Virtual LAN Trunk — A connection which carries traffic for more than one VLAN. A port which is part of a VLT connection may be a member of all VLANs.

VP

Virtual Path — Describes a set of virtual channels (VCs) between switches, grouped together.

VPC

Virtual Path Connection — A concatenation of VP links.

VPCI/VCI

Virtual Path Connection Identifier/Virtual Channel Identifier — A combination of two numbers, one for identifying the VP and one for the VCI.

VPI

Virtual Path Identifier — An 8-bit value in the cell header that identifies the connection to which the cell belongs.

BIBLIOGRAPHY

Asynchronous Transfer Mode (ATM)

Books

"ATM Foundation for Broadband Networks"

Author: Uyles Black.

Published by: Prentice Hall

ISBN: 0-13-297178-X

Standards

ATM Forum — Integrated Local Management Interface (ILMI) Specification (Version 3.1 or later).

ATM Forum — ATM User-Network Interface Specification (Version 3.1 or later).

LAN Emulation (LANE)

Standards

ATM Forum — LAN Emulation Over ATM (Version 1.0 or later).



INDEX

A

- Address resolution 2-6, 2-13
- ARP Table 8-8
 - Creating an entry 8-9
 - Deleting entries 8-10
 - Entry type 8-9
 - Locating an entry 8-10
 - Updating entries 8-10
- Asynchronous Transfer Mode 2-8
- ATM
 - Address resolution 2-6, 2-13
 - ATM Layer 2-14
 - Benefits 1-1
 - Configuration examples 5-1
 - Building backbone 5-1
 - Campus 5-2
 - Resilient Links 5-4
 - Configuration rules 4-2
 - Control connections 4-3
 - Mode 8-2
 - Network limitations 4-3
 - Number of connections per ELAN 4-3
 - Planning your network 4-1
 - Resilient Links 5-4
 - Statistics 9-1
 - Terminology 1
 - What is it? 2-8
- ATM Adaptation Layer (AAL) 2-8
 - Segmentation and Reassembly (SAR) 2-8
- ATM address
 - Displaying 8-11
 - Far end 8-9
 - Format 2-13
 - LEC 9-6
 - LES 8-5
- ATM Backbone Switch

- Network Examples 5-1
- ATM Cell
 - Benefits of use 2-8
 - Cell header 2-14
 - Cell Loss Priority (CLP) 2-14
 - Generic Flow Control (GFC) 2-14
 - Header Error Check (HEC) 2-14
 - Out of Cell Delineation State 9-10
 - Payload Type Identifier (PTI) 2-14
 - Structure 2-14
 - VCI field 2-14
 - VPI field 2-14
- ATM Layer 2-14
- ATM Module
 - Boot software version number 8-4
 - Connecting a cable 6-5
 - Device support 6-3
 - Features summary 1-2
 - Hardware version number 8-3
 - Installing 6-4
 - Power supply 6-7
 - Software version number 8-4
- ATM Port
 - Configuration 8-2
 - Link State 8-7
 - Lost Links 8-8
 - Port Speed 8-7
 - Port State 8-7
 - Statistics 9-3
- Automatic logout 7-4

B

- Bandwidth
 - Calculation C-1
 - Statistics 9-3
- Bibliography 1

- Boot software version number 8-4
- Broadcast and Unknown Server (BUS) 3-2
- Broadcast packets 3-2

C

- Cables
 - Cleaning connectors D-24
 - Connecting to the ATM Module 6-5
 - Technical Specification C-1
- Cell Loss Priority (CLP) 2-14
- Cell structure 2-14
- Cleaning Connectors D-24
- Clearing screen counters 9-5, 9-10
- Coding Violations 9-11
- Configuration rules for ATM 4-2
- Connection Table 8-10
- Connections
 - Connecting cables 6-5
 - Control connections 4-3
 - Data connections 2-7, 4-3
 - Finding 8-11
 - Mapping MAC addresses 8-9
 - Multiplexing and de-multiplexing 2-14
 - Required per ELAN 4-3
 - Troubleshooting 6-7
- Control connections 4-3
- Conventions in text 2

D

- De-multiplexing 2-14
- Device support 6-3
- Discarding cells
 - Cell Loss Priority (CLP) 2-14
- Downloading software 8-12

E

electronic emission notices F-5
 Emulated LAN (ELAN)
 ATM Module 4-3
 ELAN name 8-5, 9-6
 Manual configuration 8-5
 Mapping to VLANs 3-2, 4-2
 Resource planning 4-2
 Services 4-2
 Environmental Specifications C-1
 Error detection
 Header Error Check (HEC) 2-14
 Error messages
 Software upgrade 8-13
 Error statistics 9-3

F

Far end
 ATM address 8-9
 MAC address 8-9
 Fiber Optic Connectors
 Cleaning D-24
 FTP, support site E-1

G

Generic Flow Control (GFC) 2-14
 Glossary 1

H

Hardware version number 8-3
 Header Error Check (HEC) 2-14

I

IBM Bulletin Board System E-1
 Installing the ATM Module 6-4
 Post installation checks 6-6

Interim Local Management Interface (ILMI)

 Address resolution 2-13
 Defined 2-13
 VCC Connection 8-3

L

LAN Emulation (LANE)
 Benefits 1-1
 Components 2-3
 Configuration problems D-15
 LAN Emulation Client (LEC) 2-3
 LAN Emulation Configuration Server (LECS) 2-3
 LAN Emulation Server (LES) 2-3
 LE_ARP 2-7
 Within 3Com devices 2-4
 LAN Emulation Client (LEC) 2-3
 ATM address 9-6
 Last LEC Failure Reason 9-6
 LEC Operation at Failure 9-9
 LEC State 8-8, 9-6
 MAC address proxy 2-6, 2-7
 Mapping to ELAN 9-6
 LAN Emulation Configuration Server (LECS)
 ATM address 2-5
 Defined 2-3
 LAN Emulation Server (LES) 2-3
 ATM address 8-5
 Joining 9-6
 LAN Emulation Service 2-4
 Last LEC Failure Reason 9-6
 LEC Operation at Failure 9-9
 LEC State 8-8, 9-6
 LEDs
 Summary 6-6, D-2
 Link State 8-7
 Logging off 7-4
 Lost Links 8-8

M

MAC address
 Far end 8-9
 Finding 8-10
 Mapping MAC to ATM address 8-8
 Number of addresses supported 4-3
 Proxy 2-6, 2-7
 Manual
 Finding information 2
 Manual configuration
 Emulated LANs 8-5
 Planning 4-3
 MAX VCI Bits 8-3
 MAX VPI Bits 8-3
 Multicast packets 3-2
 Multiplexing 2-14

O

Operation and Maintenance (OAM) 2-15
 Out of Cell Delineation State 9-10

P

Passwords
 Default passwords 7-3, 7-4
 Payload 2-14
 Payload Type Identifier (PTI) 2-14
 Permanent Virtual Circuit (PVC) 2-12
 Displaying PVC connections 8-11
 When to use 4-3
 Physical Layer 2-15
 Line rate 9-13
 Path, line and section 2-15, 9-11
 Scrambling 9-11
 SDH STM-1 2-15, 8-3
 SONET STS-3c 2-15, 8-3
 Statistics 9-10
 Transmit clock 9-13
 Planning your network 4-1

P

- Port
 - Configuration 8-2
 - Setup 8-6
 - Speed 8-7
 - State 8-7
 - Statistics 9-3
- Power supply 6-3, 6-7
- PTI 2-14

R

- Resilient Links 8-11
 - Configuration example 5-4
- Routing 2-4, D-15
- Rules for ATM configuration 4-2

S

- Safety information 6-1
- Screen access rights B-1
- SDH 2-15
 - Configuring 8-3
 - Statistics 9-10
- Segmentation and Reassembly (SAR) 2-8
 - service, technical E-1
- Signalling 2-8, 2-10, 8-2
- Software upgrade
 - Error messages 8-13
 - Status messages 8-14
- Software version number 8-4
- SONET 2-15
 - Configuring 8-3
 - Statistics 9-10
- Statistics
 - AAL5
 - Discarded Frames 9-4
 - Errored Frames 9-4
 - Frames Received 9-4
 - Frames Transmitted 9-4
 - Octets Received 9-4
 - Octets Transmitted 9-4
 - ATM
 - Bad VCC Received 9-5

- Cells Received 9-5
- Cells Transmitted 9-5
- Errored Cells 9-5
- Clearing screen counters 9-5, 9-10
- Ethernet
 - Frames Received 9-10
 - Frames Transmitted 9-10
 - Octets Received 9-10
 - Octets Transmitted 9-10
- Lost Links 8-8
- Overview 9-2
- Physical Layer 9-10
 - Coding Violations 9-11
 - Errored Seconds 9-12
 - OCD 9-10
 - Severe Errored Seconds 9-12
 - Troubleshooting 9-12
 - Unavailable Seconds 9-12
- Receive Bandwidth Used 9-3
- Receive Errors 9-4
- Sampling period 9-2, 9-11
- Screen map 9-1
- SDH 9-10
- SONET 9-10
- Transmit Bandwidth Used 9-3
- VLAN 9-5
- support, technical E-1
- Switched Virtual Circuit (SVC) 2-12, 4-3
 - Displaying SVC connections 8-11
 - Setting up a SVC 8-8
 - When to use 4-3

T

- Technical Specifications
 - Bandwidth calculation C-2
 - Cabling C-1
 - Environment C-1
- Technical support and service E-1
- Terminology 1
- Troubleshooting D-1
 - Using LEDs 6-5, D-2
 - Using Physical Layer statistics 9-12

U

- Unicast packets 3-2
- User guide
 - Finding information 2
- Users
 - Default users 7-3
 - Screen access rights B-1
- User-To-Network Interface (UNI) 2-12

V

- Virtual Channel 2-10
- Virtual Channel Connection (VCC) 2-9
 - ILMI VCC 8-3
- Virtual Channel Identifier (VCI) 2-10, 8-10
 - Field in ATM cell 2-14
- Virtual LAN
 - See VLAN 3-1
- Virtual Path 2-9
- Virtual Path Identifier (VPI) 2-10, 8-10
 - Field in ATM cell 2-14
- VLAN
 - Displaying VLANs 8-5
 - Inter-switch VLANs 3-1
 - LEC Status 8-8
 - Mapping to ELAN 3-2, 4-2, 8-4
 - Statistics 9-5
- Voice support E-1

W

- World Wide Web (WWW)
 - IBM Networking home page E-1



Free Manuals Download Website

<http://myh66.com>

<http://usermanuals.us>

<http://www.somanuals.com>

<http://www.4manuals.cc>

<http://www.manual-lib.com>

<http://www.404manual.com>

<http://www.luxmanual.com>

<http://aubethermostatmanual.com>

Golf course search by state

<http://golfingnear.com>

Email search by domain

<http://emailbydomain.com>

Auto manuals search

<http://auto.somanuals.com>

TV manuals search

<http://tv.somanuals.com>