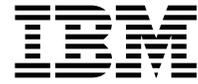


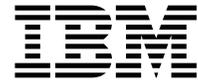
IBM 8285 Nways ATM Workgroup Switch



Installation and User's Guide



IBM 8285 Nways ATM Workgroup Switch



Installation and User's Guide

Note!

Before using this information and the product it supports, be sure to read the general information under "Notices" on page xv.

Second Edition (June 1996)

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Industry Standards Reflected in This Product

The IBM 8285 Nways ATM Workgroup Switch complies with the following ATM standards:

- ATM User-Network Interface (UNI) Specification V3.0 and V3.1, ATM Forum
- LAN Emulation Over ATM Specification V1.0, ATM Forum
- Q.2110 Service Specific Connection-Oriented Protocol (SSCOP), ITU, March 17, 1994
- Q.2130 Service Specific Coordination Function (SSCF) for support of signaling at the user-network interface, March 17, 1994

The IBM 8285 Nways ATM Workgroup Switch is designed according to the specifications of the following industry standards as understood and interpreted by IBM as of September 1994:

- RFC854 - TELNET protocol
- RFC1350 - Trivial File Transfer Protocol (TFTP)
- RFC1577 - Classical IP and ARP (Address Resolution Protocol) over ATM
- SNMP:
 - RFC1155 - Structure and Identification of Management Information (SMI) for TCP/IP based Internet.
 - RFC1156 - Management Information Base (MIB) for network management of TCP/IP based Internets (MIB-I)
 - RFC1157 - Simple Network Management Protocol (SNMP)
 - RFC1212 - Concise MIB definitions
 - RFC1213 - Management Information Base (MIB) for network management of TCP/IP based Internets (MIB-II)
 - RFC1215 - Convention for defining traps for use with SNMP

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- EMC Directive 89/336/EEC and amendment 93/31/EEC
- Low Voltage Directive 73/23/EEC
- Telecommunications Directive 91/263/EEC
- Machinery Directive 89/392/EEC
- Directive 93/68/EEC (Marking)

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Avis de conformité aux normes d'Industrie Canada

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Consequently, when used in a residential area or in an adjacent area thereto, radio interference may be caused to radios and TV receivers, and so on.

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Korean Communications Statement

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New Zealand Radiocommunications (Radio) Regulations

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Safety

This product complies with IBM and international safety standards.

See the *IBM 8285 Nways ATM Workgroup Switch: Safety and Service Catalog*, SA33-0398 for the translations of the DANGER and CAUTION notices concerning this product.

Laser Standards

The laser is a Class 1 Laser Product and complies with the following safety standards:

IEC 825-1: 1993 EN 60825-1: 1993
IEC 825-2: 1993 EN 60825-2: 1993

IEC 950: 1991 + Amdt 1: 1992 + Amdt 2: 1993
EN 60950: 1992 + Amdt 1: 1992 + Amdt 2: 1993

The compliance label on the 155Mbps ATM I/O Card is shown in Figure 1.

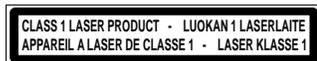


Figure 1. Class 1 Laser Label

How to Use This Guide

This guide describes the installation and operation of the IBM 8285 Nways ATM Workgroup Switch (also referred to as the ATM Workgroup Switch). The information in this guide enables you to:

- Install the IBM 8285 Nways* ATM Workgroup Switch either as an independent workgroup switch or as part of an ATM network.
- Configure switch parameters for the ATM Workgroup Switch.
- Manage the ATM Workgroup Switch using the Simple Network Management Protocol (SNMP).
- Diagnose and solve problems associated with the operation of the ATM Workgroup Switch.

Who Should Use This Guide

This guide is intended for:

- ATM network administrators
- ATM network operators
- Authorized service personnel

Contents of This Guide

This guide contains the following main parts:

Part 1, Introduction

Chapter 1, Introduction to the IBM 8285 Nways ATM Workgroup Switch describes the ATM Workgroup Switch and its main functions. It also presents examples of how to use the workgroup switch in various network configurations.

Chapter 2, Installing the IBM 8285 Nways ATM Workgroup Switch contains the complete procedure for mounting, configuring, and attaching ATM devices to the ATM Workgroup Switch.

Chapter 3, Building an ATM Campus Network describes the ATM address of the ATM Workgroup Switch and its relation to other ATM campus network components, and describes the strategy for building a network of ATM switches.

Part 2, Mounting Workgroup Switch Components

Chapter 4, Mounting the Base Unit describes how to mount the Base Unit in a rack or on a surface.

Chapter 5, Mounting the 155Mbps ATM I/O Card describes how to unpack mount the 155Mbps ATM I/O Card in the Base Unit.

Chapter 6, Mounting the Expansion Unit describes how to mount the Expansion Unit in a rack or on a surface.

Chapter 7, Mounting ATM Media Modules in the Expansion Unit describes how to mount ATM media modules in the Expansion Unit.

Chapter 8, Power-On and Self Test describes the power-on procedure and the automatic Power-On Self Test (POST) routine.

Part 3, Configuration Procedures

Chapter 9, Setting-Up and Using the Configuration Console describes how to setup and use the a console with the ATM Workgroup Switch.

Chapter 10, Configuring Basic Workgroup Switch Parameters describes how to configure the ATM Workgroup Switch local switch parameters.

Chapter 11, Configuring Ports and Media Modules describes how to configure ports on the Base Unit and on ATM media modules in the Expansion Unit.

Chapter 12, Configuring Trunk Connections describes how to configure trunk connections between ATM switches and set up PVCs.

Chapter 13, Configuring TCP/IP Parameters describes how to configure the workgroup switch to provide Classical IP Over ATM functions.

Chapter 14, Configuring LAN Emulation Parameters describes how to configure the workgroup switch to provide LAN Emulation Over ATM functions.

Chapter 15, Configuring SNMP Parameters describes how to configure the workgroup switch for management by an SNMP management application.

Chapter 16, Working With Configuration Settings describes how to save and work with configuration settings.

Part 4, Device Attachment Procedures

Chapter 17, Attaching 25.6Mbps Devices to the ATM Workgroup Switch describes how to attach 25.6Mbps devices to ports on the Base Unit or on ATM media modules in the Expansion Unit.

Chapter 18, Attaching 155Mbps Devices to the I/O card describes how to attach 155Mbps devices to the 155Mbps ATM I/O Card on the Base Unit.

Part 5, Management, Code Updates and Troubleshooting

Chapter 19, Network and Switch Management provides guidelines for managing the ATM Workgroup Switch.

Chapter 20, Updating Microcode and Picocode provides guidelines for upgrading microcode and picocode, and for performing upload and download operations.

Chapter 21, Troubleshooting describes how to diagnose and solve problems associated with the operation of the ATM Workgroup Switch.

Part 6, Appendixes

Appendix A, Specifications describes the specifications for the ATM Workgroup Switch.

Appendix B, Cables, Pins and Connectors provides cabling and connector guidelines for connecting a console and ATM devices to the ATM Workgroup Switch Base Unit.

Appendix C, Error and Information Codes list the return codes displayed for the Q.2931 and TFTP protocols.

Appendix D, ATM Address Formats in the ATM Workgroup Switch shows complete definitions of all ATM address formats supported by the ATM Workgroup Switch.

Glossary describes terms and abbreviations used in this manual.

Bibliography lists the documents in which you can find additional information on the functions and technology used in the ATM Workgroup Switch.

Index lists the concepts, terms, and tasks described in this manual and the page numbers on which you can find the information.

Related Information

To understand the information presented in this guide and to use the ATM Workgroup Switch more effectively, refer to the supplementary documents listed in “Bibliography” on page 225.

Prerequisite Knowledge

To understand the information presented in this book, you should be familiar with:

- Features and characteristics of the IBM 8285 Nways ATM Workgroup Switch, as described in the *IBM 8285 Nways ATM Workgroup Switch: Specification Sheet*, GA33-0380.
- Principles of asynchronous transfer mode (ATM) technology
- ATM Forum UNI Specification V3.1
- ATM Forum LAN Emulation Over ATM Specification V1.0.

Automatic Update Service

The *Automatic Update Service (AUS)* subscription is a simple and cost-effective way of ensuring that your hardware modules are up-to-date with the latest code functions and improvements. Available on a 3-year subscription basis, AUS subscriptions cover all your feature modules with independently upgradable code components. With AUS subscriptions, you automatically receive the newest versions of code when they are made available.

To subscribe to AUS from Europe, the Middle East or Africa, fill out the form that comes in the ATM Workgroup Switch package and return it to the IBM address indicated. ATM Workgroup Switch software updates will then be sent to you at the address you specify. If you reside in the U.S.A., it is not necessary to fill out the form in order to receive ATM Workgroup Switch software updates.

Improved Decision Making

With the 3-year subscription, it is easy to predict the annual cost of upgrading your network with the latest code functions. Also, since you always have the latest version of management modules, fewer planning considerations are required when ordering new media and interconnect modules.

Asset Protection

The automatic distribution of the latest code versions ensures that your hardware is always up-to-date with the latest set of functions, thereby expanding the life of your network, and reducing compatibility problems.

Connectivity Improvements

With the latest version of code in place, your management and interconnect modules are automatically upgraded with the latest performance and configuration improvements, as well as new bridging or routing features.

Network Operations Productivity

The AUS subscription ensures that the ATM Workgroup Switch or modules (of a given type) in your network are kept at the same level of code, therefore making network operations simpler and more consistent. Also, with the latest version of the management module installed, the network manager can perform configuration and problem management for all the newly announced hub components and modules without restrictions.

For more information about the *Automatic Update Service*, contact your IBM marketing representative or your authorized reseller.

Conventions Used in This Guide

The following text conventions are used in this guide:

Text Convention	Meaning	Example
Bold	Text emphasis	Selective backpressure temporarily stops one virtual connection. Global backpressure temporarily stops an ATM link.
<i>Italics</i>	Special term	This is known as a <i>hot swap</i> .
	Document titles	Refer to the <i>ATM User-Network Interface Specification - Version 3.1</i> for more information.
Monospace	Command syntax (parameters and variables)	SET PORT slot.port ENABLE
	User input (including carriage return)	To display detailed information, enter the following command: show port 1.2 verbose [ENTER]
	System messages and screen displays	1.12:UNI enabled UP-OKAY Signalling Version : with ILMI Flow Control : Off

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Chapter 1. Introduction to the IBM 8285 Nways ATM Workgroup Switch

The following sections describe:

- ATM Workgroup Switch Components
- The ATM Workgroup Switch Base Unit and Expansion Unit
- Workgroup Switch Functionality
- LAN Emulation Over ATM
- Networking Configurations
- Security Controls

ATM Workgroup Switch Components

The IBM 8285 Nways ATM Workgroup Switch comprises two desktop or rack-mountable units:

- A Base Unit and
- An optional Expansion Unit feature

Base Unit

The ATM Workgroup Switch Base Unit is a self-contained ATM Switch and Control Point unit with 12 ATM ports (25.6Mbps) and a slot for one of the optional 155Mbps ATM I/O Card features: Multimode Fibre (FC 5500) or Single-Mode Fibre (FC 5501).

The I/O card can be linked to:

- A local server
- An ATM network consisting of other ATM Workgroup Switches or 8260 hubs
- Other products that are compliant with ATM Forum specifications for 155Mbps links.

(Refer to "Fiber Cabling Guidelines" on page 199 for guidelines and recommendations for using fiber cabling.)

The Base Unit has an auto-sense power supply that adapts automatically to local voltage requirements. The Base Unit may be installed either in a standard rack or on a surface, such as a desktop.

Expansion Unit Feature

The Expansion Unit feature provides three slots to add IBM 8260 ATM modules that can provide up to 36 additional ATM ports. The ATM modules that are currently available include:

- ATM Media modules (25, 100, and 155Mbps)
- ATM LAN Bridge modules
- Modules developed under the ATM kit Development Program

One Expansion Unit can be connected to the Base Unit via an Expansion Interface cable.

Modules installed in the Expansion Unit form an integral part of the ATM Workgroup Switch. The slots are interconnected by the same type of ATM backplane found in the 8260 hub, and ports on ATM modules in the Expansion Unit can be switched to any other port in either the Base Unit or the Expansion Unit.

The Expansion Unit has an auto-sense power supply that adapts automatically to local voltage requirements. The Expansion Unit may be rack mounted or may be stacked on top of the Base Unit when installed on a desktop.

The ATM Workgroup Switch Base Unit

All ATM ports, controls, LEDs and connectors are located on the front panel of the ATM Workgroup Switch, as shown in Figure 2.

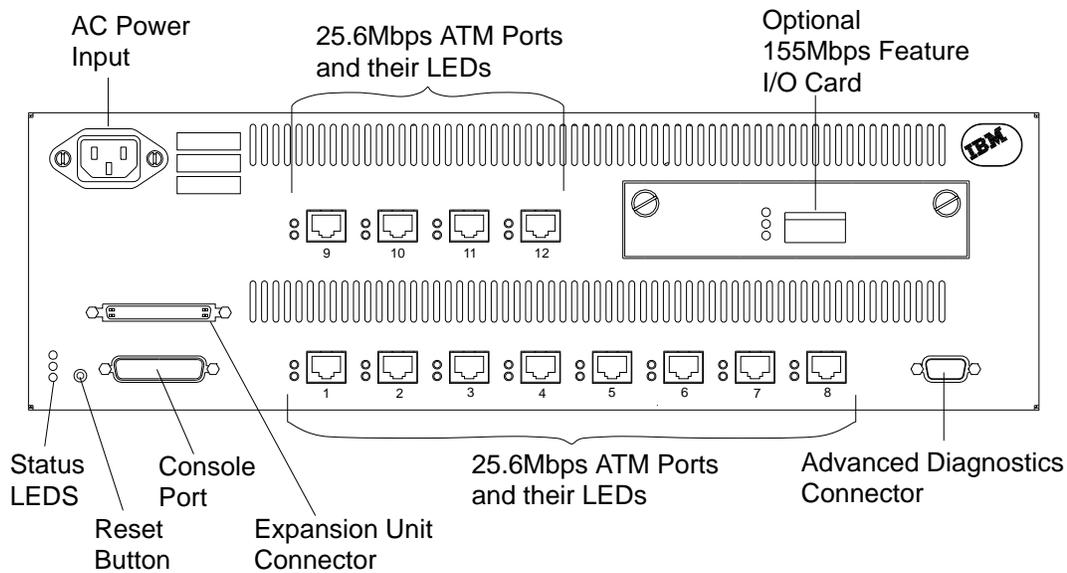


Figure 2. Front Panel of the ATM Workgroup Switch Base Unit

ATM Ports on the Base Unit

The ATM Workgroup Switch Base Unit provides two types of ATM port:

25.6Mbps Ports

The Base Unit has 12 ATM ports (numbered 1–12) for attaching 25.6Mbps ATM devices via twisted-pair cables.

155Mbps Port (optional)

The optional I/O port feature (port 13) connects to a 155Mbps ATM device, such as a local server or an 8260 hub. Two features are currently offered:

- FC 5500 - 155Mbps Multimode Fiber I/O Port with SC connector
- FC 5501 - 155Mbps Single Mode Fiber I/O Port with SC connector

The arrangement and numbering of ports on the Base Unit is shown in Figure 3.

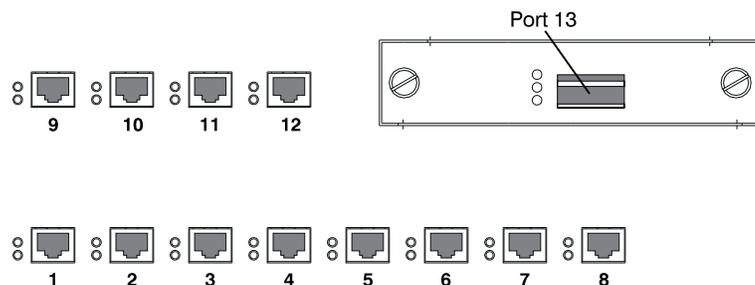


Figure 3. ATM Ports on the ATM Workgroup Switch Base Unit

LEDs on the Base Unit

The port LEDs and ATM Workgroup Switch status LEDs are shown in figures 4, 5, and 6.

Base Unit Status LEDs

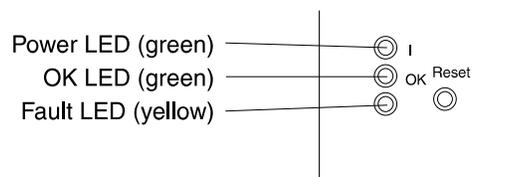


Figure 4. Status LEDs for the ATM Workgroup Switch

25.6Mbps Port LEDs



Figure 5. LEDs for 25.6Mbps ATM Ports

155Mbps Port LEDs

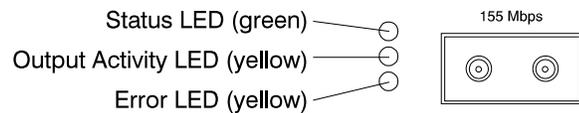


Figure 6. LEDs for the 155Mbps ATM Port

Connectors and Controls on the Base Unit

The ATM Workgroup Switch Base Unit also has four non-ATM connectors and one control button on its front panel:

Power Input

This connects the Base Unit auto-sense power supply to the mains.

Console Port

This RS-232 connector is used to attach a console for initial configuration of the workgroup switch. It may also be used to attach a modem to the workgroup switch.

Expansion Connector

This connector attaches to an optional ATM Workgroup Switch Expansion Unit (available in a future release).

Advanced Diagnostics Connector

This connector is only used by authorized service personnel for advanced diagnostic testing.

Reset Button

The reset button resets both the Base Unit and the optional Expansion Unit.

The ATM Workgroup Switch Expansion Unit Feature

All LEDs, connectors and slots for ATM media modules are located on the front panel of the Expansion Unit, as shown in Figure 7.

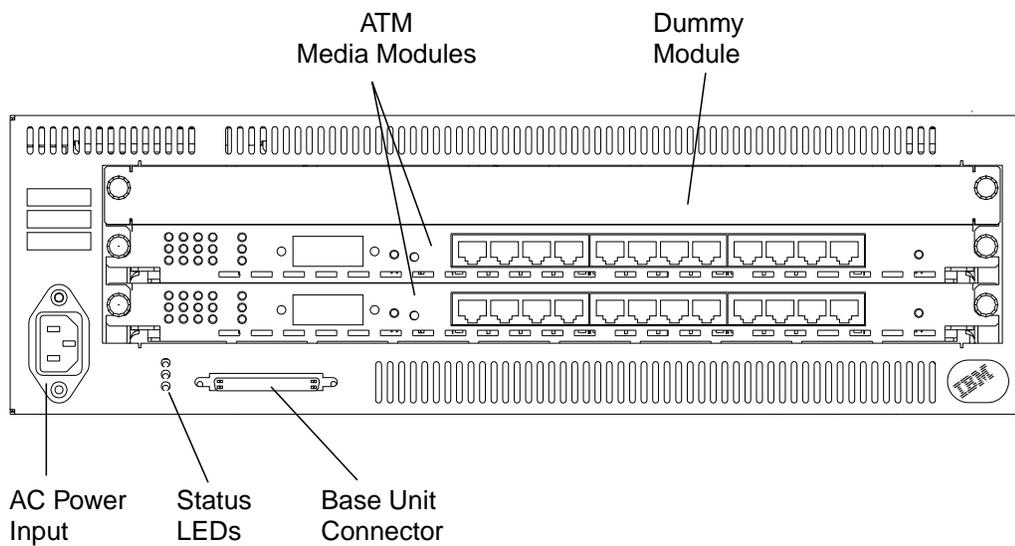


Figure 7. Front Panel of the ATM Workgroup Switch Expansion Unit

Slots for ATM Media Modules

The ATM Workgroup Switch Expansion Unit provides three slots for IBM 8260 ATM media modules. The slots on the Expansion Unit are numbered 2 - 4, beginning at the bottom.

LEDs on the Expansion Unit

The Expansion Unit status LEDs are shown in figure 8.

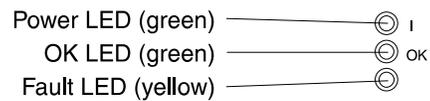


Figure 8. Status LEDs for the Expansion Unit

Connectors and Controls on the Expansion Unit

The ATM Workgroup Switch Expansion Unit has two connectors on its front panel:

Power Input

This connects the Expansion Unit auto-sense power supply to the mains.

Base Connector

This connector is used to attach the Expansion Connector cable to the workgroup switch Base Unit.

Switch/Control Point Functionality

The IBM 8285 Nways ATM Workgroup Switch integrates the same ATM switching functions and network control functions that are used in the IBM 8260 hub, such as call setup processing, topology discovery, and route selection.

ATM Switching Functions

The ATM Switch fabric switches ATM cells from one ATM port to another ATM port in the ATM Workgroup Switch.

Control Point Functions

The ATM Workgroup Switch requires a control program (as do all ATM switching devices) to perform the functions associated with the establishment and management of ATM circuits. These functions are integrated into the switching element of each ATM Workgroup Switch.

ATM control functions are fully distributed instead of being centralized. This means that all nodes participate as peers in the control algorithms. Distribution of control functions provide for availability, scalability, and growth in an ATM network. The Control Point in each ATM Workgroup Switch provides the following functions:

Control Plane Functions

- Support of ATM signaling (SVCs) according to ATM Forum V3.1 specifications
- Switch-to-switch interface (SSI) based on an extension of the ATM Forum UNI V3.1 as stated in the ATM Forum P-NNI framework
- Topology services and route computation based on TRS, with automatic bypass of failed nodes and links only for SSI connections (TRS is an extension of OSPF, Open Shortest Path First.)
- Interconnection of local ATM networks over an ATM WAN ('SONET Lite'/P-NNI phase 0) that provides a permanent virtual path, allowing switched connections to be set up between end systems on both sides of the WAN (VP tunneling)
- Internal SVC APIs to support node management and services over switched ATM connections
- Support of permanent virtual path (VP) and permanent virtual channel (VC) point-to-point connections
- Support of IP Over ATM (RFC 1577) for node management and services over a Classical IP subnetwork; PING message: 916 bytes maximum
- Support of Ethernet (802.3) and Ethernet V.2 (DIX) LAN Emulation Client for node management and services over a LAN Emulation subnetwork; PING and TELNET message: Maximum length depends on the maximum SDU size supported on the corresponding emulated LAN (see Table 2 on page 15)
- Support of 802.3 and 802.5 LAN Emulation Servers and Broadcast Unknown Servers (LES/BUS)

Management Plane Functions

- Full SNMP support (get, getnext, set, and traps)
- MIB-II support
- IETF AToMIB
- Full Interim Local Management Interface (ILMI) support at UNI and from the network management station
- OSPF MIB support for managing topology and route computation
- IBM extension
 - Hub-specific: switch, modules and ports
 - Enhanced PVC management (automatic route computation and recovery)
 - Signalling (Q.2931 and SAAL) configurations and statistics
 - ATM statistics
- Services for local and remote administration.

User Plane Functions (hardware)

- ATM layer (switching)
- Support of Reserved Bandwidth (RB) connection
- Support of Unspecified Bit Rate (UBR or "best effort") connection.

The SNMP ATM agent is a function of the Control program in the ATM Workgroup Switch and implements the ATM MIB defined in the V3.1 UNI Specification of the ATM Forum.

The AToMIB is defined by the IETF and by the IBM extensions. It can be driven by SNMP managers, such as IBM NetView for AIX*. The following ATM management applications can be used by a LAN administrator to better tune the system:

- Nways Campus Manager ATM for AIX Version 1
- Nways Campus Manager ATM for HP-OV Version 1
- Nways Campus Manager ATM for Windows Version 1

Both PVCs and SVCs are supported. The signaling is upwardly compatible with the ATM Forum V3.1 UNI. Control messages are encapsulated in the SAAL Adaptation Layer.

The ILMI (ATM Forum V3.1) is fully supported. End-systems can register their local address to the ATM Workgroup Switch and receive notification of their network address. ILMI messages are SNMP-formatted and conveyed using the AAL5 Adaptation Layer.

ATM Connections

The Control Point in the ATM Workgroup Switch provides a complete set of functions to control an ATM campus network and to interconnect local ATM networks over ATM wide area networks.

The Control Point supports an extensive set of ATM connections, including:

- Switched (SVC) and permanent (PVC)
- Point-to-point and point-to-multipoint
- Reserved Bandwidth (RB) and Unspecified Bit Rate (UBR).

Table 1. ATM Connections Supported in ATM Workgroup Switches

Type of Virtual Connection	Connection Type	Connection Class	Connection Mode
Virtual Path Connection (VP)	Permanent	Reserved Bandwidth and Unspecified Bit Rate	Point-to-point
Virtual Channel Connection (VC)	Switched	Reserved Bandwidth and Unspecified Bit Rate	Point-to-point and point-to-multipoint
Virtual Channel Connection (VC)	Permanent	Reserved Bandwidth and Unspecified Bit Rate	Point-to-point

LAN Emulation Over ATM

The IBM 8285 Nways ATM Workgroup Switch supports LAN emulation, as defined in ATM Forum specifications, using two different servers:

- LAN Emulation Server (LES)
- Broadcast and Unknown Server (BUS)

The LAN emulation servers are integrated in the IBM 8285 Nways ATM Workgroup Switch Control Point, and they are configured and operate in tandem.

The IBM 8285 Nways ATM Workgroup Switch also includes a basic LAN Emulation Client (LEC) and supports external LAN Emulation Configuration Servers (LECSs).

Highlights

IBM's implementation of LAN emulation in the ATM Workgroup Switch complies with Version 1.0 of the ATM Forum specifications for LAN emulation, and supports:

- Both 802.5 (Token Ring) and 802.3/Ethernet V.2 (DIX) LAN types for the LES/BUS.
- Up to two separate emulated LANs simultaneously, of the same or different LAN types.
- 802.3 LAN types for the LEC.
- Both UNI 3.0 and 3.1 LECs, concurrently.
- Up to 128 LECs (combined total).
- LES addresses that are either configured directly in each LEC or supplied through a dialog with an external LECS.
- LECS locations that may be:
 - Set to the well known anycast LECS ATM address
 - Supplied by the LECS ATM address field in the ILMI MIB
 - Set to the well known PVC (VPI=0, VCI=17)
- All maximum frame sizes defined in ATM Forum specifications:
 - Control frames: 1516 octets
 - Data frames: 1516, 4544, 9234, 18190 octets
- Best Effort connections with Quality of Service set to 0. Bearer classes supported are:
 - BCOB-X and BCOB-C for incoming calls
 - BCOB-X for outgoing calls.

IBM's current implementation of LAN emulation does not support:

- Communication over PVCs
- Internal LECS
- Broadcast Manager, which is not standardized.

Centralized LES/BUS

The ATM Workgroup Switch LAN servers are centralized, such that each emulated LAN belongs to only one LES/BUS. Distributed, or multiple, emulated LAN servers are not yet standardized.

The LAN emulation function translates LAN (MAC) addresses to ATM addresses, and performs broadcast and multicast LAN services.

While the ATM Workgroup Switch does support two separate emulated LANs, the two emulated LANs cannot communicate directly with each other; a router or bridge is required. This configuration is not currently recommended.

If desired, you can disable the LAN emulation functions of the ATM Workgroup Switch and use 'external' LAN emulation servers, attached, for example, to an 8260 hub.

Integrated LAN Emulation Components

LAN Emulation Server (LES)

The LES provides control and address resolution functions.

Broadcast and Unknown Server (BUS)

The BUS provides broadcast and multicast functions.

No separate configuration commands are required to start the BUS, as it is started automatically when starting the LES.

LAN Emulation Client (LEC)

An integrated 'Lite' LAN Emulation Client is also provided in the Control Point, which allows TFTP, TELNET and SNMP functions to be run over an 802.3 or Ethernet V.2 (DIX) emulated LAN. This client may work with the integrated LES/BUS or with an external ATM Forum compliant LES/BUS.

The maximum length of PING and TELNET messages depends on the maximum SDU size supported on the corresponding emulated LAN. Table 2 lists the correspondence (in bytes):

Table 2. Maximum PING and TELNET Lengths

Maximum SDU - 802.3 ELAN	Maximum Length PING - 802.3 LEC	Maximum Length PING - DIX LEC
1516	1492	1500
4544	4520	4528
9234	9210	9218
18190	18166	18176

Networking Configurations

The ATM Workgroup Switch is a self-contained ATM subsystem, and may be configured as a stand-alone workgroup switch, unconnected to external ATM networks.

In addition, the ATM Workgroup Switch may be deployed in various ATM network configurations, such as:

- Remote Feeder
- Client/Server Workgroup
- Floor Workgroup Switch

The following sections illustrate these configurations. Notice, however, that the ATM Workgroup Switch can be used in any combination with other ATM switches, such as other ATM Workgroup Switches or 8260 hubs.

ATM Remote Feeder

When used as a remote feeder node, the workgroup switch's 155Mbps ATM I/O Card allows you to connect to the main network via ATM bearer services or privately owned fiber links.

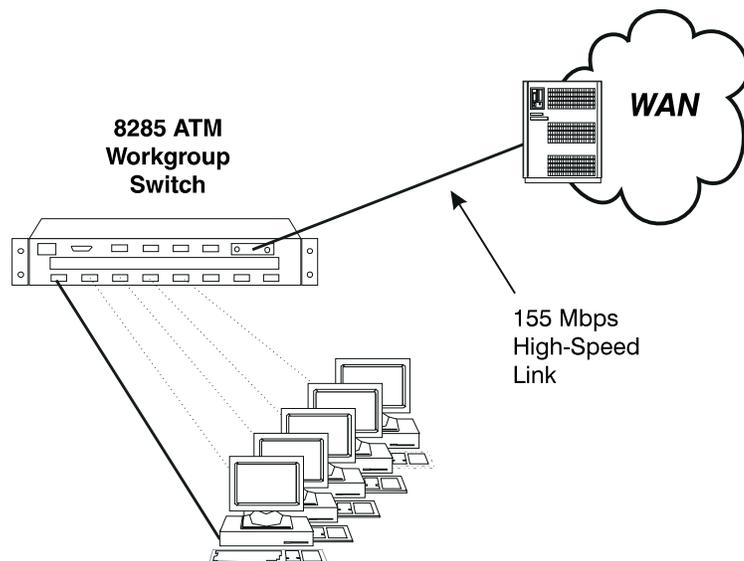


Figure 9. ATM Workgroup Switch in Remote Feeder Configuration

Client/Server Workgroup

The workgroup switch can be configured with:

- Client workstations connected to the 25.6Mbps ATM ports
- The server connected to the 155Mbps ATM I/O Card interface.

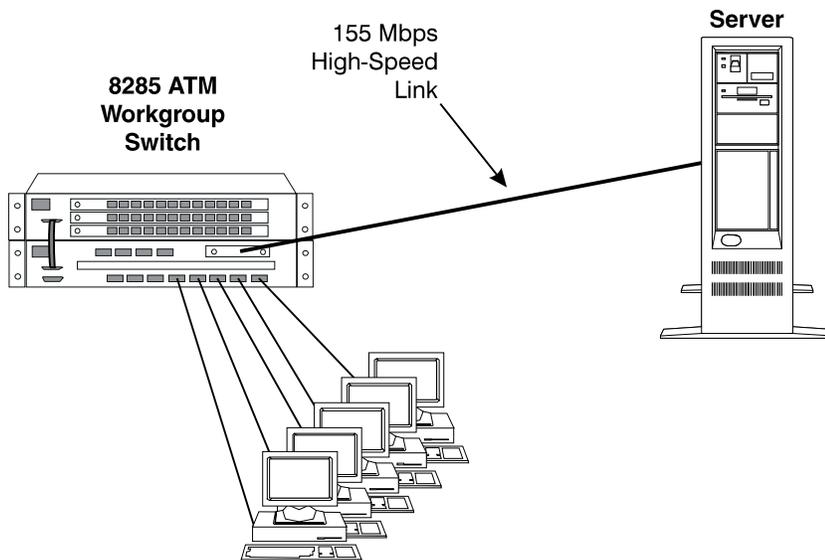


Figure 10. ATM Workgroup Switch in Client/Server Configuration

Floor Workgroup Switch

In larger networks, the workgroup switch can function as part of a larger ATM backbone to bring ATM to the desktop of every floor in a building. Multiple 155Mbps uplinks can be used to connect the workgroup switch to the main backbone for added reliability and increased bandwidth.

In addition, the workgroup switch provides switching between local workstations.

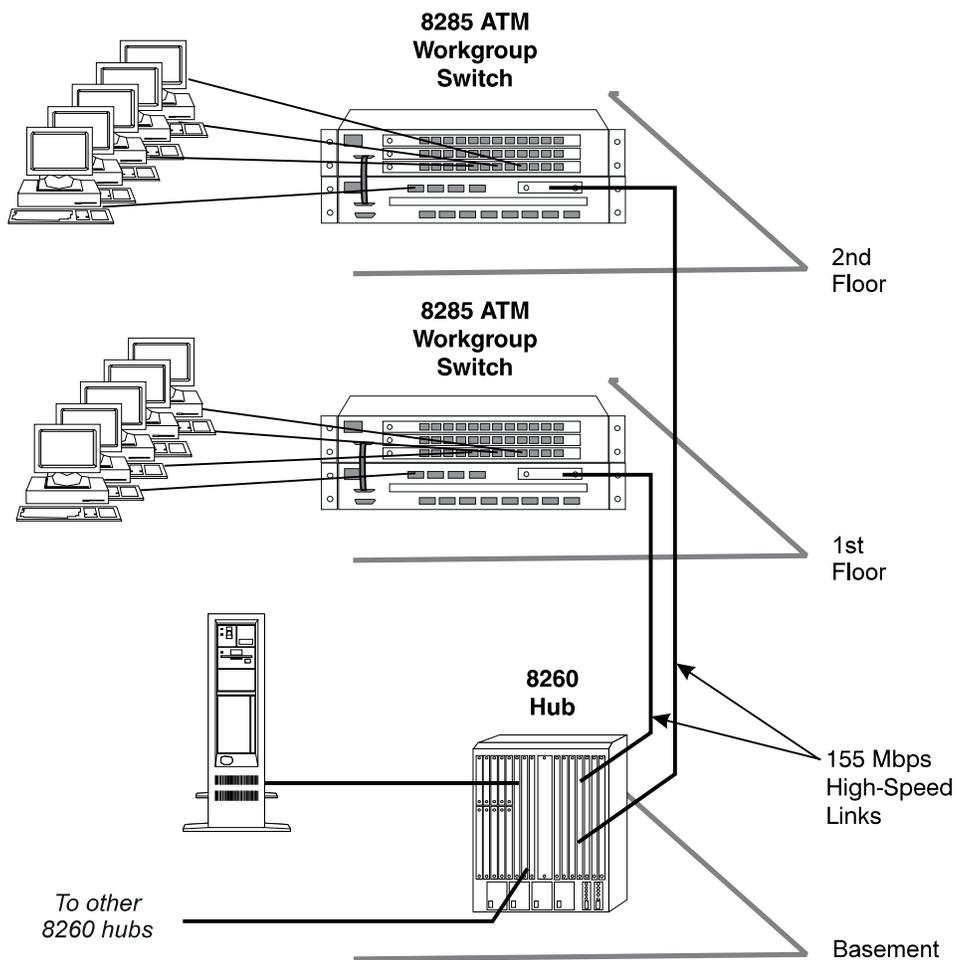


Figure 11. ATM Workgroup Switch in Floor Workgroup Configuration

Security Controls

Password Protection

To prevent unauthorized access to an ATM subsystem, the ATM Workgroup Switch provides two password levels to protect against network tampering and unauthorized access to the ATM Workgroup Switch console.

The **administrator password** allows full use of all ATM Workgroup Switch commands; the **user password** allows use of a limited set of ATM Workgroup Switch commands that do not let you change configuration settings.

ATM Port Security

The ports of the ATM Workgroup Switch are disconnected the first time you install it, and they must be enabled before they can carry ATM traffic. This is an additional security feature to prevent unauthorized access to the ATM subsystem.

ATM Media Module Security

The media modules in the ATM Workgroup Switch Expansion Unit are isolated the first time you install them, and must be connected to the network before they can carry ATM traffic. This is an additional security feature to prevent unauthorized access to the ATM subsystem.

Chapter 2. Installing the IBM 8285 Nways ATM Workgroup Switch

This chapter contains the three procedures for installing the ATM Workgroup Switch:

Procedure 1: Mounting the ATM Workgroup Switch Components

Procedure 2: Configuring the ATM Workgroup Switch

Procedure 3: Attaching ATM Devices to the ATM Workgroup Switch

Before You Start

To install the ATM Workgroup Switch components, you need the following items:

Rack Mounting

If the unit will be mounted in a rack, you need:

- A rack inventory chart and a cabling chart from your network administrator.
- Four screws appropriate for your rack and a screwdriver.
- The cable management bracket (shipped with the workgroup switch).

Desktop Mounting

If the unit will be mounted on a surface such as a desktop, you will need:

- A cabling chart from your network administrator.
- A screwdriver for reversing the mounting brackets on the workgroup switch.

Procedure 1: Mounting the ATM Workgroup Switch Components

To install the ATM Workgroup Switch perform the following steps in sequence:

- **1** Mount the **Base Unit** by following the instructions in Chapter 4, "Mounting the Base Unit" on page 47.
- **2** Mount the (optional) **155Mbps ATM I/O Card** by following the instructions in Chapter 5, "Mounting the 155Mbps ATM I/O Card" on page 53.
- **3** Mount the optional **Expansion Unit** feature by following the instructions in Chapter 6, "Mounting the Expansion Unit" on page 59.
- **4** Mount ATM **media modules** in the optional Expansion Unit by following the instructions in Chapter 7, "Mounting ATM Media Modules in the Expansion Unit" on page 65.
- **5** Before starting the next procedure, check that the ATM Workgroup Switch components have been mounted correctly, as described in "Verifying Component Mounting" on page 23.

Verifying Component Mounting

To verify that the workgroup switch components are correctly mounted:

___ **1** Power-on the ATM Workgroup Switch, noting the progress of the Power On Self Test (POST) as described in Chapter 8, "Power-On and Self Test" on page 69.

___ **2** Check that the Status LEDs on the front panels of both the Base Unit and the Expansion Unit are lit as shown here:

Power LED (green) ON —●— i
OK LED (green) ON —●— ok
Fault LED (yellow) OFF —○—

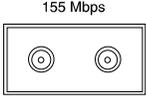
___ **3** Check that all 25.6Mbps Port LEDs on the Base Unit are lit as shown here:

Port Enable LED (green) OFF —○—
Output Activity LED (yellow) OFF —○—



___ **4** Check that the Port LEDs on the optional 155Mbps ATM I/O Card are lit as shown here:

Status LED (green) OFF —○—
Output Activity LED (yellow) OFF —○—
Error LED (yellow) OFF —○—



___ **5** Check that the Port LEDs on Expansion Unit modules are lit correctly, as described in the documentation for the specific module.

Incorrect: If any of the LEDs are incorrectly lit, follow the troubleshooting procedures in Chapter 21, "Troubleshooting" on page 149. **Do not start the next procedure until all LEDs are correctly lit.**

Correct: If all LEDs are correctly lit, you are finished with this procedure. Continue with "Procedure 2: Configuring the ATM Workgroup Switch" on page 24.

Procedure 2: Configuring the ATM Workgroup Switch

Before configuring the ATM Workgroup Switch, you must:

- Successfully complete “Procedure 1: Mounting the ATM Workgroup Switch Components” on page 22.
- Power-on the workgroup switch.

To configure the ATM Workgroup Switch perform the following steps in sequence:

- 1 Set up and attach a configuration **console** to the ATM Workgroup Switch Base Unit as described in Chapter 9, “Setting-Up and Using the Configuration Console” on page 73.
If no prompt appears or if the console does not function as expected, follow the troubleshooting procedures in “Problems with the Configuration Console” on page 155.
- 2 Configure the **basic** parameters of the workgroup switch, as described in Chapter 10, “Configuring Basic Workgroup Switch Parameters” on page 85.
- 3 Configure the **ports** in the Base Unit and the ports and ATM media modules in the Expansion Unit, as described in Chapter 11, “Configuring Ports and Media Modules” on page 93.
- 4 If the workgroup switch will form part of an ATM Campus Network, configure the **trunks** to the other switches and **PVCs**, as described in Chapter 12, “Configuring Trunk Connections” on page 99.
- 5 If you will be using Classical IP Over ATM, configure the **TCP/IP** parameters, as described in Chapter 13, “Configuring TCP/IP Parameters” on page 103.
- 6 If you will be using LAN Emulation Over ATM, configure the **LAN Emulation** parameters, as described in Chapter 14, “Configuring LAN Emulation Parameters” on page 107.
- 7 If you will be using an SNMP application to manage the ATM Workgroup Switch, configure the **SNMP** parameters, as described in Chapter 15, “Configuring SNMP Parameters” on page 115.
- 8 Save your configuration settings and logoff from the configuration console, as described in “Saving Configuration Settings and Logging Off” on page 119.
- 9 Before starting the next procedure, check that the workgroup switch is correctly configured and that ports are ready for attachment to ATM devices by following the steps in “Verifying Configuration” on page 25.

Verifying Configuration

To verify that the workgroup switch is correctly configured:

- ___ **1** Enter the `SHOW MODULE ALL` command.
- ___ **2** Check that all ports on the Base Unit and on all connected modules show a status of `UP-N0 ACTIVITY`.

Incorrect: If any of the ports show a status other than `UP-N0 ACTIVITY`, follow the troubleshooting procedures in Chapter 21, “Troubleshooting” on page 149. **Do not start the next procedure until all ports show the correct status.**

Correct: If all ports show a status of `UP-N0 ACTIVITY`, you are finished with this procedure. Continue with “Procedure 3: Attaching ATM Devices to the ATM Workgroup Switch” on page 26.

Procedure 3: Attaching ATM Devices to the ATM Workgroup Switch

To attach ATM devices to the ATM Workgroup Switch perform the following steps in sequence:

- **1** Power-off the workgroup switch by disconnecting the power cords from the electrical outlet and from both the Base Unit and the Expansion Unit.
- **2** Attach 25.6Mbps devices to the Base Unit ports by following the instructions under Chapter 17, “Attaching 25.6Mbps Devices to the ATM Workgroup Switch” on page 129. For information on cables, connectors and part numbers, see Appendix B, “Cables, Pins and Connectors” on page 189.
- **3** If you have the optional 155Mbps ATM I/O Card, attach a 155Mbps device by following the instructions under Chapter 18, “Attaching 155Mbps Devices to the I/O card” on page 133. For information on cables, connectors and part numbers, see Appendix B, “Cables, Pins and Connectors” on page 189.
- **4** If you have the optional Expansion Unit Feature, attach devices to the Expansion Unit modules by following the instructions that accompany the module.
- **5** Check that all devices are correctly attached by following the steps in “Verifying Device Attachment” on page 27.

Verifying Device Attachment

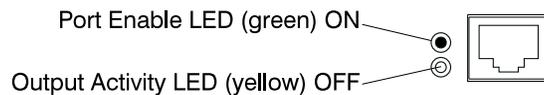
To verify that all devices are correctly attached you must check that all LEDs display the correct patterns, and check that all ports show the correct status.

Part 1: Check LED Patterns

1 Power-on the ATM Workgroup Switch as described in Chapter 8, "Power-On and Self Test" on page 69 and check the port LEDs on the ATM Workgroup Switch:

2 Check that the 25.6Mbps Port LEDs on the Base Unit are lit as described below:

- If a port has a device attached that is powered on, and if the port has been enabled, the expected pattern is as shown here:



- If a port does not have a device attached, or if the attached device is not powered on, the expected pattern is:
 - Port Enable LED (green) BLINKING
 - Output Activity LED (yellow) OFF
- If a port is not enabled, the expected pattern is:
 - Port Enable LED (green) OFF
 - Output Activity LED (yellow) OFF

3 Check that the 155Mbps I/O Port LEDs on the Base Unit are lit as described below:

- If the port has a device attached that is powered on, and if the port has been enabled, the expected pattern is as shown here:



- If the port does not have a device attached, or if the attached device is not powered on, the expected pattern is:
 - Status LED (green) BLINKING
 - Output Activity LED (yellow) OFF
 - Error LED (yellow) OFF
- If the port is not enabled, the expected pattern is:
 - Status LED (green) OFF
 - Output Activity LED (yellow) OFF
 - Error LED (yellow) OFF

- ___ **4** Check that the Port LEDs on all Expansion Unit modules are lit correctly, as described in the documentation for the specific media module.

Incorrect: If any of the port LEDs do not show the correct pattern, follow the troubleshooting procedures in Chapter 21, "Troubleshooting" on page 149. **Do not proceed to "Part 2: Check Status of Ports" until all LEDs are correctly lit.**

Correct: If all port LEDs are correctly lit, proceed to "Part 2: Check Status of Ports."

Part 2: Check Status of Ports

- ___ **1** Enter the `SHOW MODULE ALL` command. All ports should show a status of OKAY.

Incorrect: If any ports do not show a status of OKAY, follow the troubleshooting procedures in Chapter 21, "Troubleshooting" on page 149. **Do not attempt to apply normal ATM traffic to the workgroup switch until all ports show the correct status.**

Correct: If all ports show a status of OKAY, you have finished installing the ATM Workgroup Switch.

Chapter 3. Building an ATM Campus Network

This chapter describes the components of the ATM Campus Network and their relation the elements of an ATM address.

Overview

The purpose of an ATM network is to set up connections via one or more ATM subsystems between two ATM user devices. ATM subsystems can be interconnected to build a local, privately owned and administered **ATM Campus Network**.

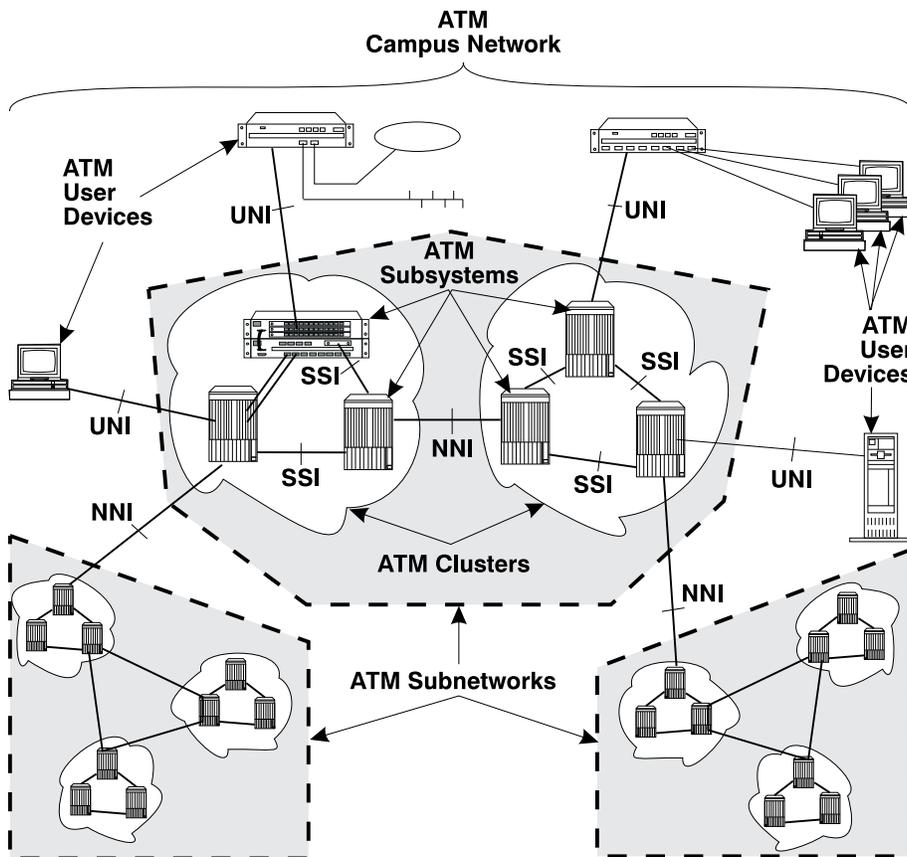


Figure 12. Components of an ATM Campus Network

ATM Campus Network Components

The various parts of the ATM address form a hierarchy of network components, as shown in Figure 13.

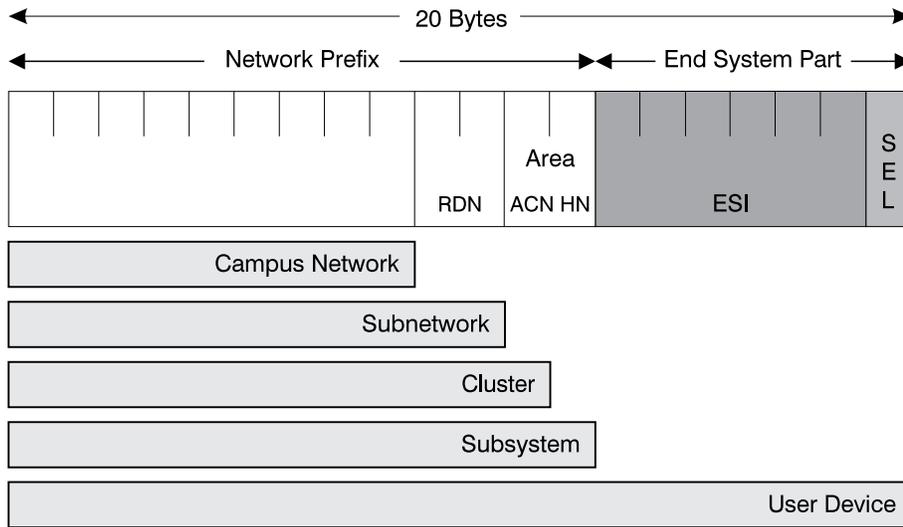


Figure 13. ATM Address Hierarchy

For a full description of the ATM address formats supported by the ATM Workgroup Switch, see Appendix D, “ATM Address Formats in the ATM Workgroup Switch” on page 211.

The terms used to describe the components of an ATM Campus Network are defined here:

ATM Campus Network

One or more ATM subnetworks interconnected using NNI interfaces.

This set of subnetworks is controlled by one administrative domain and a single private owner using one network access protocol (UNI).

An ATM campus network is identified by:

- The first 9 bytes of the unique network prefix.

ATM Subnetwork

One or more ATM clusters interconnected using NNI interfaces.

An ATM subnetwork is identified by:

- The first 9 bytes of the network prefix, which are the same for all subnetworks in a campus network, plus
- A 2-byte routing domain number (RDN), which is unique within the ATM Campus Network.

- ATM Cluster** One or more ATM subsystems interconnected using SSI interfaces.
An ATM cluster is identified by:
- The first 11 bytes of the network prefix, which are the same for all clusters in an ATM subnetwork, plus
 - A 1-byte ATM Cluster Number (**ACN**), unique within the ATM subnetwork, which ranges from 0 to 255.
- ATM Subsystem** An individual self-contained switching unit, such as a hub or workgroup switch. The components of the ATM subsystem in an ATM Workgroup Switch include:
- Integrated ATM Control Point and Switch functions
 - The UNI, SSI, and NNI ATM interfaces
 - Ports for connecting to ATM devices
 - ATM media modules installed in the Expansion Unit.
- An ATM subsystem is identified by:
- The first 12 bytes of the network prefix, which are the same for all subsystems in a cluster, plus
 - A 1-byte Hub Number (**HN**), unique within the ATM Cluster, which ranges from 0 to 255.
- ATM User Device** An end system that encapsulates data into ATM cells and forwards them to the ATM subsystem across a UNI interface. Examples of ATM user devices are:
- Servers and workstations equipped with ATM adapters
 - ATM concentrators or workstations equipped with ATM adapters
 - Routers with ATM adapters
 - LAN ATM bridges.
- An ATM user device is identified by:
- The first 13 bytes of the network prefix, which are the same for all user devices attached to an ATM subsystem, plus
 - A 6-byte End System Identifier (**ESI**), unique within the ATM Subsystem, plus
 - A 1-byte Selector field that may be used by the user device.
- The ATM Workgroup Switch passes the network prefix of an ATM address to attached end systems using the Interim Local Management Interface (ILMI) protocol.

Network Interfaces

ATM standards define three protocols used across the interfaces between ATM campus network components:

- UNI** Defines the interface between an ATM user device (such as a terminal, router, bridge, server, workstation, or concentrator equipped with an ATM adapter) and the ATM network. The ATM subsystem supports the private UNI defined by the ATM Forum UNI Specification V3.1.
- SSI** Defines the interface between two ATM switches in the same ATM cluster.
- The SSI fully supports networking functions without the need of operator intervention, such as routing, node failure and node recovery, backup, and topology management by the Topology Routing Service (TRS) program.
- You can define multiple SSI connections between two ATM switches. The SSI has been developed from the Public-NNI for use in IBM ATM subnetworks.
- NNI** Defines the interface between two ATM switches belonging to different ATM Clusters in the same subnetwork or in different subnetworks.
- Operator intervention is required in order to manage networking functions such as routing, backup, topology changes, and so on.
- You can define only one NNI connection between two ATM switches.

Connecting ATM Devices to Form a Network

The following sections provides guidelines for building an ATM Campus Network:

- Linking user devices to a switch (via UNI interface)
- Linking switches together (via SSI interface) to form clusters
- Linking clusters together (via NNI interface) to form subnetworks
- Linking subnetworks together (via NNI) to form a Campus Network

Linking User Devices (UNI Interface)

ATM devices that can be connected to a Switch using the UNI interface include terminals and workstations, routers, bridges, concentrators and servers.

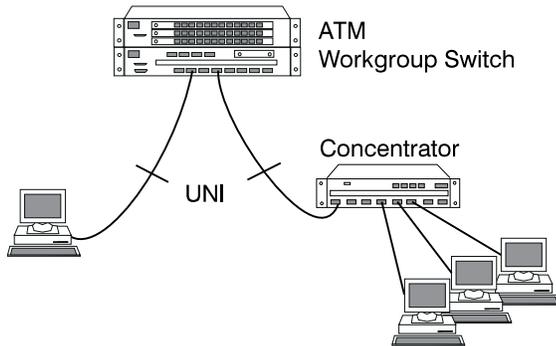


Figure 14. Connections to User Devices (UNI)

Guidelines for Configuring UNI Ports on the ATM Workgroup Switch:

- Both PVCs and SVCs can be defined on the same physical port
- For SVCs, the connection identifiers (VPI:VCI) have VPI equal to 0.
- For PVCs, both Virtual Path (VP) connections and Virtual Channel (VC) connections are supported:
 - VP Identifiers (VPI) are in the range:
 - 0-7 over 25.6Mbps ports
 - 0-15 over all other ports
 - VC Identifiers (VCI) are in the range 32-1023.
- The Well-Known PVC 0.17 (ATM Forum LAN Emulation) is supported. This PVC can be defined using the SET PVC command, or using Nways Campus Manager ATM version 1.1.2.
- ILMI is not required for ATM connection through PVC.
- The maximum number of ILMI registered addresses per switch is 1024.

Linking Subsystems to Form a Cluster (SSI Interface)

An ATM cluster is a group of ATM switches connected by SSI trunks.

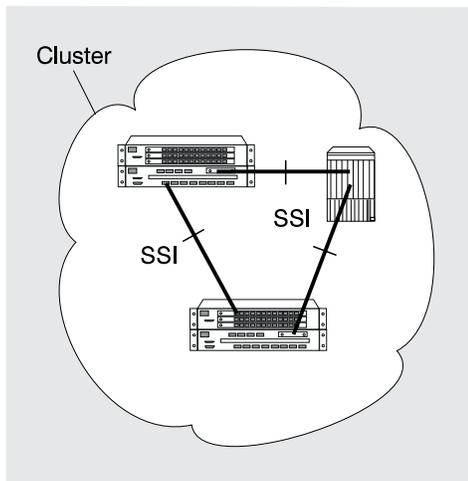


Figure 15. Connections Within a Cluster (SSI)

Guidelines for SSI Trunks:

- The bandwidth you specify (or default) must be identical at both ends of an SSI link.
- The total bandwidth budget for all SSI ports defined in the Base Unit and Expansion Unit is 212Mbps.
- The total **Reserved Bandwidth** of the Base Unit and Expansion Unit (for class-A PVCs and NNI ports, for example) cannot exceed 180Mbps.

See also “General Guidelines for Configuring Trunks” on page 44 for further information.

Performance Considerations:

- Each cluster should contain no more than 25 switches
- Switches should not be separated from each other by more than 5 hops. (Call set up and cell transit time are proportional to the number of hops.)

Parallel SSI Trunk Links: For increased availability or throughput, parallel SSI trunk links may be defined between switches as shown in Figure 16.

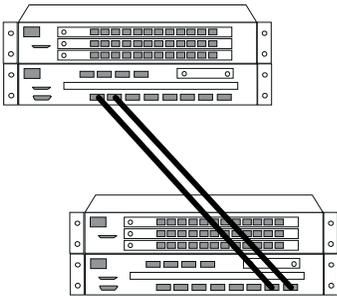


Figure 16. Parallel Trunk Links

Note: The bandwidth provided by parallel links between switches cannot be shared, that is, two parallel links between 25.6Mbps ports does not provide 51.2Mbps bandwidth.

Linking Clusters to Form a Subnetwork (NNI Interface)

An ATM subnetwork is a group of ATM clusters connected by NNI trunks. Each NNI trunk connects the 'boundary switch' in one cluster to the boundary switch in another cluster, as shown in Figure 17.

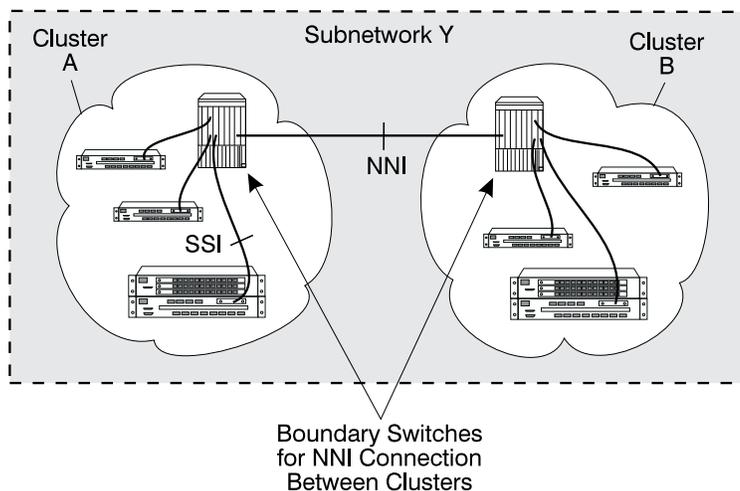


Figure 17. NNI Trunks Between Clusters

Configuring NNI Trunks Between Clusters: On each of the boundary switches that will be linked by an NNI trunk, you will:

- Configure the port for the trunk as an NNI port (using the SET PORT command)
- Configure a 'logical link' for that port (using the SET LOGICAL_LINK command) by specifying:
 - Virtual Path Identifier (VPI) number
 - ATM cluster number (ACN) for the remote boundary switch
 - Bandwidth available on the virtual path
 - Signalling role for Q.2931 protocol.

You can configure multiple logical links over the same physical port. However, you can only configure one logical link (using one pair of ATM ports) for each ATM cluster-to-cluster trunk connection.

Guidelines for NNI Trunks:

- You can establish NNI links both over physical links and over Virtual Path connections (VP tunneling).
- You can define a maximum of 16 logical links per NNI port, with VPIs in the range:
 - 0-7 over 25.6Mbps ports
 - 0-15 over all other ports
- The total bandwidth reserved for NNI links is:
 - 21.2Mbps per 25.6Mbps port
 - 131Mbps per 155Mbps port

- The total **Reserved Bandwidth** of the Base Unit and Expansion Unit (for class-A PVC and NNI ports, for example) cannot exceed 180Mbps.
- According to ATM Forum recommendations, PVCs cannot cross NNI links. To set up a PVC across an NNI link, see the workaround described in “PVCs Between clusters” on page 42.
- Multicast VCCs are supported on NNI links, with VPIs in the range:
 - 0-7 over 25.6Mbps ports
 - 0-15 over all other ports

See also “General Guidelines for Configuring Trunks” on page 44 for further information.

Adjacent Clusters: Due to the lack of dynamic routing on NNI links, all clusters within the same subnetwork **must** be adjacent, as shown in Figure 18.

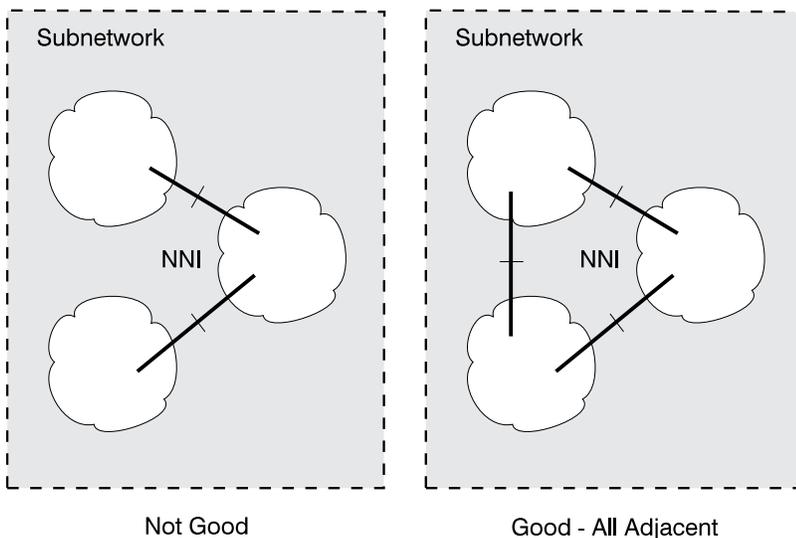


Figure 18. Connections Within a Subnetwork or Campus Network (NNI)

Parallel NNI Trunk Links: Parallel NNI trunk links may also be defined between clusters for increased availability or throughput, as shown in Figure 16 on page 35.

Parallel NNI links must begin from the same switch and end at the same switch.

Linking Subnetworks to Form a Campus Network

An ATM Campus Network is a group of ATM subnetworks connected by NNI trunks. Each NNI trunk connects the 'boundary switch' in one subnetwork to the boundary switch in another subnetwork, as shown in Figure 19.

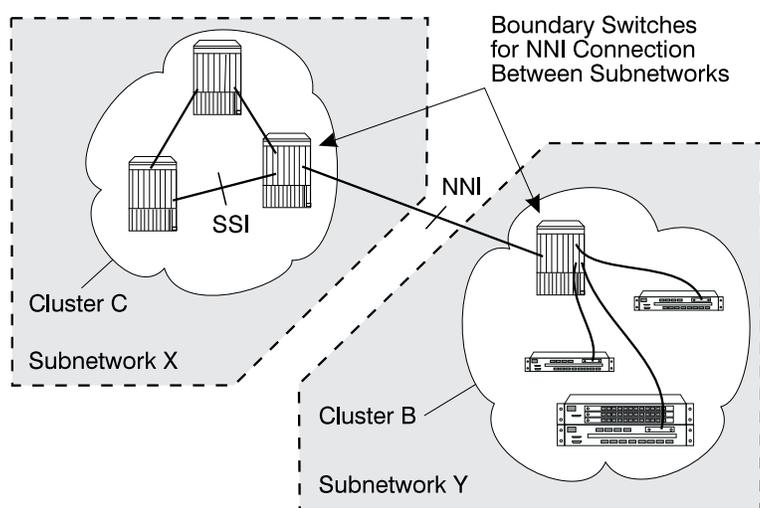


Figure 19. NNI Trunks Between Subnetworks

Configuring NNI Trunks Between Subnetworks: On each of the boundary switches that will be linked by an NNI trunk, you will:

- Configure the port for the trunk as an NNI port (using the SET PORT command)
- Define a 'static route' (using SET STATIC_ROUTE) that associates a local cluster number (ACN) with the address of the remote boundary switch
- Configure a 'logical link' to the local ACN associated with the remote switch (using SET LOGICAL_LINK)

You can configure multiple logical links over the same physical port. However, you can only configure one logical link (using one pair of ATM ports) for each ATM cluster-to-cluster trunk connection.

Guidelines for NNI Trunks via Static Routes:

- Parallel NNI links may be defined between clusters in separate subnetworks.
- The maximum number of Static Routes associated to local ATM Cluster Numbers (ACNs) is 50.
- Due to the lack of dynamic routing on NNI links, it is recommended that you design networks where all the clusters are adjacent, as shown in Figure 18 on page 37.

See also "General Guidelines for Configuring Trunks" on page 44 for further information.

Example: Configuring a Static Route

The following example demonstrates the steps required to configure a connection between two ATM user devices attached to different subnetworks. Figure 20 shows the trunks that must be configured to allow Workstation Kouroos and Workstation Sphinx to communicate,

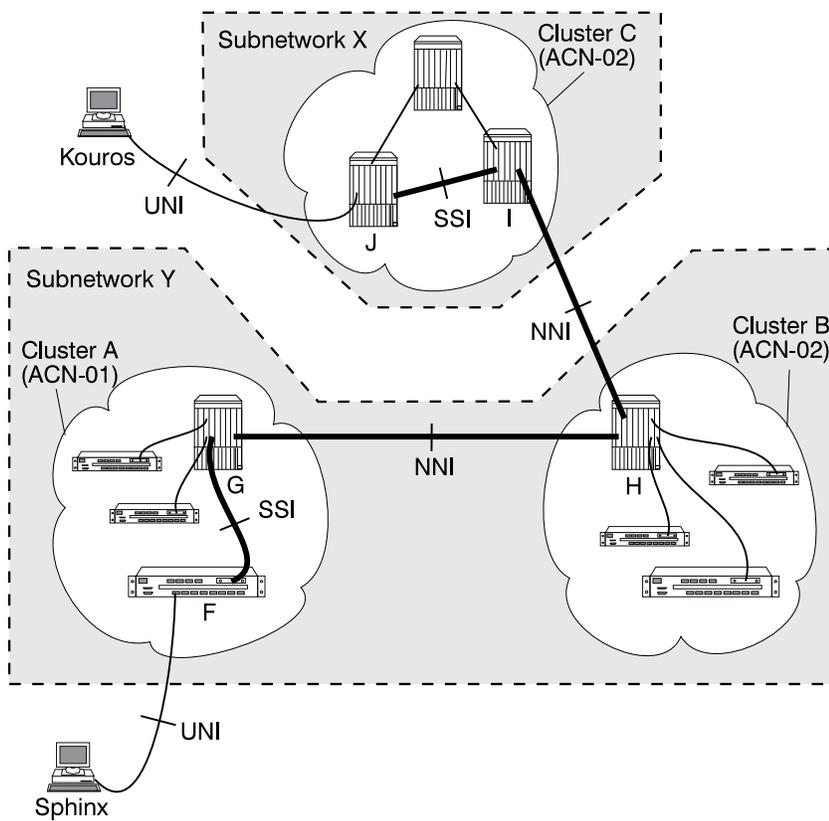


Figure 20. Example of Logical Links and Static Routes

From Sphinx to Kouros: To configure the route from Workstation Sphinx to Workstation Kouros, you must know the local ACN for cluster C (02). You would then start from ATM Workgroup Switch F, the entry point to cluster A in subnetwork Y:

1. From ATM Workgroup Switch F (entry point in cluster A), enter the SET STATIC_ROUTE command with the local ACN for Cluster B (02).
2. From Hub G (boundary hub), enter the SET LOGICAL_LINK command with the local ACN for Cluster B (02).
3. From Hub H (the entry point in cluster B), enter the SET STATIC_ROUTE command with a dummy ACN (for example, 33) that will represent Cluster C (local ACN=02) in Subnetwork X.
4. From Hub H (which is also a boundary hub), enter the SET LOGICAL_LINK command using the same dummy ACN (33).

The ATM address of Workstation Kouros is known in cluster C by the updates received at each ATM switch by the Topology Routing Service (TRS).

From Kouros to Sphinx: To configure the route for communication in the opposite direction, you must know the local ACN for cluster A (01). You would start from Hub J, the entry point to cluster C in subnetwork X:

1. From Hub J, enter the SET STATIC_ROUTE command with a dummy ACN (for example, 44) that will represent Cluster A (local ACN=01 in Subnetwork Y).
2. From Hub I (boundary hub), enter the SET LOGICAL_LINK command using the same dummy ACN (44) for Cluster A.
3. From Hub H (boundary hub), enter the SET LOGICAL_LINK command with the ACN for cluster A (01).

The ATM address of Workstation Sphinx is known in cluster A by the TRS updates.

Configuring Permanent Virtual Circuits (PVCs)

Permanent Virtual Circuits (PVCs) can be defined to connect two ATM ports within the same cluster. Two types of PVC are supported:

- PVCs for virtual channel connections (VCCs)
- PVCs for virtual path connections (VPCs), also known as permanent virtual path (PVP).

For each PVC you must define:

- The hub number (HN) of the remote switch
- The ports that form the local and remote end points
- A unique PVC identifier
- The type of PVC (path or channel)
- The bandwidth allocation algorithm (best effort or reserved)

The maximum number of PVCs that can exist in an workgroup switch is 100.

PVC Workarounds

Workarounds are necessary to create PVCs in certain circumstances:

- PVCs across NNI trunks.
- PVCs to 8260 hubs with CPSW modules earlier than version 2.1.0

PVCs Between clusters: According to ATM Forum recommendations, PVCs cannot cross NNI links. To set up a PVC that works across an NNI link between clusters:

- Set up the two PVCs within the clusters that will be joined by the NNI link
- Join both PVCs by fibre or cable, as shown in Figure 21
- Configure the two “boundary” ports with the same VPI:VCI.

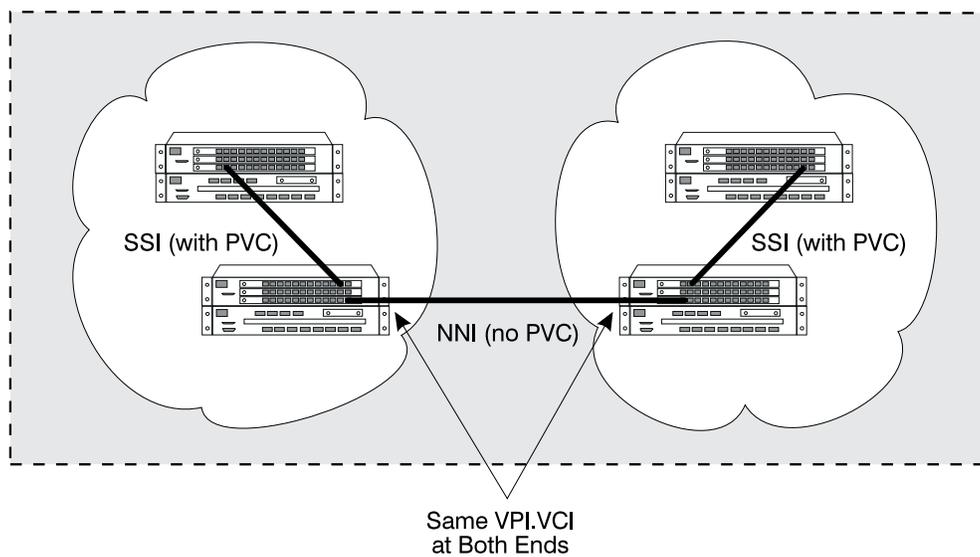


Figure 21. PVC Workaround for Cross-NNI Links

PVCs to Early IBM 8260 ATM Control Point and Switches: Internal management of PVCs in the ATM Workgroup Switch is not compatible with versions of the IBM 8260 ATM Control Point and switch prior to version 2.1.0.

To set up a PVC to an 8260 hub with a CPSW earlier than version 2.1.0, you must:

- Define one PVC among the 'pre-v.2.1.0' switches only
- Define one PVC among the later version switches
- Join the two PVCs by fibre or cable, as shown in Figure 22
- Configure the two "boundary" ports with the same VPI:VCI.

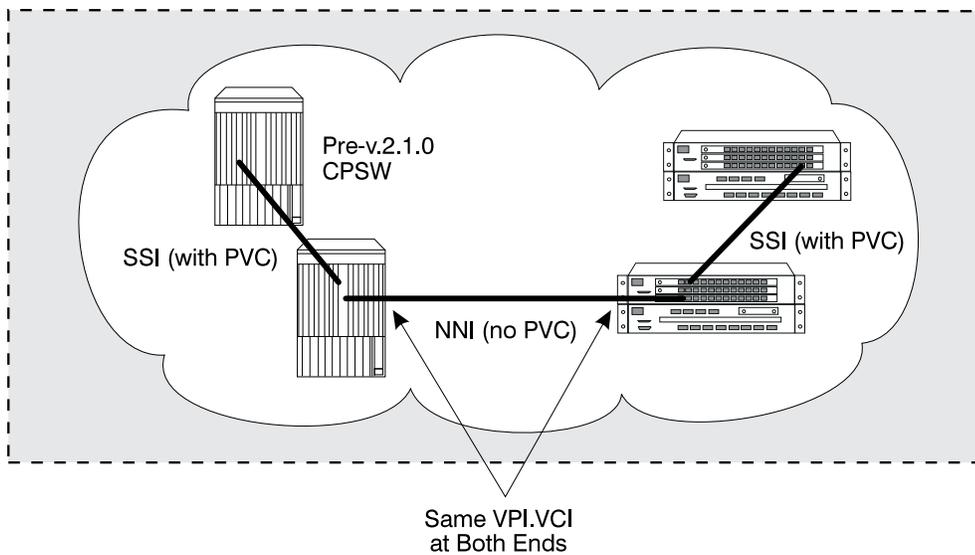


Figure 22. PVC Workaround for Early Hub Versions

General Guidelines for Configuring Trunks

- The ATM Workgroup Switch does not police traffic on its ATM ports. If an attached device does not comply with the agreed bandwidth, or if, for example, you forward traffic from a 155Mbps port to a 25.6Mbps port, cells will be lost.
- When traffic on a Reserved Bandwidth connection exceeds the agreed bandwidth, the traffic on Non-Reserved Bandwidth connections is reduced.
- If you are using PVCs and you think the traffic will reach the limits of the ports or of the workgroup switch, it is recommended that you define these PVCs as reserved_bandwidth.
- The following maximum numbers of connections apply to switched Virtual Circuits (SVC) and Permanent Virtual Circuits (PVC).

Maximum number of connections per switch

The maximum number of connections depends on their type, Point-to-Point (PtP) or Point-to-Multipoint (PtM), and for PtM connections on the number of branches per connection. The following rules apply:

- The switch has 2048 control blocks
- 2 control blocks are required per PtP connection (up to 1024 PtP connections)
- 1 control block is required per branch of a PtM connection
- The switch has 2048 party control blocks (2 party control blocks are required per party)
- The maximum number of parties over point-to-multipoint connections is 1000.
- The maximum number of PVCs that can be defined and saved per switch is 100. PVC definitions are stored in non-volatile RAM for automatic restart

Maximum number of connections per port

The maximum number of PtP plus PtM connections is 992.

Maximum number of connections per Base Unit.

The maximum number of PtP plus PtM connections on the Base Unit is 992.

Maximum number of Clients in the LAN-Emulation Server

The integrated LAN-Emulation Server can accept up to 128 client registrations.

Important: Problems in the normal operation of your ATM subnetwork may occur when the maximum number of virtual connections (VCs) allowed on the ATM Workgroup Switch Base Unit is exceeded.

Part 2. Mounting Workgroup Switch Components

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Chapter 4. Mounting the Base Unit

This chapter describes the procedures for mounting the Base Unit.

See the *IBM 8285 Nways ATM Workgroup Switch: Safety and Service Catalog, SY33-2113* for DANGER and CAUTION notices that concern this product, and their translations.

Contents of the Base Unit Shipping Group

Figure 23 illustrates the contents of the ATM Workgroup Switch Base Unit shipping group.

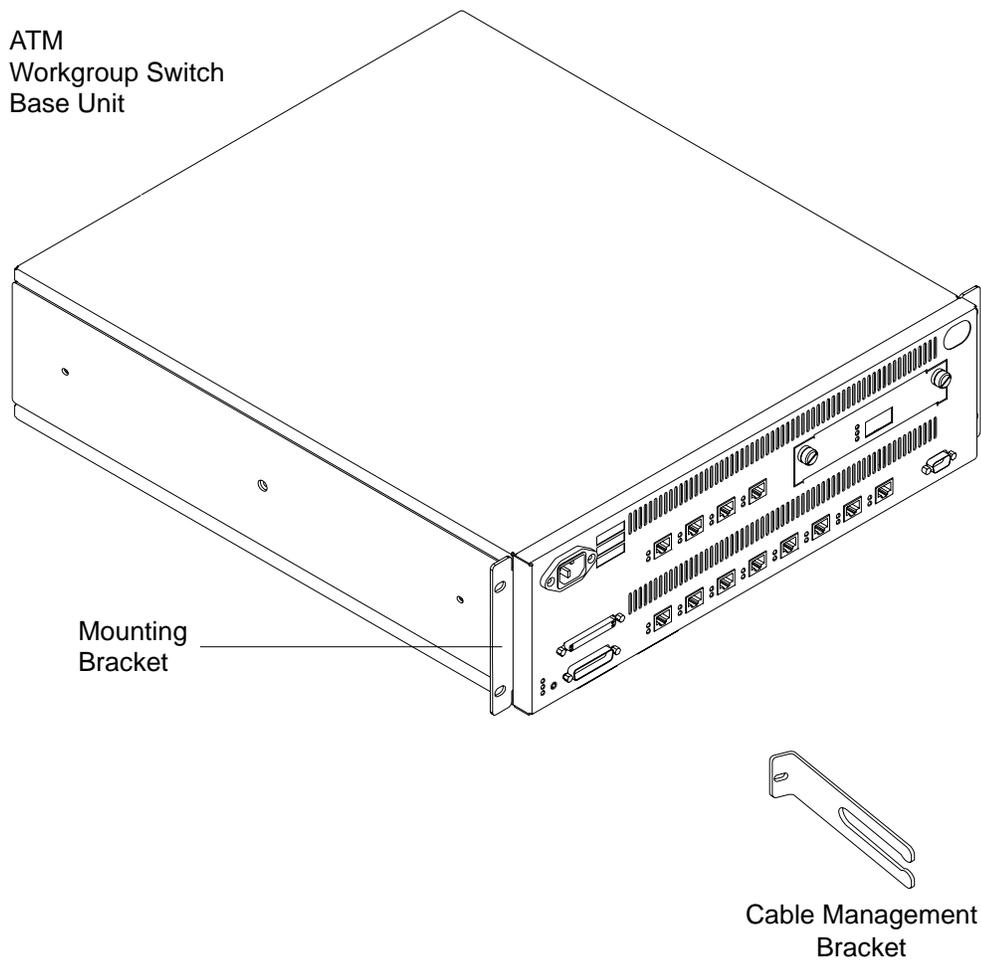


Figure 23. Contents of the ATM Workgroup Switch Shipping Group

The Base Unit shipping group contains:

- An ATM Workgroup Switch Base Unit with mounting brackets attached – P/N 58G9654
- A cable management bracket – P/N 92G8549
- An RS-232 wrap plug (not shown) – P/N 58G9868
- An RS-45 wrap plug (not shown) – P/N 42H0540
- RS-232 connectors for the ATM Workgroup Switch configuration console (not shown), consisting of:
 - Cable – P/N 6323741
 - Null-modem interposer – P/N 58F2861
 - Gender changer – P/N 58G4422
- A power cord (not shown) suitable for the country
- The following publications (not shown):
 - *IBM 8285 Nways ATM Workgroup Switch: Installation and User's Guide*, SA33-0381 (this manual)
 - *IBM 8285 Nways ATM Workgroup Switch: Safety and Service Catalog*, SA33-0398
 - *IBM 8285/8260: ATM Command Reference Guide*, SA33-0385

If any item is missing or damaged, contact your place of purchase.

Rack or Surface Mounting

Use the cabling chart provided by your network administrator to determine whether the Base Unit will be mounted on a surface or in a rack. If you are using the ATM Workgroup Switch Cabling Chart that came with the *IBM 8250/8260/8285: Planning and Site Preparation Guide*, GA33-0285, this information is found in the top portion of that chart.

Notes:

1. Make sure that there is adequate space around the Base Unit to provide sufficient ventilation for the unit. The Base Unit requires at least 100 mm (4 in) spacing at the front and 300 mm (12 in) at the back.
2. Make sure the mounting location meets the environmental requirements of the Base Unit (temperature, humidity, ventilation, and so on) as described in Appendix A, "Specifications" on page 185.
3. Before installing the Base Unit, be sure to read "Electronic Emission Notices" on page xvii.

If the Base Unit is to be:

- Rack mounted (the preferred mounting style), continue with "Rack Mounting the Base Unit" on page 49.
- Surface mounted, go to "Surface Mounting the Base Unit" on page 51.

Rack Mounting the Base Unit

Notes:

1. At the discretion of the installer, a second person may help install the Base Unit in the equipment rack.

You must support the Base Unit while you are tightening the screws to avoid dropping it on the floor or on other equipment beneath it in the rack. The Base Unit weighs approximately 12.8 kg (28.2 lb).

2. It is recommended that you use a screw starter when installing the Base Unit in the rack.

Follow these steps to mount the Base Unit in a rack:

- **1** Look at the rack inventory chart provided by your network administrator to determine where in the rack the Base Unit should be mounted.
- **2** Insert the lower left-hand screw into the Base Unit, and then lift the Base Unit into position, lining up the screw and the mounting hole in the rack.
Partially tighten the screw.
- **3** Align the hole in the cable management bracket with the holes on the right-hand mounting bracket and the rack. Using one screw, secure the cable management bracket and the lower right-hand side of the unit in the rack. This is shown in Figure 24 on page 50.

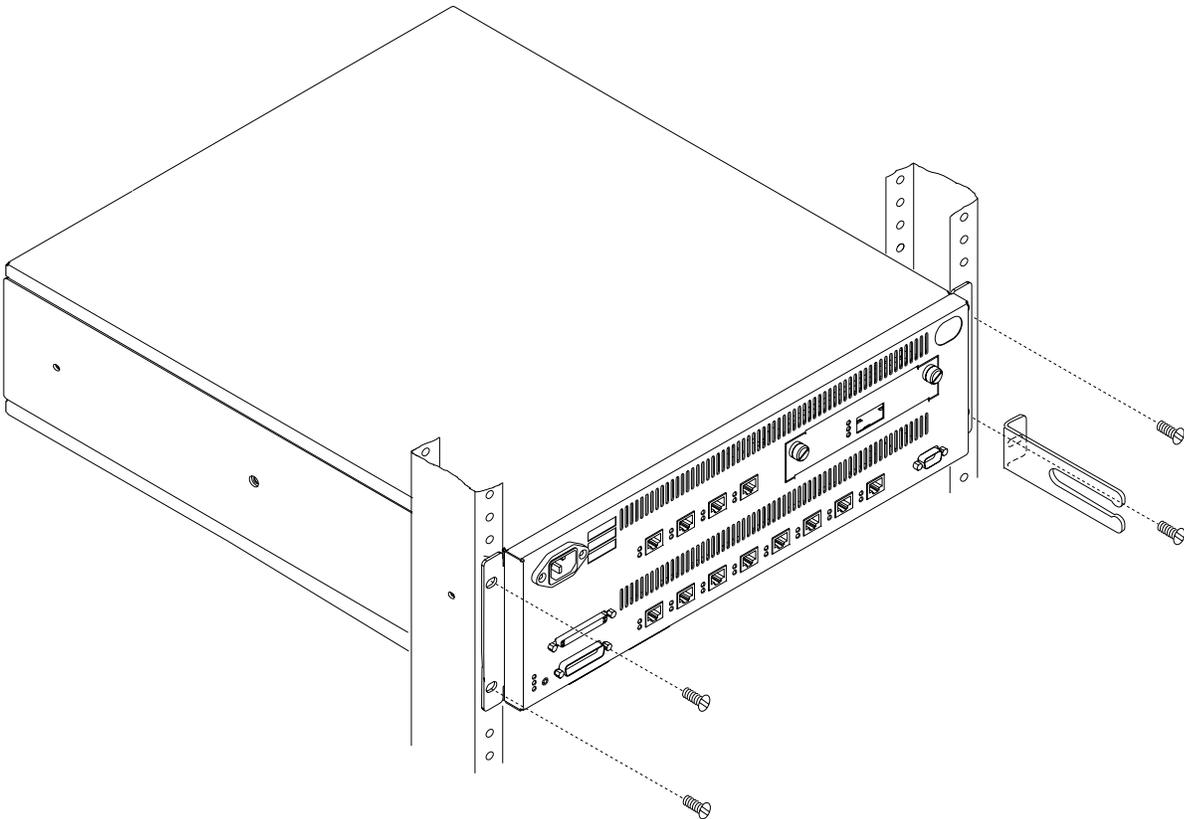
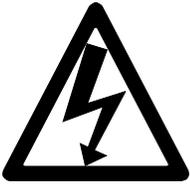


Figure 24. Rack Mounting the Base Unit

- ___ **4** Insert and partially tighten the upper two screws.
- ___ **5** Tighten all four screws securely with a screwdriver.
- ___ **6** Return to “Procedure 1: Mounting the ATM Workgroup Switch Components” on page 22.

Surface Mounting the Base Unit

Note: For safety purposes, the mounting surface must be able to support a minimum of 100 kg (200 lbs).



- **1** Using a screwdriver, loosen the four flat-head screws that attach the two mounting brackets to the sides of the Base Unit. The middle screw with the Phillips head is visible but should not be loosened.

- **2** Rotate the brackets and reattach them to the Base Unit as shown in Figure 25 on page 52. The bracket stamped (A) stays on the left side of the Base Unit (from the front) and the bracket stamped (B) on the right side.

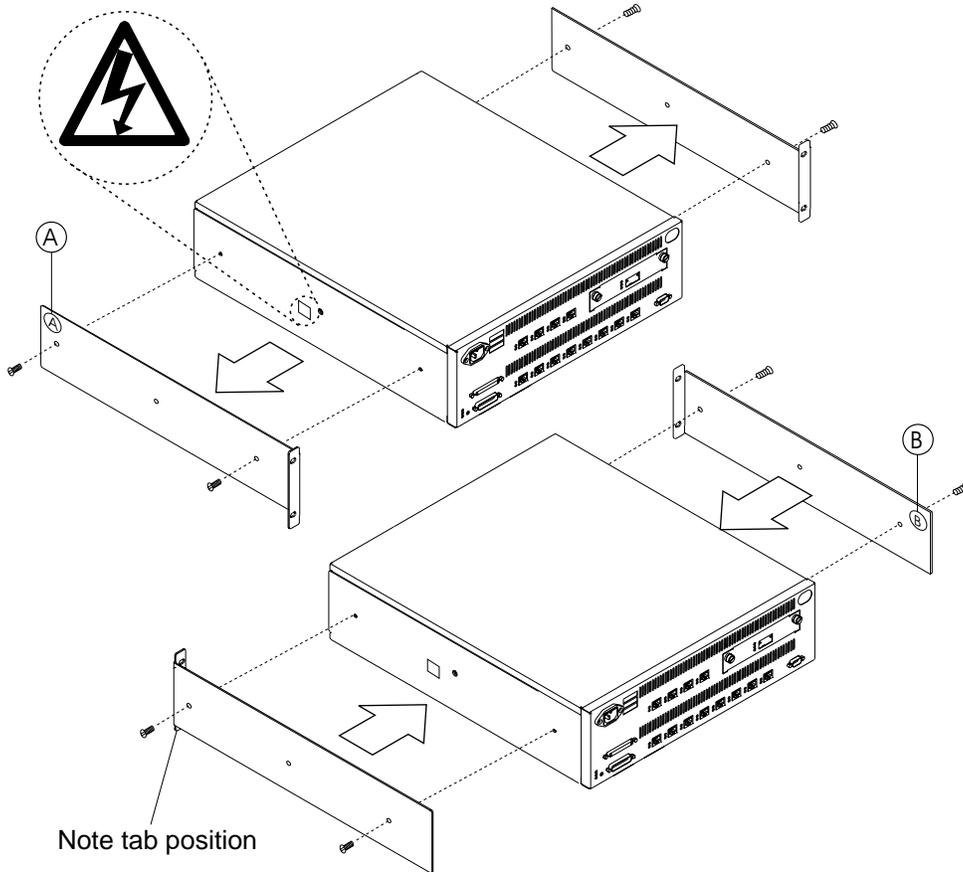


Figure 25. Attaching the Mounting Brackets for Surface Mounting

- ___ **3** Place the Base Unit on the surface where it is to be used.
- ___ **4** Return to “Procedure 1: Mounting the ATM Workgroup Switch Components” on page 22.

Chapter 5. Mounting the 155Mbps ATM I/O Card

This chapter describes the installation procedures for the optional 155Mbps ATM I/O Card:

- Precautionary procedures
- Unpacking the I/O card
- Installing the I/O card in the ATM Workgroup Switch

No special tools are needed to install the I/O card. The procedure is the same for both the single mode I/O card and the multi-mode I/O card.

See the *IBM 8285 Nways ATM Workgroup Switch: Safety and Service Catalog, SY33-2113* for DANGER and CAUTION notices that concern this product, and their translations.

Precautions

Electrostatic discharge (ESD) can damage static-sensitive devices on circuit boards. Follow these precautions when you handle the 155Mbps ATM I/O Card.

Warnings:

1. Do not remove the board from its anti-static shielding bag until you are ready to inspect or install it.
2. Handle the board by the faceplate only.

Use one of the following proper grounding techniques, if possible, when you install the 155Mbps ATM I/O Card:

- Use a foot strap and grounded mat or wear a grounded static discharge wrist strap.
- Touch the grounded rack or other source of ground just before you handle the I/O card

Unpacking the I/O Card

To unpack the 155Mbps ATM I/O Card:

1. Verify that the I/O card is the feature that you ordered by checking the MFI Part Number listed on the side of the shipping carton:
 - P/N 47H2290 - Multimode Fiber (MMF) I/O card
 - P/N 51H3860 - Single Mode Fiber (SMF) I/O card
2. Remove the I/O card from the shipping carton.
3. Remove the I/O card from the anti-static shielding bag, and inspect it for damage.

Always handle the I/O card by the faceplate, being careful not to touch the components. If the I/O card appears to be damaged, return it to the anti-static shielding bag, repack in the shipping carton, and contact your local supplier.

Keep the shipping carton and anti-static shielding bag in which your 155Mbps ATM I/O Card was shipped for future storage or shipment.

Record the serial number of the I/O card you received.

Mounting Procedure

To install the 155Mbps ATM I/O Card, perform the following steps in sequence:

- 1** Be sure to power off the ATM Workgroup Switch by unplugging the power cord before you begin, because the 155Mbps ATM I/O Card is not hot-pluggable. If you do not unplug the power cord, you risk damaging the ATM Workgroup Switch.
- 2** Loosen the knurled screws on both sides of the dummy slot cover and remove it from the front panel of the Base Unit.

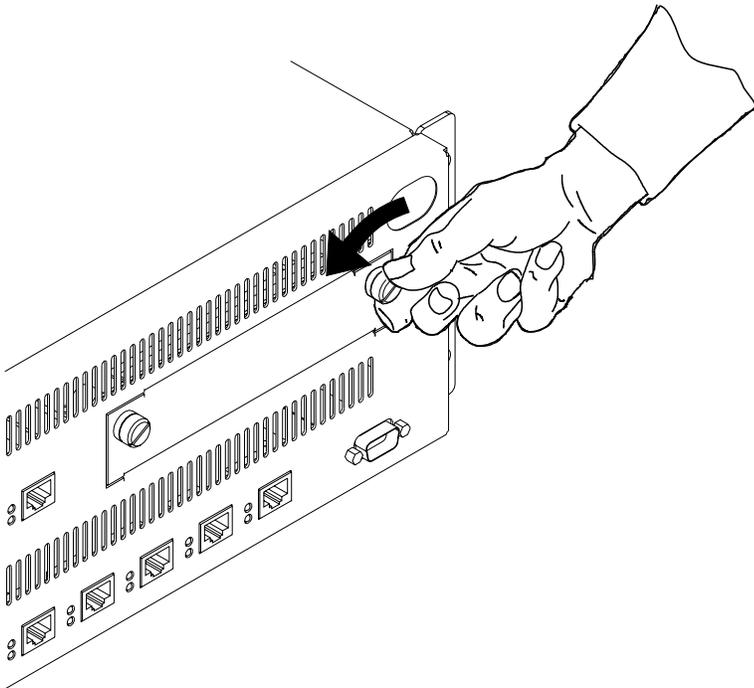


Figure 26. Removing the Dummy Slot Cover

Store the dummy slot cover in a safe place in case the I/O card needs to be removed in the future.

- 3** Insert the I/O card in the open slot and ensure that the edges of the module are inside the guide rails.

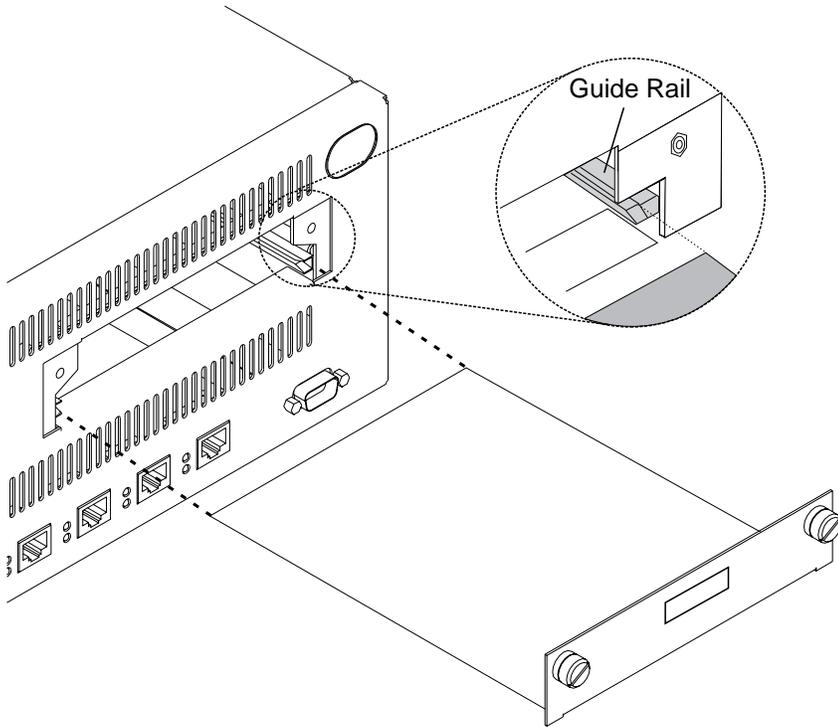


Figure 27. Inserting the 155Mbps ATM I/O Card

- 4** Slide the module into the Base Unit until it snaps into place and is flush with the front panel of the Base Unit.

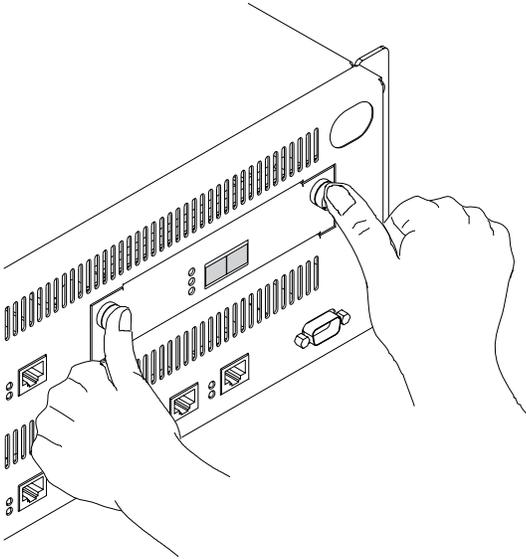


Figure 28. Pressing the I/O card into Place

- 5** Push in and finger-tighten the knurled screws on both sides of the I/O card.
- 6** Return to “Procedure 1: Mounting the ATM Workgroup Switch Components” on page 22.

Chapter 6. Mounting the Expansion Unit

This chapter describes the procedures for mounting the Expansion Unit.

See the *IBM 8285 Nways ATM Workgroup Switch: Safety and Service Catalog, SY33-2113* for DANGER and CAUTION notices that concern this product, and their translations.

Contents of the Expansion Unit Shipping Group

Figure 29 illustrates the contents of the ATM Workgroup Switch Expansion Unit shipping group.

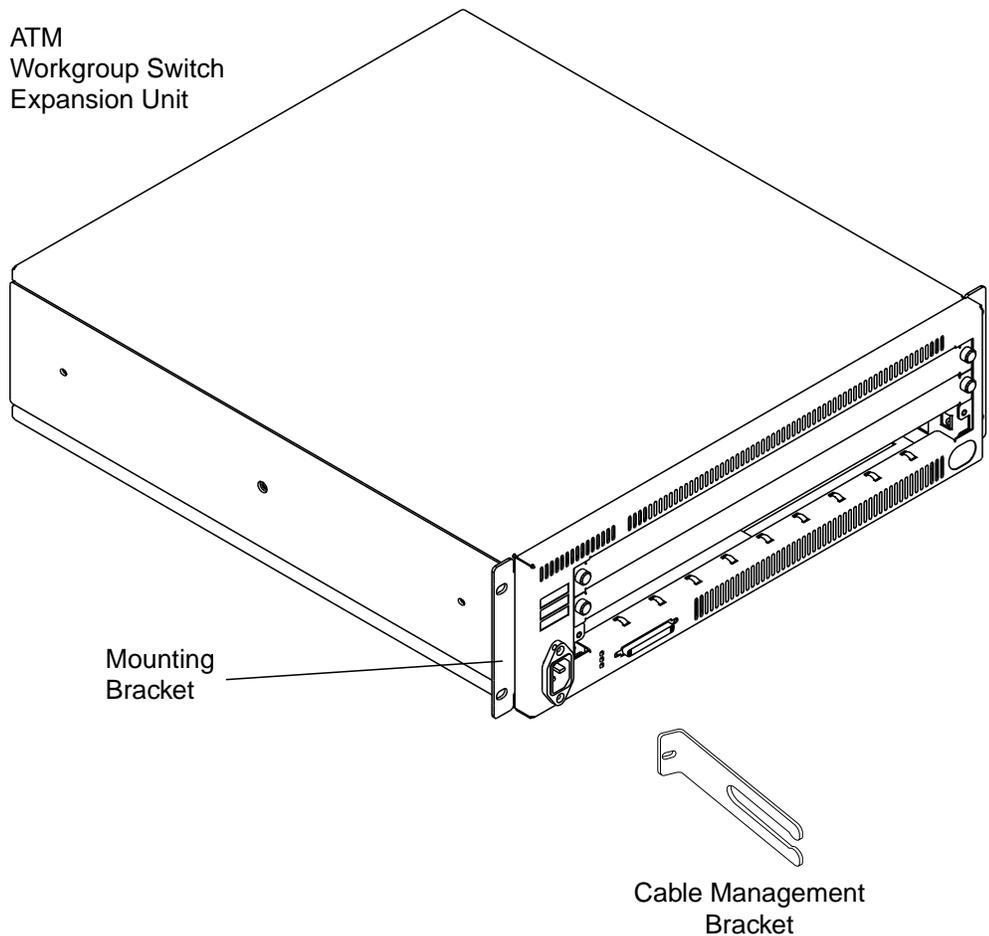


Figure 29. Contents of the Expansion Unit Shipping Group

The Expansion Unit shipping group contains:

- An ATM Workgroup Switch Expansion Unit with mounting brackets attached – P/N 47H2422
- A cable management bracket – P/N 92G8549
- A power cord (not shown) suitable for the country
- An Expansion Interface cable (not shown) – P/N 58G9738
- An Expansion Connector wrap plug (not shown) – P/N 58G9869

If any item is missing or damaged, contact your place of purchase.

Rack or Surface Mounting

Use the cabling chart provided by your network administrator to determine whether the Expansion Unit will be mounted on a surface or in a rack. If you are using the ATM Workgroup Switch Cabling Chart that came with the *IBM 8250/8260/8285: Planning and Site Preparation Guide*, GA33-0285, this information is found in the top portion of that chart.

Notes:

1. Make sure that there is adequate space around the Base Unit to provide sufficient ventilation for the unit. The Base Unit requires at least 100 mm (4 in) spacing at the front and 300 mm (12 in) at the back.
2. Make sure the mounting location meets the environmental requirements of the Base Unit (temperature, humidity, ventilation, and so on) as described in Appendix A, "Specifications" on page 185.
3. Before installing the Expansion Unit, be sure to read "Electronic Emission Notices" on page xvii.

If the Expansion Unit is to be:

- Rack mounted (the preferred mounting style), continue with "Rack Mounting the Expansion Unit" on page 61.
- Surface mounted, go to "Surface Mounting the Expansion Unit" on page 64.

Rack Mounting the Expansion Unit

Notes:

1. At the discretion of the installer, a second person may help install the Expansion Unit in the equipment rack.
2. You must support the Expansion Unit while you are tightening the screws to avoid dropping it on the floor or on other equipment beneath it in the rack. The Expansion Unit weighs approximately 12.8 kg (28.2 lb).
3. It is recommended that you use a screw starter when installing the Expansion Unit in the rack.

Follow these steps to mount the Expansion Unit in a rack:

- **1** Look at the rack inventory chart provided by your network administrator to determine where in the rack the Expansion Unit should be mounted.
- **2** Insert the lower left-hand screw into the Expansion Unit, and then lift the Expansion Unit into position, lining up the screw and the mounting hole in the rack.
Partially tighten the screw.
- **3** Align the hole in the cable management bracket with the holes on the right-hand mounting bracket and the rack. Using one screw, secure the cable management bracket and the lower right-hand side of the unit in the rack. This is shown in Figure 30 on page 62.

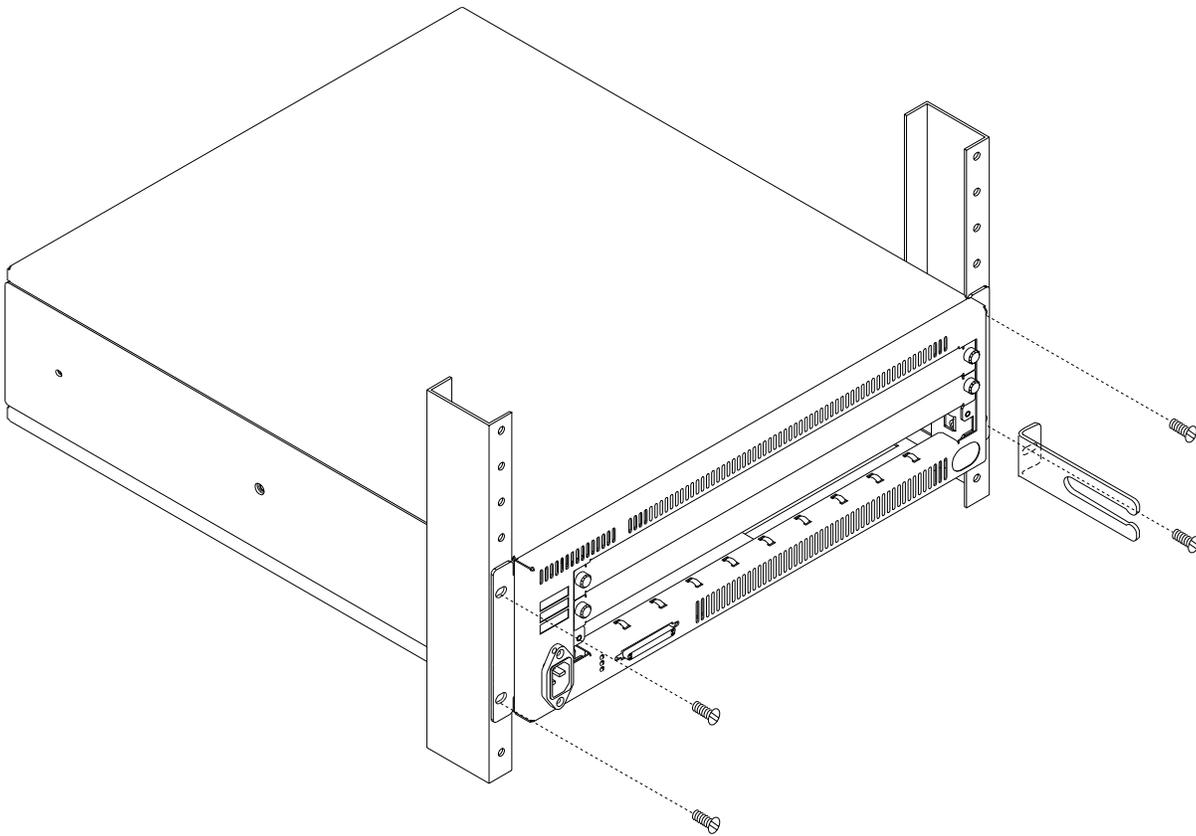


Figure 30. Rack Mounting the Expansion Unit

- ___ **4** Insert and partially tighten the upper two screws.
- ___ **5** Tighten all four screws securely with a screwdriver.

- ___ **6** Attach one end of the Expansion Interface cable to the Base Connector on the Expansion Unit, as shown in Figure 31.

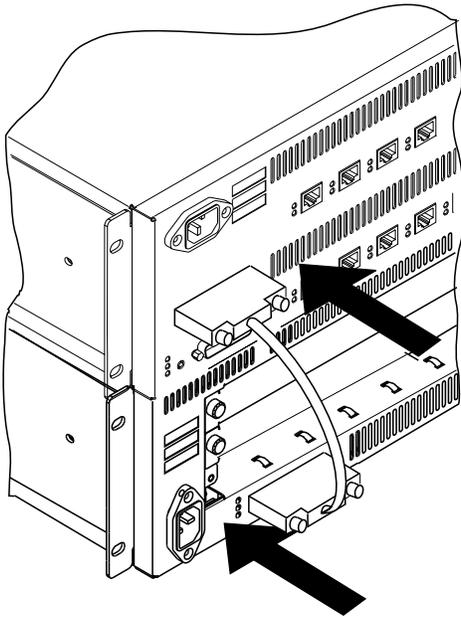


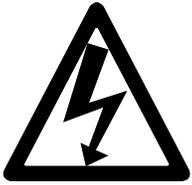
Figure 31. Attaching the Expansion Interface Cable

Attach the other end of the cable to the Expansion Connector on the Base Unit in the same way. Finger-tighten the two jack screws on each connector.

- ___ **7** Return to “Procedure 1: Mounting the ATM Workgroup Switch Components” on page 22.

Surface Mounting the Expansion Unit

Note: For safety purposes, the mounting surface must be able to support a minimum of 100 kg (200 lbs).



- 1 Using a screwdriver, loosen the four flat-head screws that attach the two mounting brackets to the sides of the Expansion Unit. The middle screw with the Phillips head is visible but should not be loosened.
- 2 Remove the brackets and reattach the screws to the Expansion Unit as shown in Figure 32. Retain the brackets for possible future rack mounting.

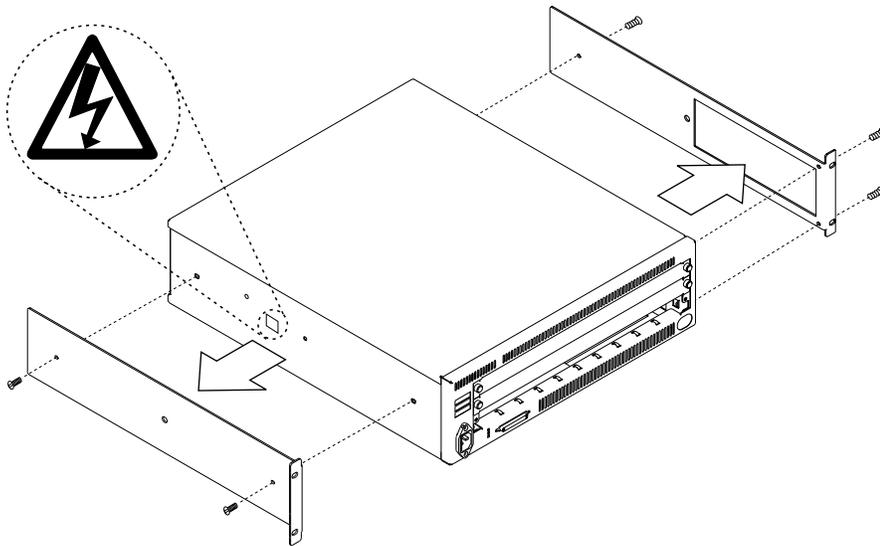


Figure 32. Attaching the Mounting Brackets for Surface Mounting

- 3 Place the Expansion Unit on top of the Base Unit that it will be connected to.
- 4 Attach one end of the Expansion Interface cable to the Base Connector on the Expansion Unit, as shown in Figure 31 on page 63. Attach the other end of the cable to the Expansion Connector on the Base Unit in the same way. Finger-tighten the two jack screws on each connector.
- 5 Return to “Procedure 1: Mounting the ATM Workgroup Switch Components” on page 22.

Chapter 7. Mounting ATM Media Modules in the Expansion Unit

This chapter describes general procedures for mounting ATM media modules in the Expansion Unit. For specific installation instructions, see the documentation for the individual module.

See the *IBM 8285 Nways ATM Workgroup Switch: Safety and Service Catalog, SY33-2113* for DANGER and CAUTION notices that concern this product, and their translations.

Note: It is not necessary to power off the workgroup switch when installing or removing modules. (????) All and all ATM media modules can be installed or removed from the workgroup switch without causing any disruption to workgroup switch operation.

Guidelines for Mounting ATM Media Modules

Observe these general guidelines when handling, installing, or removing an ATM media module.

- Electrostatic discharge (ESD) can damage static-sensitive devices on circuit boards.
 - Do not remove an ATM media module from its anti-static shielding bag until you are ready to inspect it.
 - To ensure that static charge is removed, touch any installed module's fastener screw before installing a new module. This will help to dissipate charge energy through the chassis to the grounded power cord.
 - Handle an ATM media module by the faceplate only.
- Do not twist or otherwise force ATM media modules into the workgroup switch when inserting them in the workgroup switch's left and right card guides.
- To assure proper installation, simply match the left and right card guides as you slide the module cleanly into place. Do not attempt to push the module all the way into the workgroup switch until you have verified that module ejectors are OPEN. (See Figure 34 on page 67.)
- When removing any installed ATM media module (and especially when removing an ATM media module on which submodules are installed), carefully pull the ATM media module straight out of the slot. This helps to ensure that installed submodules and host circuit board components are not damaged as the host module is being removed.
- Complete any ATM media module installation by simultaneously closing the left and right ejectors before tightening the faceplate screws that secure the module to the front of the workgroup switch. We recommend that you use a screwdriver to tighten and loosen the faceplate screws.
- After installing an ATM media module, record its slot location on the Hub Planning Chart provided in the *IBM 8250/8260/8285: Planning and Site Preparation Guide, GA33-0285* and the module planning chart shipped with each ATM media module. The Hub Planning Chart also makes it easy to record network connections for any installed module, and to enter remarks that will help you to operate your workgroup switch in the most convenient and efficient manner possible.

Mounting Procedure

For each ATM media module you will mount in the ATM Workgroup Switch perform the following steps:

- 1 If the slot is filled with a dummy module, loosen the knurled screws on both sides of the cover and remove it from the front panel of the Expansion Unit.

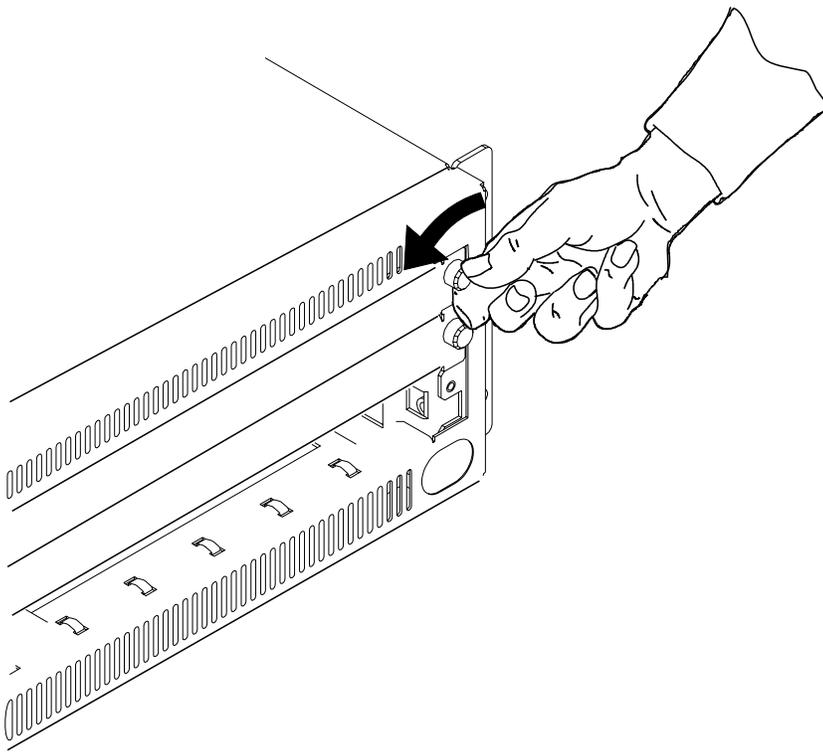


Figure 33. Removing the Dummy Module

Store the dummy module in a safe place in case the ATM media module needs to be removed in the future.

- 2 Make sure that both ejectors (left and right) are in the open position before attempting to install the module as shown in Figure 34.

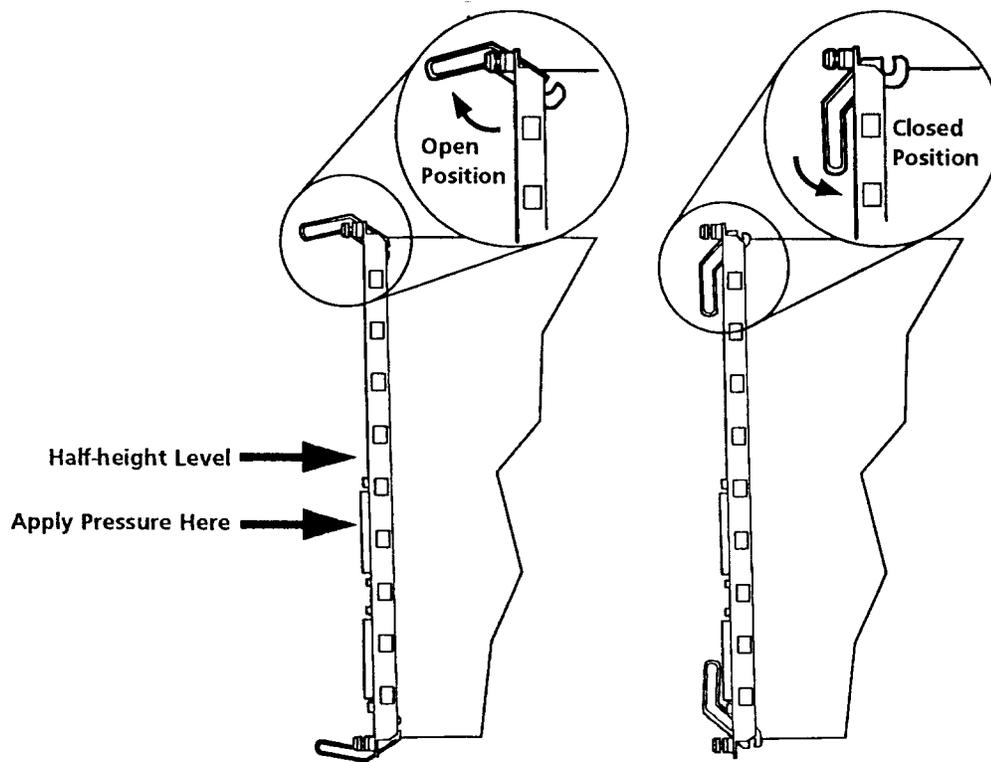


Figure 34. ATM Media Module Ejectors ("Open" and "Closed" Positions)

- 3 Match the module circuit board to the slot's left and right card guides. The easiest way to do this is to line up the module circuit board with the number at the left of the selected slot before you insert the circuit board in the card guides.

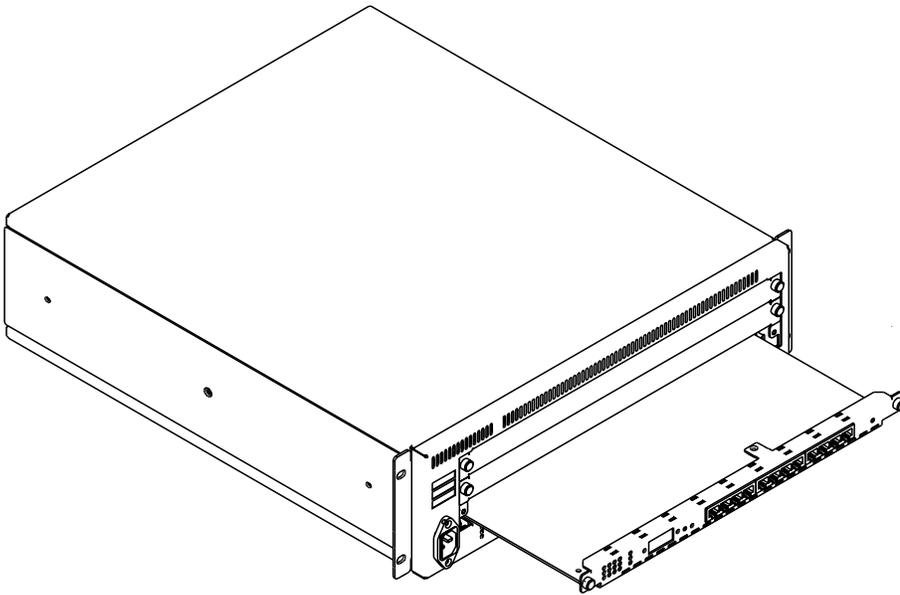


Figure 35. Inserting an ATM Media Module in the Expansion Unit

- **4** Slide the circuit board into the slot's left and right card guides. Push the module in at a point to the right of the "half height" level for smoother travel. See Figure 34 on page 67.
- **5** Push the end of each ejector toward the horizontal center of the ATM media module to pull the module into the slot. When the module makes contact with the backplane connectors, seat the module into the connectors by pressing each ejector simultaneously into the closed position.
- **6** Fasten the spring-loaded screws on the front panel of the module to the workgroup switch using your fingers. Do not overtighten.
- **7** Return to "Procedure 1: Mounting the ATM Workgroup Switch Components" on page 22.

Chapter 8. Power-On and Self Test

This chapter describes the Power-On procedure and the ATM Workgroup Switch's subsequent Power-On Self Test (POST) routine.

Power-On Procedure

To power-on the ATM Workgroup Switch, perform the following steps:

- ___ **1** Connect the power cords first to the Base Unit and Expansion Unit and then to an electrical outlet.
Note: Neither the ATM Workgroup Switch Base Unit nor the Expansion Unit have a power switch. They are powered on when you plug in the power cord.
- ___ **2** Check that the Power LEDs (I) on the front panels of the Base Unit and the Expansion Unit are lit (step 1 in Figure 36 on page 70).
 - If they are not lit, check that the power outlet is working correctly.
 - If the outlet is working and the Power LEDs are not lit, check the power cords.
 - If the power cords are working and the Power LEDs are still not lit, contact your IBM service representative.
- ___ **3** Verify that the Power-On Self Test (POST) has been completed successfully:
 - If none of the LEDs is lit or if any of the LEDs is not in the normal state, go to Chapter 21, "Troubleshooting" on page 149 and proceed with troubleshooting procedures.
 - If the POST has been completed successfully and all of the LEDs are in the normal state (step 3 in Figure 36 on page 70), the ATM Workgroup Switch is running normally.
- ___ **4** Return to the main installation procedure.

Power-On Self Test (POST)

The ATM Workgroup Switch automatically performs a POST once it is connected to a power supply. The POST should last about 10 seconds. Figure 36 shows the patterns of the Status LEDs on the Base Unit and Expansion Unit as the ATM Workgroup Switch performs its POST.

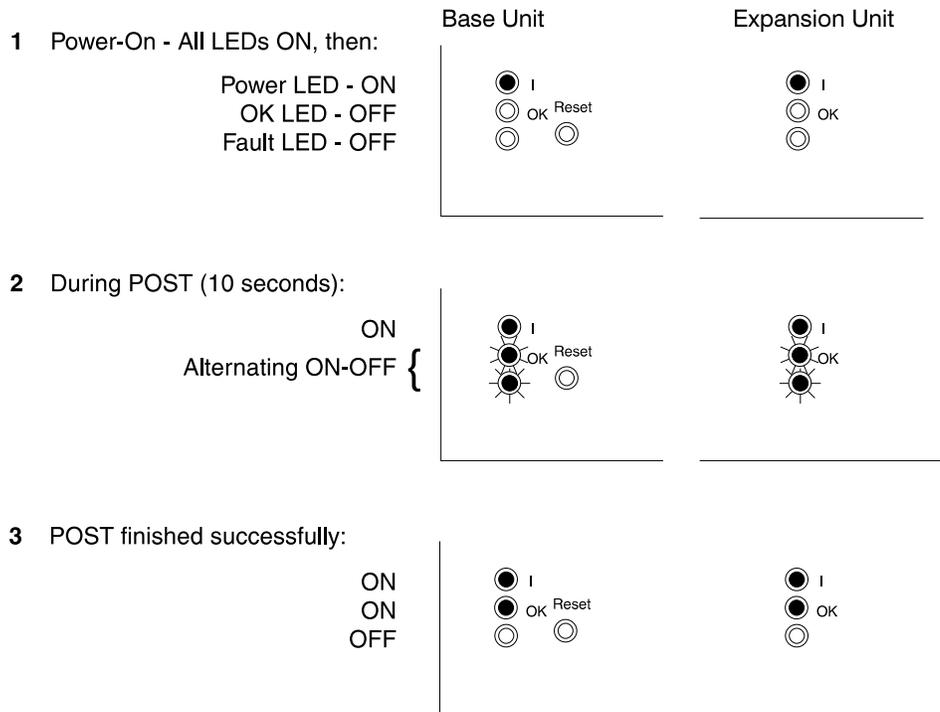


Figure 36. Pattern of the Status LEDs during Power-On Self-Test

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Chapter 9. Setting-Up and Using the Configuration Console

This chapter describes:

- How to enter commands and get help on the IBM 8285 Nways ATM Workgroup Switch configuration console
- Procedures for setting up the configuration console in Normal (ASCII) mode
- Procedures for setting up the configuration console to operate via a SLIP protocol connection
- How to set up a TELNET session to manage the IBM 8285 Nways ATM Workgroup Switch from a remote console.
- How to reconfigure configuration console settings.

Normal Mode and SLIP Mode

The commands for configuring the ATM Workgroup Switch are entered using a configuration console (ASCII terminal or workstation) connected to the console port. The console can communicate in one of two ways:

Normal (ASCII) mode

In normal mode, commands are entered directly from the configuration console.

Procedure: To configure the configuration console in Normal mode, follow the procedures under "Setting Up a Configuration Console in Normal (ASCII) Mode" on page 77.

SLIP mode

In SLIP mode, commands are entered via a TELNET session between an IP workstation and the workgroup switch.

If your workstation supports TFTP, it can also be used as a TFTP server to perform DOWNLOAD and UPLOAD operations between your workstation and the workgroup switch. (See "UPLOAD and DOWNLOAD Operations" on page 144.)

This method requires an initial connection in Normal mode to set up the IP addresses and change the port protocol.

Procedure: To configure the configuration console in SLIP mode, follow the procedures under "Setting Up a Configuration Console in SLIP Mode" on page 78.

After the switch has been initially configured, it is also possible to configure and manage the switch:

- From a remote TELNET sessions, as described in "TELNET Sessions Via a Remote Switch" on page 82.
- Using an SNMP management application, as described in Chapter 19, "Network and Switch Management" on page 139.

Using the Configuration Console

The following section describes keystrokes and the command syntax to use to enter ATM Workgroup Switch commands from a configuration console. For a complete description of all ATM Workgroup Switch configuration commands, see the *IBM 8285/8260: ATM Command Reference Guide, SA33-0385*.

Entering ATM Workgroup Switch Commands

You configure the various functions of the workgroup switch by entering commands at the prompt on the configuration console. The default prompt appears as shown here:

```
8285>
```

ATM Workgroup Switch commands are not case-sensitive. The system interprets ABC (uppercase) the same as abc (lowercase).

The values you enter for certain command **parameters** are, however, case-sensitive and must be typed exactly as shown in the *IBM 8285/8260: ATM Command Reference Guide, SA33-0385*. For example, if you enter RWTRAP and rwtrap for the com_name parameter in two separate SET COMMUNITY commands, you will create two different community names.

Keyboard Functions

When entering ATM Workgroup Switch commands the following keyboard functions are available:

Keystroke	Function
BS or Backspace	Moves the cursor one space backward and deletes the character.
Enter	Runs the command or prompts you to enter missing parameters.
Space bar	Types the complete ATM Workgroup Switch command.
Ctrl + C	Cancels the command that is currently running and returns you to a blank command line.
Ctrl + R	Retypes the last command you entered on the command line. The last 10 commands you entered can be retyped in this way.
Ctrl + L	Types the currently edited command on the next line.
?	Displays a list of available commands.

Getting Help

To get help on available ATM Workgroup Switch commands, type ? on the command line and press Enter. For example, to see what commands start with the word SAVE, you would enter:

```
8285> save ?
```

The following response is displayed:

```
Possible completions:  
  alert  
  all  
  community  
  device  
  lan_emul  
  module_port  
  static_route  
  terminal  
  tftp
```

If you logged on as the system administrator, you can enter ? to display a list of all active ATM Workgroup Switch commands. An example is shown here:

```
8285> ?  
  
  clear  
  download  
  dump  
  logout  
  maintain  
  ping  
  reset  
  revert  
  save  
  set  
  show  
  swap  
  telnet  
  upload  
  wrap
```

Command Completion

The configuration console command line accepts abbreviated command input with a facility called **command completion**. Command completion lets you enter a command and its parameters by typing the minimum number of characters to uniquely identify the command or a parameter.

For example, to enter the SAVE command, you only need to type SA and press the space bar:

```
8285> sa
```

The system automatically fills in the rest of the command:

```
8285> save
```

To enter a parameter, such as COMMUNITY, with the SAVE command, you can type the first few letters (for example, COMM) and press the space bar:

```
8285> save comm
```

The rest of the parameter is automatically entered:

```
8285> save community
```

If you enter an insufficient number of letters (for example, only S or C) for the system to determine the command or parameter (for example, Set, Show, Save and so on), the word is not completed and you are prompted to enter the rest of the command. The system also prompts you if you forget to enter a mandatory parameter.

Setting Up a Configuration Console in Normal (ASCII) Mode

The following procedure sets up the configuration console in Normal mode and logs you on as the system administrator with full access to all ATM Workgroup Switch commands:

- ___ **1** Connect an ASCII-type terminal to the RS-232 console port on the front panel of the workgroup switch.
- ___ **2** In the terminal's user guide, locate the procedure for setting parameters for baud rate, data bits, parity, and stop bits.
- ___ **3** If necessary, change these settings to the values used by the workgroup switch so that the console and the workgroup switch can communicate. The factory-set default settings for the ATM Workgroup Switch are as follows:

Parameter	Workgroup Switch Default Value
Baud rate	9600
Data bits	8
Parity	None
Stop bits	1

- ___ **4** Press Enter. The following message is displayed:

```
8285 ATM Streamer
(c) Copyright IBM Corp. 1994, 1996. All rights reserved.

Password:
```

- ___ **5** Enter 8285 as the password and press Enter. (The password is not displayed on the screen.) The Welcome screen is displayed:

```
Password: 8285

Welcome to system administrator service on 8285.
8285>
```

Setting Up a Configuration Console in SLIP Mode

The procedure that follows sets up the configuration console in SLIP mode and logs you on as the system administrator with full access to all ATM Workgroup Switch commands.

Note: A typical workstation includes two serial ports (COM1, COM2):

- One dedicated to an ASCII-terminal emulator,
- The other dedicated to an IP stack and supported via the SLIP protocol.

Both ports are needed for this procedure.

- 1** Connect your workstation to the RS-232 console port on the front panel of the Base Unit from the 'ASCII-terminal' serial port.
- 2** Configure the terminal in Normal mode and logon as administrator as described in "Setting Up a Configuration Console in Normal (ASCII) Mode" on page 77.
- 3** If a data transmission rate **other than 9600** is required, use the SET TERMINAL BAUD command to configure a data transmission rate.

```
8285>set terminal baud 19200
```

- 4** Set the local IP address (workgroup switch) and remote IP address (workstation) for the SLIP protocol using the SET TERMINAL SLIP_ADDRESSES command.

```
8285>set terminal slip_addresses [ENTER]
Enter local ip address : 9.100.86.139
Enter remote ip address : 9.100.86.138
8285>
```

- 5** Switch the configuration console port operating mode to SLIP using the SET TERMINAL CONSOLE_PORT_PROTOCOL command.

```
8285>set terminal console_port_protocol slip
```

- 6** Unplug the cable from the 'ASCII-terminal' serial port and plug it into the 'IP-stack' serial port of your workstation.

Note: If no activity takes place for a period of 20 minutes, the console automatically returns to Normal mode.

- ___ **7** Configure the IP stack SLIP with the IP address of the workgroup switch and verify the workgroup switch-to-workstation connectivity by issuing a PING request.

```
C:\>ping 9.100.86.138
```

- ___ **8** Start a TELNET session to the workgroup switch.

```
C:\>telnet 9.100.86.139
```

- ___ **9** Logon as administrator. The Welcome screen is displayed:

```
Password: 8285  
Welcome to system administrator service on 8285.  
8285>
```

Returning to Normal Mode

To switch the configuration console port back to Normal mode, use the SET TERMINAL CONSOLE_PORT_PROTOCOL command.

```
8285>set terminal console_port_protocol normal
```

Notes:

1. If no activity takes place for a period of 20 minutes, the console automatically returns to Normal mode.
2. An ATM Workgroup Switch RESET also restores the configuration console port to NORMAL operating mode.

SLIP Support

The SLIP function is supported on:

- TCP/IP for AIX version 3.2.5
- TCP/IP V2.1.2 for IBM DOS V7 (no TFTP support)
- TCP/IP V2.0 for OS/2 V3 (WARP)
- ChameleonNFS V4.0 for Windows

Using TCP/IP for AIX version 3.2.5

1. Enter `smitty mkinet`
2. Enter serial line INTERNET Network Interface
3. Configure the local and remote IP addresses
4. The mask is not required
5. Do not fill in the baud rate and the dial string
6. PING the IP address of the remote workgroup switch.

Using TCP/IP V2.1.2 for IBM DOS V7 (no TFTP support)

1. Use Custom command, then SLIP interface
2. Select SL0 and enable the interface
3. Select COM1 and 9600 modem speed
4. Configure the local and remote IP addresses
5. The mask is not required
6. PING the IP address of the remote workgroup switch.

Using TCP/IP V2.0 for OS/2 V3 (WARP)

1. Configure the SLIP connection using the TCPIP_CFG icon then SLIP.
2. Enable the SLIP interface on the correct COMM port.
3. Keep VJ compression **off** and use 1000 as MTU size.
4. Configure the local and remote IP addresses.
5. The mask is not required.
6. Configure FFTP server using TCPIP_CFG icon thru *AUTOSTART*. This is required in the FFTP server for workgroup switch download and upload operations.
7. Set terminal speed with the `mode com1` command.
8. PING the IP address of the remote workgroup switch.

Using Chameleon NFS V4.0 or V4.1 for Windows

1. Configure the SLIP connection using the Custom icon under ChameleonNFS
2. Select COM1 and no flow control PORT option
3. Do not select a modem under the Modem option
4. Configure the local and remote IP addresses
5. The mask is not required.
6. Enter the appropriate hostname in the **services/host** table.
7. Use the TELNET icon under ChameleonNFS to connect to terminal dialog via VT220 emulation.

TELNET Sessions Via a Remote Switch

The ATM Workgroup Switch's remote login feature allows you to log on to an ATM Workgroup Switch from a remote configuration console or network workstation that supports the TELNET protocol.

Figure 37 shows an example of a remote login to an ATM Workgroup Switch.

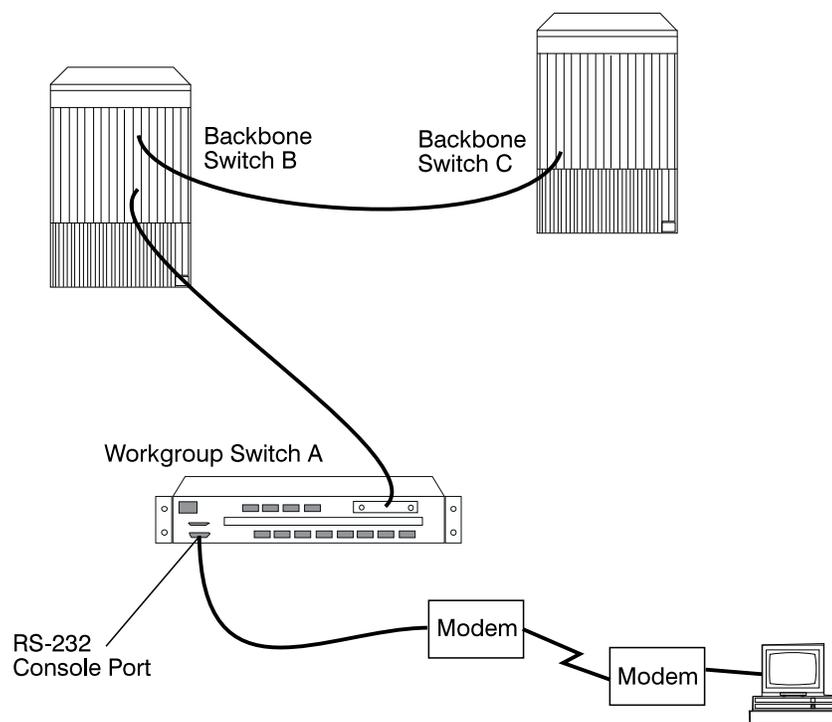


Figure 37. Working in Remote ATM Workgroup Switch Sessions

You can remotely log on to only one ATM Workgroup Switch at a time. Once you are connected to workgroup switch A, however, you can also remotely log on and manage backbone switches B or C.

Note: The TELNET protocol is not routable.

Minimum Local Configuration

Before you can log on to an ATM Workgroup Switch from a remote switch, you must perform a minimum configuration using a configuration console (in either Normal or SLIP mode). The minimum configuration that is required depends on the type of subnetwork you will use for the TELNET session:

Classical IP

- Set the ATM address of the workgroup switch
- Enable the port that connects to the ARP server
- Set the ATM address of the ARP server in the workgroup switch
- Set the IP address of the workgroup switch
- Enable the port that will be used for the TELNET session.

LAN Emulation

- Set the ATM address of the workgroup switch
- If you will use an internal LES, start the LES
- If you will use an external LES, enable the port that will be used to connect to the external LES
- Start the LEC.

These steps are described in “Procedure 2: Configuring the ATM Workgroup Switch” on page 24.

Logon

You specify the ATM Workgroup Switch by entering its IP address with the TELNET command:

```
C:\> telnet 123.94.202.9 [ENTER]
```

Once you are connected to the remote switch, you must log on by entering the correct password. Afterwards all the commands you enter are run on the remote module as if entered from a local console session.

Logoff

To log off from a TELNET session, enter the LOGOUT command. The LOGOUT command disconnects the TELNET connection and reconnects you to the local workgroup switch accessed through your configuration console. The following message is displayed with the local management prompt:

```
ATM2 logout                [ENTER]
Bye
Remote session completed
C:\>
```

Timeout

You can set a timeout period for a remote ATM Workgroup Switch by entering the SET TERMINAL TIMEOUT command. When this value is exceeded, the system automatically logs you off the remote workgroup switch session and returns you to your local session.

Although any unsaved configuration changes are still active, they will be lost the next time you reset or reboot the remote workgroup switch. To save these changes, you must re-establish the remote session and enter the SAVE command.

Automatic Modem Hangup

If you use a modem to connect to the workgroup switch, you can use the SET TERMINAL HANGUP command to automatically hang up the modem connection when you log off the workgroup switch. If you do not hang up the modem connection, an unauthorized user can pick up your open session and work in it.

The following command shows what to enter to automatically hang up the modem after you log off the workgroup switch. The command is set by default to disable so that the modem does not automatically hang up.

```
8285> set terminal hangup enable [ENTER]
```

Chapter 10. Configuring Basic Workgroup Switch Parameters

Procedure

To configure the basic default parameters for the ATM Workgroup Switch, perform the following steps:

- | | | | |
|------------------|---|----------|---|
| Mandatory | — | 1 | Set the user and administrator passwords as described in “Setting Passwords” on page 86, using the command:
<code>set device password</code> |
| Recommended | — | 2 | Set the internal clock as described in “Setting the Internal Clock” on page 88, using the command:
<code>set clock</code> |
| Recommended | — | 3 | Set the name of the workgroup switch as described in “Switch Name” on page 89, using the command:
<code>set device name</code> |
| Recommended | — | 4 | Set the contact information as described in “Service Contact Information” on page 89, using the commands:
<code>set device location</code>
<code>set device contact</code> |
| Optional | — | 5 | Set the console prompt as described in “Console Prompt” on page 90, using the command:
<code>set terminal prompt</code> |
| Optional | — | 6 | Set the console timeout value as described in “Console Timeout” on page 90, using the command:
<code>set terminal time_out</code> |
| Mandatory | — | 7 | Set the ATM address of the workgroup switch as described in “Setting the ATM Address of the Workgroup Switch” on page 92, using the command:
<code>set device atm_address</code>
This resets the ATM subsystem. |
| | — | 8 | Return to “Procedure 2: Configuring the ATM Workgroup Switch” on page 24. |

For a detailed description of each ATM Workgroup Switch configuration command, see the *IBM 8285/8260: ATM Command Reference Guide*.

Setting Passwords

It is necessary to set two levels of workgroup switch passwords:

- **Administrator** password that provides access to **all** ATM Workgroup Switch commands with read-write (configuration) access
- **User** password that provides access to a **subset** of ATM Workgroup Switch commands including most SHOW commands, PING and TELNET.

See the *IBM 8285/8260: ATM Command Reference Guide* for more information on access to ATM Workgroup Switch commands.

Administrator Password

1. At the console prompt, type the SET DEVICE PASSWORD ADMINISTRATOR command:

```
8285> set device password administrator
```

Then press Enter.

2. In the next three fields displayed, enter your current password and the new password (up to fifteen characters) twice as shown below. For security purposes, the values you enter are not displayed on the screen.

```
Enter current administrator password: {old password}  
New password:                       {new password}  
Re-enter password:                   {new password}
```

Then press Enter. You are prompted when your password is accepted:

```
Password changed.
```

3. To save your new password, type the SAVE DEVICE or the SAVE ALL command:

```
8285> save device
```

Then press Enter.

You will need to enter the new administrator password the next time you log on to the workgroup switch. Note that you have only ten seconds to enter a password when the Password prompt is displayed. If you do not enter a password, a Timeout message is displayed. To redisplay the Password prompt and start again, press Enter.

User Passwords

1. Log on to workgroup switch using the administrator password.
2. At the management prompt, type the SET DEVICE PASSWORD USER command:

```
8285> set device password user
```

Then press Enter.

3. In the next three fields displayed, enter the administrator password and the new user password (up to fifteen characters) twice as shown here:

```
Enter current administrator password: {admin password}
New password:                        {new user password}
Re-enter password:                   {new user password}
```

Then press Enter. You are prompted when the password is accepted:

```
Password changed.
```

4. To save your new user password, type the SAVE DEVICE or the SAVE ALL command:

```
8285> save device
```

Then press Enter.

Checking Passwords: Passwords cannot be viewed after they have been set.

Setting the Internal Clock

You need to set the ATM Workgroup Switch's 24-hour internal clock only once, when you install the workgroup switch. When you set the internal clock, you establish a starting time, date, and day.

- To set the internal clock, enter the SET CLOCK command and specify the time and date parameters. Then press Enter.

For example, the following command sets the internal clock to 4:44 p.m. on September 30, 1996:

```
8285> set clock 16:44 1996/09/30
```

The internal clock uses its own battery and functions even when the workgroup switch fails to operate.

Checking the Clock: To see the status of the clock, use the command:

```
8285> show clock
```

Customizing Workgroup Switch Default Parameters

The ATM Workgroup Switch is preconfigured with default settings that may need to be changed before you can use the switch. To modify these parameters, you must log on using the system administrator password. Then use the SET command to change the values for any of the following:

- Name of the workgroup switch
- Contact name and location
- Console prompt
- Console timeout value.

A brief description of each parameter is given in the following sections. For more detailed information, see the *IBM 8285/8260: ATM Command Reference Guide*.

Switch Name

In order to simplify the command parameters you need to enter to perform certain ATM tasks, you can assign a unique name to each workgroup switch. You can then use this name instead of the IP address.

To set a unique name for the workgroup switch, enter the SET DEVICE NAME command and press Enter.

```
8285> set device name [new name]
```

Service Contact Information

After installing and logging on to the workgroup switch, you should enter the location of the workgroup switch and the name of the appropriate person to contact in case of a failure in the ATM subsystem.

To do so, enter the following commands:

- SET DEVICE LOCATION to specify where the workgroup switch is installed
- SET DEVICE CONTACT to specify the name of the service personnel to contact.

Console Prompt

It is also recommended that you customize the prompt used by each configuration console. This makes it easier to recognize the workgroup switch to which you are connected when you log on via a remote switch.

The default prompt is:

```
8285>
```

Suggestion: To make it easier to recognize an ATM Workgroup Switch by its command prompt, set the prompt to the name of the ATM Workgroup Switch used in the SET DEVICE NAME command. See the *IBM 8285/8260: ATM Command Reference Guide* for more information.

To customize the prompt of an ATM Workgroup Switch, use the SET TERMINAL PROMPT command.

```
8285>set terminal prompt ATM2
ATM2>
```

Console Timeout

The TERMINAL TIMEOUT parameter is a safety precaution that lets you specify how long you can remain logged on to the configuration console without entering any data from the keyboard. This prevents unauthorized users from accessing the workgroup switch if you forget to log off the system. If no keystroke is entered for the time period specified by SET TERMINAL TIMEOUT, the system automatically logs you off.

The default value for SET TERMINAL TIMEOUT is 0. This means that no timeout period is set and that you cannot be automatically logged off from the system.

To specify a timeout value (in minutes), use the SET TERMINAL TIMEOUT command.

```
8285>set terminal timeout 2
```

Checking Workgroup Switch Default Parameters: To check the switch name or contact information, use the command:

```
8285> show device
```

To check the console timeout, use the command:

```
8285> show terminal
```

Setting the ATM Address of the Workgroup Switch

A default ATM address is provided with the workgroup switch. You can continue to use this default address only if you use your workgroup switch as a standalone ATM switch. If you want to connect the workgroup switch to other ATM subsystems, its ATM address must be defined as follows:

AFI-RDN The first (leftmost) 11 bytes of the Network Prefix is the address of the ATM subnetwork to which the ATM Workgroup Switch belongs.

If the ATM campus network is connected to a public carrier, this address is assigned by the appropriate administrative authority.

ACN If the ATM subnetwork contains multiple ATM clusters, this byte specifies the number of the cluster to which the workgroup switch belongs.

HN If the ATM cluster contains multiple ATM subsystems, this byte specifies the number of the workgroup switch in the cluster.

To set the ATM address for a workgroup switch, use the SET DEVICE ATM_ADDRESS command:

```
8285> set device atm_address
      39.11.FF.22.99.99.99.00.00.00.00.01.49.11.11.11.11.11.49
```

The SET DEVICE ATM_ADDRESS command automatically saves the new address and resets the ATM subsystem.

Checking the ATM Address of the Workgroup Switch: To see the ATM address of the &sws, use the command:

```
8285> show device
```

Chapter 11. Configuring Ports and Media Modules

This chapter describes the procedures for configuring modules and ports. Also, "Default Settings for ATM Modules and Ports" on page 94 describes how the workgroup switch handles the default settings of modules and ports.

Procedure

To configure the default local parameters for the ATM Workgroup Switch, perform the following steps:

- | | | | |
|------------------|---|----------|---|
| Mandatory | — | 1 | Connect the ATM media modules in the Expansion Unit to the network as described in "Connecting ATM Media Modules to the Network" on page 95, using the command:
<pre>set module</pre> |
| Mandatory | — | 2 | Enable the ports that will be used, and define their interface type type (UNI, SSI, or NNI), as described in "Enabling ATM Ports and Setting Interface Types" on page 96, using the command:
<pre>set port</pre> |
| | — | 3 | Return to "Procedure 2: Configuring the ATM Workgroup Switch" on page 24. |

Default Settings for ATM Modules and Ports

When an ATM Workgroup Switch is powered-on, it automatically receives the configuration settings of all ATM media modules that are mounted in the Expansion Unit as well as their ports. The ATM Workgroup Switch provides the following features that maximize security and minimize the risk of losing module and port configuration settings:

- All ATM media modules installed in an ATM Workgroup Switch **after** an ATM Workgroup Switch module has been installed will have their ports disabled to prevent unauthorized connections. In this case, the ATM media modules will have their network setting set to `isolated`.
- If you remove an ATM media module from the Expansion Unit and then reinstall it or another ATM media module of the same type in the same slot, the ATM Workgroup Switch will automatically configure it using the last settings configured for the slot.

For the actual default settings of a particular ATM module, refer to the documentation of that module.

Refer to the *IBM 8250/8260/8285: Planning and Site Preparation Guide*, GA33-0285 for a chart to record the parameters you set for the ATM media modules in your Expansion Unit.

Connecting ATM Media Modules to the Network

Connecting an ATM Media Module

You must connect the ATM media modules in the Expansion Unit to the network during configuration because the factory default setting isolates them from receiving network traffic.

To connect an ATM media module, you use the SET MODULE command:

```
8285> set module 3 connected
```

Isolating an ATM Media Module

To disconnect an ATM media module use the command:

```
8285> set module 3 isolated
```

When you isolate an ATM media module from the network, it remains in Reset mode and no activity takes place on it. Its current configuration settings cannot be accessed by the network. In order to use the module for ATM data transmission, you must reconnect it to the network and enable it.

Note: You cannot isolate slot 1, which is the Base Unit itself.

Checking Configuration of Modules: To see the status of, for example, all slots in the ATM Workgroup Switch use the command:

```
8285> show module all
```

Enabling ATM Ports and Setting Interface Types

Before you attach devices to the ATM media ports on the Base Unit, you must enable each port and configure the type of interface used by the port to receive and transmit ATM data.

You can set a port to any of the ATM interfaces:

- User-to-Network (UNI) for ports attached to ATM user devices
- Switch-to-Switch (SSI) for ports attached to other switches in the same local cluster
- Network-to-Network (NNI) for ports attached to switches in remote clusters or subnetworks.

See “Connecting ATM Devices to Form a Network” on page 33 for more information on setting up connections between ATM devices.

For example, to enable port 2 on the Base Unit (‘slot’ 1) as a UNI port:

```
8285> set port 1.2 enable uni
```

Slot Numbers in the Workgroup Switch: The ATM Workgroup Switch Base Unit is defined as ‘slot’ 1. Ports 1–12 refer to the 25.6Mbps ATM ports, as shown in Figure 3 on page 6. Port 13 refers to the (optional) 155Mbps ATM I/O Card port.

The three slots in the Expansion Unit are numbered 1, 2 and 3, from the bottom up.

Checking Configuration of Ports: To see the status of all ports in the ATM Workgroup Switch Base Unit, for example, use the command:

```
8285> show port 1.all
```

Enabling Ports with SET MODULE

You can also use the SET MODULE command with the ENABLE parameter to enable **all** ports on a module, for example:

```
8285> set module 1 connected enable
```

Disabling an ATM Port

To disable an ATM port that is connected to a failing device, for example, use the command:

```
8285> set port 1.2 disable
```

Chapter 12. Configuring Trunk Connections

Carry out the procedures in this chapter only if you want to connect your ATM Workgroup Switch to other switches.

For an overview of the concepts required to connect the workgroup switch to other switches in an ATM campus network, see Chapter 3, "Building an ATM Campus Network" on page 29.

Procedure

To configure trunk connections to other switches, or to configure Permanent Virtual Circuits (PVCs) in the ATM Workgroup Switch or in the local ATM cluster, perform the following steps:

- **1** If you will connect the workgroup switch to one or more clusters or subnetworks in an ATM network, you must create trunks (logical links) to the other ATM switches in the network.
To set up trunks to other switches, as described in "Setting Up Trunks (Logical Links)" on page 100, use the command:

```
set logical_link
```
- **2** If the switches you will connect to are outside the local subnetwork, you must also define static routes to those switches.
To define static routes for switches in other subnetworks, as described in "Setting Static Routes to Other Subnetworks" on page 100, use the command:

```
set static_route
```
- **3** To create a PVC for Virtual Channel Connections (VCCs), as described in "Creating a PVC for Virtual Channel Connections" on page 101, use the command:

```
set pvc
```
- **4** To create a PVC for Virtual Path Connections (VPCs), as described in "Creating a PVC for Virtual Paths Connections" on page 102, use the command:

```
set pvc
```
- **5** Return to "Procedure 2: Configuring the ATM Workgroup Switch" on page 24.

Setting Up Trunks (Logical Links)

To connect the ATM Workgroup Switch to another ATM switch, you must create a trunk using the SET LOGICAL_LINK command.

See “Connecting ATM Devices to Form a Network” on page 33 for a description of the strategy for setting up trunk links in an ATM network.

The *IBM 8285/8260: ATM Command Reference Guide* also gives an example of the SET LOGICAL_LINK command.

Setting Static Routes to Other Subnetworks

If a switch to which you want to connect resides in another ATM subnetwork, you must also assign a local ATM cluster number (ACN) to the static route for that subnetwork. The ACN you assign is used in the SET LOGICAL_LINK command to establish the logical link between the two subnetworks.

For example, to map the static route '45337741531200010204' to ACN 3:

```
8285> set static_route 45337741531200010204 3
```

The static route you enter with the SET STATIC_ROUTE command can be up to 19 bytes.

Creating a PVC for Virtual Channel Connections

Before defining PVCs in the workgroup switch, see the guidelines in “Configuring Permanent Virtual Circuits (PVCs)” on page 41.

The following examples show how to set up two PVCs for virtual channel connections (‘best effort’ and reserved bandwidth) from the same port (1.2) in the workgroup switch to the same port (4.4) in the remote switch (hub number 2 in the cluster).

```
8285> set pvc 1.2 1 4.4 2 channel * * best_effort
PVC set and started.

8285> set pvc 1.2 2 4.4 2 channel * * reserved_bandwidth 50
PVC set and started.

8285> show pvc all
```

Local end point				Remote end point			role	QoS	Status
Port	id	type	Vpi/Vci	Port	Vpi/Vci	HNb			
1.02	1	PTP-PVP	0/32	4.04	0/44	2	Primary	BE	Active
1.02	2	PTP-PVP	1/124	4.04	1/98	2	Primary	RB	Active

```
8285>
```

Checking PVCs: It is recommended to check the configuration of PVCs after they are created, using the command `SHOW PVC ALL VERBOSE`. If a PVC fails, determine the Q2931 Cause Code using this command and check its meaning in Appendix C, “Error and Information Codes” on page 207.

Creating a PVC for Virtual Paths Connections

Before defining PVCs in the workgroup switch, see the guidelines in “Configuring Permanent Virtual Circuits (PVCs)” on page 41.

The following examples show how to set up a PVC for virtual path connections ('best effort') from port 1.2 in the workgroup switch to port 4.4 in the remote switch (hub number 2 in the cluster).

```
8285> set pvc 1.2 1 4.4 2 channel * * best_effort
PVC set and started.
```

```
8285> show pvc all
```

Local end point				Remote end point			role	QoS	Status
Port	id	type	Vpi/Vci	Port	Vpi/Vci	HNb			
1.02	1	PTP-PVP	0/*	4.04	0/*	2	Primary	BE	Active

```
8285>
```

Chapter 13. Configuring TCP/IP Parameters

Carry out the procedures in this chapter only if you want use 'Classical IP Over ATM' functions on the ATM Workgroup Switch.

Procedure

To configure the TCP/IP parameters for the ATM Workgroup Switch, perform the following steps:

- ___ **1** Assign a unique IP address and subnetwork mask to the ATM Workgroup Switch, as described in "IP Address and Subnetwork Mask" on page 104, using the command:

```
set device ip_address
```
- ___ **2** Set the IP address of the default gateway, as described in "Default Gateway" on page 105, using the command:

```
set device default_gateway
```
- ___ **3** Set the IP address of the ARP server, as described in "ARP Server" on page 105, using the command:

```
set device arp_server
```
- ___ **4** Return to "Procedure 2: Configuring the ATM Workgroup Switch" on page 24.

IP Address and Subnetwork Mask

Every device in an IP subnetwork must have a unique IP address and subnetwork mask. In a Classical IP Over ATM network, you must use the SET DEVICE IP_ADDRESS command to assign a unique IP address and subnetwork mask to the workgroup switch.

For example, the following command sets a unique IP address for a Classical IP subnetwork on the workgroup switch and a subnetwork mask for an ATM class C device:

```
8285> set device ip_address atm 195.44.45.48 FF.FF.FF.0
```

The subnetwork mask is specific for each type of Internet class. In general, the subnetwork mask is the group of common characters to the left of the IP address. (These characters are also called the network ID.) The host address is the group of unique characters to the right of the IP address.

The following command sets the subnetwork mask for an ATM class B device (ATM Forum QoS class 2):

```
8285> set device ip_address atm 195.44.45.48 FF.FF.0.0
```

Default Gateway

The default gateway is the IP address of the gateway that will receive and forward packets whose addresses are unknown to the ATM subnetwork.

For example, the following command defines the gateway with the address 195.44.45.26 as the default gateway:

```
8285> set device default_gateway 195.44.45.26
```

ARP Server

The ARP (Address Resolution Protocol) server is used in a Classical IP Over ATM network to map IP addresses to ATM addresses.

The following command defines the ATM address for an ARP server:

```
8285> set device arp_server
      39.11.FF.22.99.99.99.00.00.00.00.01.49.11.11.11.11.11.49
```

Chapter 14. Configuring LAN Emulation Parameters

Carry out the procedures in this chapter only if you want use 'LAN Emulation Over ATM' functions on the ATM Workgroup Switch.

Procedure

To configure the default local parameters for the ATM Workgroup Switch, perform the following steps:

- ___ **1** If you want to implement LAN emulation, configure the LAN Emulation Server and Broadcast Unknown Server (LES/BUS) parameters, as described in "Setting Up LAN Emulation Servers" on page 108, using the command:

```
set lan_emul server n start
```

- ___ **2** If you want to start a LAN Emulation Client, for example for TFTP functions, configure the LEC parameters, as described in "Setting Up a LAN Emulation Client" on page 111, using the command:

```
set device lan_emulation_client
```

- ___ **3** If you want external LAN Emulation Configuration Server (LECS) support, configure the LECS ATM address or fixed PVC, depending on the configuration requirements of the LECS and external LECs (workstations, bridges, and so on).

To configure the LECS ATM address, as described in "Setting the LECS ATM Address" on page 113, use the commands:

```
set lan_emul configuration_server  
set pvc
```

- ___ **4** Return to "Procedure 2: Configuring the ATM Workgroup Switch" on page 24.

Setting Up LAN Emulation Servers

You can define either one or two separate LAN Emulation Servers (LESs). Either one, or both, may be Token Ring or Ethernet. If you start two LESs, the maximum number of LECs (128) applies to both LESs **combined**.

When you start a LES, its associated BUS is automatically started.

The sections below describe how to:

- Start a LES
- Display the status and current parameters for both LESs
- Stop a LES.

For further information on the commands used in these procedures, refer to the *IBM 8285/8260: ATM Command Reference Guide*.

Starting a LES

Token Ring — The following sample command includes parameters to start a Token Ring LES:

```
8285>set lan_emul server 2 start tr 4 4544 [ENTER]
8285>Emulated LAN name: LAN2tr [ENTER]

Starting server.
8285>
```

Ethernet — The following sample command includes parameters to start an Ethernet LES:

```
8285> set lan_emul server 1 start eth 124 1516 [ENTER]
8285>Emulated LAN name: LAN1eth [ENTER]

Starting server.
8285>
```

Notes:

1. The (optional) LAN name is case-sensitive.
2. Only the Maximum Frame Size and LAN Name parameters have default values. All other parameters must be entered when starting a LES.

Checking the LESs: Use the SHOW LAN_EMUL SERVERS command to display the current status and parameters defined for both LESs:

```
8285> show lan_emul servers
-----
----- LAN Emulation Server 1 -----
Status           : Running.
LAN type         : Ethernet.
Actual LAN name  : "LAN1eth".
Desired LAN name : "LAN1eth".
Actual max frame size : 1516.
Desired max frame size: 1516.
Max number of clients : 124.
ATM address : 39.99.99.99.99.99.00.00.99.99.01.50.50.50.50.50.50.02
Current number of operational LECs: 3
-----
----- LAN Emulation Server 2 -----
Status           : Running.
LAN type         : Token Ring.
Actual LAN name  : "LAN2tr".
Desired LAN name : "LAN2tr".
Actual max frame size : 4544.
Desired max frame size: 4544.
Max number of clients : 4.
ATM address : 39.99.99.99.99.99.00.00.99.99.01.50.50.50.50.50.50.03
Current number of operational LECs: 0
```

Stopping a LES

To stop a LES (for example, emulated LAN number 2):

```
8285> set lan_emul server 2 stop
```

Stopping a LES also stops its associated BUS.

Depending on the number of LECs that are connected to the LES, there may be a delay from the time the command is issued and the time the LES is completely stopped. For this reason, you should verify that the LES has stopped using the SHOW LAN_EMUL SERVERS command before trying to start the LES again.

Displaying the LECs Connected to a LES

By specifying the number of the LES in the SHOW LAN_EMUL SERVERS command, you can view all of the LECs that are connected to that LES:

```
8285> show lan_emul servers 1
----- LAN Emulation Server 1 -----
Status                : Running.
LAN type               : Ethernet.
Actual LAN name       : "LANIeth".
Desired LAN name      : "LANIeth".
Actual max frame size : 1516.
Desired max frame size: 1516.
Max number of clients : 124.
ATM address           : 39.99.99.99.99.99.00.00.99.99.01.50.50.50.50.50.02
Current number of operational LECs: 3
Local: 39.99.99.99.99.99.00.00.99.99.01.50
50.50.50.50.50.50.01 (port 0.0) OPERATIONAL NonProxy
10.11.11.00.29.35.00 (port 1.1) OPERATIONAL NonProxy
Remote: 39.99.99.99.99.99.00.00.99.99.01.51
51.44.32.51.44.32.00 (port 1.13) OPERATIONAL Proxy
```

Setting Up a LAN Emulation Client

To configure the LEC, use the SET DEVICE LAN_EMULATION_CLIENT with the following parameters:

- LAN type
- IP address
- Subnetwork Mask
- Individual MAC address
- Associated LES ATM address

Notes:

1. The MAC address must be in a 802.3 format. Local and universal administered MAC addresses are supported.
2. The associated LES ATM address is the address of a LES monitoring the 802.3 emulated LAN. The LES may be internal to the 8285 or external.
In the case of an internal LES you should start the LES before you configure the LEC, in order to be able to get its ATM address (via SHOW LAN_EMUL SERVERS).
3. The LEC does not support a LECS connection.
4. The maximum frame size and emulated LAN name are provided by the associated LES.
5. The SET DEVICE LAN_EMULATION_CLIENT command automatically starts the LEC.
6. By default, an 802.3 LEC is started. To start an Ethernet V.2 (DIX) LEC, use the ETH_TYPE DIX keywords.
7. IBM TCP/IP for DOS configures the Emulated Ethernet Layer as Ethernet V.2 (DIX) by default.
8. No command to stop the LEC is available.

For example, to configure the LEC with IP address 9.100.20.55:

```
8285>set device lan_emulation_client eth eth_type dix
      ip_address 9.100.20.55 les_atm_address

8285>Enter ATM address :
      39.99.99.99.99.99.99.00.00.99.99.01.50.50.50.50.50.50.02

Client starting.
8285>
```

After the eth parameter, the other parameters may be entered in any order.

The first time the SET DEVICE LAN_EMULATION_CLIENT ETH is used, you must configure all four parameters before saving the configuration settings (no default values are provided). Once the configuration settings have been saved, it is possible to change only one parameter at a time using the SET DEVICE LAN_EMULATION_CLIENT command.

Setting the LECS ATM Address

Some LAN Emulation Clients (LECs) determine the ATM address of their associated LES from the LAN Emulation Configuration Server (LECS). The ATM Workgroup Switch supports these LECs with three separate methods for establishing a connection to the LECS:

- LECS Well Known Address
- ILMI MIB
- Fixed PVC (0.17)

LECS Well Known Address

The LEC can directly call the LECS Well Known Address, which is 47.00.79.00.00.00.00.00.00.00.00.00.00.A0.3E.00.00.01.00 .

For LECs that use this method of addressing, you must define the LECS unicast address to be substituted for the Well Known Address in each ATM switch on the Call-Setup path, using the command:

```
8285> set lan_emul configuration_server active_wka
      39.99.99.99.99.99.00.00.99.99.01.04.00.11.80.95.4F.13.00
```

Notes:

1. You can define several ATM addresses for the LECS, but **only one** can be enabled at a time (using the command SET LAN_EMUL CONFIGURATION_SERVER ACTIVE_WKA).
2. In order to use this method, the LECS must be able to accept calls to the WKA. If the LECS does not support calls to the WKA, you must use another addressing method.

ILMI MIB

The LEC can get the unicast ATM address by doing a GETNEXT on the variable atmSrvcRegATMAddress in the ILMI MIB.

For LECs that use this method of addressing, you must define the LECS ATM address in **each** ATM switch that deals with these LECs. You define the LECS ATM address with the SET LAN_EMUL CONFIGURATION_SERVER command, as described in the *IBM 8285/8260: ATM Command Reference Guide*, SA33-0385.

Define the LECs address in each ATM switch that deals with these LECs, for example:

```
8285> set lan_emul configuration_server inactive_wka
      39.99.99.99.99.99.00.00.99.99.01.02.00.80.05.A9.92.9F.00
```

Fixed PVC (0.17)

If the LEC requires a connection via fixed PVC, you must use the command `SET PVC` to define a PVC for virtual channel connection on the LEC side with `vpi.vci` equal to 0.17. When defining a PVC for virtual channel connection (VCC), the range of allowed VCI values includes the value 17.

Define a PVC on the LEC side with `vpi.vci` equal to 0.17, as shown here:

```
C:\> set pvc 1.5 1 2.6 5 channel 0.17 0.17 best_effort
```

Checking the LECS Configuration: To see the configuration of the LECS address, use the command:

```
8285> show lan_emul configuration_server
```

Chapter 15. Configuring SNMP Parameters

Carry out the procedures in this chapter only if you want to manage your ATM subsystem from an SNMP workstation.

If you want to manage the ATM subsystem in an ATM Workgroup Switch from an SNMP workstation, you may access the workgroup switch through either a Classical IP subnetwork or a LAN Emulation subnetwork.

Procedures

SNMP Using “Classical IP Over ATM”

To manage the workgroup switch from a “Classical IP Over ATM” subnetwork, perform the following steps:

- ___ **1** Set the IP address and subnetwork mask, as described in “IP Address and Subnetwork Mask (IP only)” on page 117, using the command:

```
set device ip_address
```
- ___ **2** Set the default gateway, as described in “Default Gateway (IP & LE)” on page 117, using the command:

```
set device default_gateway
```
- ___ **3** Set the ARP server address, as described in “ARP Server (IP only)” on page 117, using the command:

```
set device arp_server
```
- ___ **4** Set the community table, as described in “Community Table (IP & LE)” on page 118, using the command:

```
set community
```
- ___ **5** Specify which alerts you want to enable, as described in “Alerts (IP & LE)” on page 118, using the command:

```
set alert
```
- ___ **6** Return to “Procedure 2: Configuring the ATM Workgroup Switch” on page 24.

SNMP Using “LAN Emulation Over ATM”

To manage the workgroup switch from an “LAN Emulation Over ATM” subnetwork, perform the following steps:

- ___ **1** Set the IP address, subnetwork mask and LEC parameters, as described in “LAN Emulation Client (LE only)” on page 117, using the command:

```
set device lan_emulation_client
```
- ___ **2** Set the default gateway, as described in “Default Gateway (IP & LE)” on page 117, using the command:

```
set device default_gateway
```
- ___ **3** Set the community table, as described in “Community Table (IP & LE)” on page 118, using the command:

```
set community
```
- ___ **4** Specify which alerts you want to enable, as described in “Alerts (IP & LE)” on page 118, using the command:

```
set alert
```
- ___ **5** Return to “Procedure 2: Configuring the ATM Workgroup Switch” on page 24.

Notes:

1. You may select only **one** of the subnetworks to be used for the Default Gateway.
2. Although it is expensive, nothing prevents you from using both subnetworks at the same time, each subnetwork being independent from the other (no communication between them). In the latter case an ARP server and an 802.3/Ethernet V2 LES are required. Only one of the subnetworks may be chosen for the Default Gateway.

IP Address and Subnetwork Mask (IP only)

In order for SNMP to run properly, every device in the network must have a unique IP address and subnetwork mask. In a classical IP subnetwork, you must use the SET DEVICE IP_ADDRESS command to assign a unique IP address and subnetwork mask to the workgroup switch.

For details on setting the IP address and subnetwork mask, see “IP Address and Subnetwork Mask” on page 104.

LAN Emulation Client (LE only)

In order for SNMP to run properly, every device in the network must have a unique IP address and subnetwork mask. In a LAN Emulation subnetwork, you must use the SET DEVICE LAN_EMULATION_CLIENT command to assign a unique IP address and subnetwork mask to the workgroup switch.

For details on setting up a LEC, see “Setting Up a LAN Emulation Client” on page 111.

Default Gateway (IP & LE)

The default gateway is the IP address of the gateway that will receive and forward packets whose addresses are unknown to the ATM subnetwork. The default gateway is useful when sending alert packets from the workgroup switch to a management workstation that is on a different network and is accessible via a router.

For details on setting the default gateway, see “Default Gateway” on page 105.

ARP Server (IP only)

The ARP (Address Resolution Protocol) server is used in a classical IP over ATM network to map IP addresses to ATM addresses. This is necessary to permit communication between an ATM network and SNMP stations in a Classical IP subnetwork.

For details on setting the default gateway, see “ARP Server” on page 105

Community Table (IP & LE)

The Community table defines which SNMP stations in the network can access information from the ATM Workgroup Switch, and which station(s) will receive a trap from the workgroup switch when it detects an error.

To create an entry in the Community table, you use the SET COMMUNITY command. For example, the following command specifies that a community name called ATMMGMT with an IP address of 195.44.45.244 has read-write access to the ATM Workgroup Switch:

```
8285> set community ATMMGMT 195.44.45.244 read_write
```

The community name parameter is case-sensitive. Be sure, therefore, to enter the community name in uppercase or lowercase letters exactly as you want it to appear. To display a list of existing community names, use the SHOW COMMUNITY command.

Alerts (IP & LE)

To enable or disable the function for sending alerts via SNMP traps to the ATM Workgroup Switch local console and network management stations, you use the SET ALERT command. See the *IBM 8285/8260: ATM Command Reference Guide*, for information on the different types of alerts you can enable and disable with this command.

For example, the following command enables an alert to be sent when a configuration change is made to the workgroup switch:

```
8285> set alert change trap
```

Chapter 16. Working With Configuration Settings

The following sections describe how to:

- Save your configuration settings and logoff from the configuration console
- Revert to previously saved configuration settings
- Display the current configuration settings
- Modify the current configuration settings.

Saving Configuration Settings and Logging Off

Use the SAVE command to save the last configuration changes made to module-specific parameters and to any of the following workgroup switch parameters:

- Alert
- Community
- Device
- LAN_emul
- Module_port
- Static_route
- Terminal
- TFTP.

When you make changes with the SET command, they are activated immediately but are not saved permanently. You must use the SAVE command in order to permanently store the new parameter values. When the workgroup switch is reset, only the parameter values that have been permanently saved are loaded.

By entering the SAVE ALL command, you save the last configuration changes made to all ATM parameters:

```
8285> save all          [ENTER]
```

To save the changes made to an individual parameter, enter the parameter name in the SAVE command. For example, if you changed the type of interface used on an ATM port, you would save this setting as follows:

```
8285> set port 1.3 enable UNI      [ENTER]
Port set
8285> save module_port           [ENTER]
8285>
```

Note that if you changed configuration settings for the DEVICE or TERMINAL, these values are **not** saved using the SAVE MODULE_PORT command. To save these settings, you must use the SAVE DEVICE and SAVE TERMINAL commands.

When all your configuration changes are saved, log off the console by entering the LOGOUT command and pressing Enter. The system prompts you when you are logged off:

```
8285> logout                      [ENTER]
Bye
```

If, when logging off, you have changed workgroup switch configuration parameters but forgotten to save them, the following message appears:

```
8285> logout                      [ENTER]
WARNING: Save unsaved changes before logout.
```

The system prompt is redisplayed. You must then either save your changes (using the SAVE command) or cancel them (using the REVERT command) before you can log off.

Note: You can log off and keep the configuration changes you last made by entering `logout force`. The force parameter allows you to keep and reuse your current configuration settings until you reset or reboot the workgroup switch. The next time you reset or reboot, these settings are lost.

Reverting Configuration Changes

Use the REVERT command to restore the configuration parameters that were active at the time of the last SAVE. Any changes made using the SET command since the last SAVE are lost.

The REVERT command has the same options as the SAVE command:

- Alert
- All
- Community
- Device
- LAN_emul
- Module_port
- Static_route
- Terminal
- TFTP.

For example, when working remotely, you may want to change the console prompt used in your local workgroup switch session to more easily identify it.

```
8285> set terminal prompt atm2:      [ENTER]
```

By using the REVERT TERMINAL command, you can later revert the prompt setting back to the default:

```
atm2: revert terminal                [ENTER]
```

```
Reverting terminal configuration.  
8285>
```

Note that when you enter the REVERT TERMINAL command, you revert **all** TERMINAL parameters, such as BAUD, DATA_BITS, HANGUP, PARITY, STOP_BITS, and TIMEOUT.

Reverting LES Configuration Settings

1. Before reverting the configuration settings of the LES, you must stop the LES with the SET LAN_EMUL SERVER *n* STOP command.
2. You should then verify the LES has been stopped (after the emulated LAN membership of each LEC has been released) using the SHOW LAN_EMUL SERVERS command.
3. Reverting the LES parameters returns the LES to the state it was in at the last SAVE.

Displaying Configuration Settings

The ATM Workgroup Switch lets you display your currently configured settings for:

- Alerts
- ATM_ESI
- Clock
- Community
- Device
- LAN_emul
- Logical_link
- Module
- Static_route
- Port
- PVC
- Terminal
- TFTP
- Trace.

To do so, use the SHOW command. For example, to view information on the status of the ports in the Base Unit, use the SHOW MODULE ALL command:

```
8285> show module all verbose      [ENTER]

Slot  Install  Connect Operation  General Information
-----
  1      Y      Y          Y          8285 ATM Streamer

status: connected / hardware okay
       enable / Normal

P/N:      S/N:
EC level: Manufacture:
Operational FPGA version : 7050000
Backup FPGA version : FEDF0000

Type  Mode      Status
-----
1.01:UNI enabled  UP-NO ACTIVITY
1.02:UNI enabled  UP-NO ACTIVITY
1.03:UNI enabled  UP-NO ACTIVITY
1.04:UNI enabled  UP-NO ACTIVITY
1.05:UNI disabled NOT IN SERVICE
1.06:UNI disabled NOT IN SERVICE
1.07:UNI disabled NOT IN SERVICE
1.08:UNI disabled NOT IN SERVICE
1.09:UNI disabled NOT IN SERVICE
1.10:UNI disabled NOT IN SERVICE
1.11:UNI disabled NOT IN SERVICE
1.12:UNI disabled NOT IN SERVICE
1.13:Not installed
```

Modifying Configuration Settings

Using the SET command, you can change the configuration settings for any of the following parameters:

- Alert
- ATM_ESI
- Clock
- Community
- Device
- LAN_emul
- Logical_link
- Module
- Static_route
- Port
- PVC
- Terminal
- TFTP
- Trace.

Important: Remember that (except for SET CLOCK, ATM_ESI, PVC, TRACE, and LAN_EMUL CONFIGURATION_SERVER) the changes you make with the SET command are not saved permanently in nonvolatile memory. To do so, you must use the SAVE command before logging off. See “Saving Configuration Settings and Logging Off” on page 119 for more information.

Modifying LES Configuration Settings

1. Before modifying the configuration settings of the LES, you must stop the LES with the SET LAN_EMUL SERVER *n* STOP command.
2. You should then verify the LES has been stopped (after the emulated LAN membership of each LEC has been released) using the SHOW LAN_EMUL SERVERS command.
3. Restart the LES using the SET LAN_EMUL SERVER *n* START command with the new settings.

When you isolate an ATM media module from the network, it remains in Reset mode and no activity takes place on it. Its current configuration settings cannot be accessed by the network. In order to use the module for ATM data transmission, you must reconnect it to the network and enable it.

As another example, to display the complete status of ATM port 13, enter:

```
8285> show port 1.13 verbose          [ENTER]
```

```
1.13:SSI enabled  UP-OKAY
```

```
SSI Bandwidth      : 25000 kbps
```

```
Connector          : RJ45
```

```
Media              : none
```

```
Remote device is active
```

```
IX status          : IX OK
```

```
Port speed         : 25000 kbps
```

Reconfiguring Console Port Settings

Carry out the procedures in this section only if you need to connect another device (besides the configuration console) to the workgroup switch, and if the other device runs at a slower baud rate, uses a different parity, or has a different data bit value than the workgroup switch's preconfigured factory settings.

For example, if you want to connect a 4800 baud modem to the workgroup switch to remotely manage it, you must change the factory-set default baud rate from 9600 to 4800. To do so, you would enter the following command:

```
8285> set terminal baud 4800 [ENTER]
```

See the *IBM 8285/8260: ATM Command Reference Guide*, SA33-0385 for information on the SET TERMINAL commands that allow you to reconfigure configuration console settings.

Saving Reconfigured Console Port Settings

After you use the SET TERMINAL command to reset the baud rate, the parity, or the data bit value for the ATM Workgroup Switch, the change is activated immediately and you lose communication with the configuration console. The new configuration console setting is not, however, permanently saved.

In order to save the configuration console parameters that you reconfigure with the SET command, you must connect the new configuration console to the workgroup switch, log on, and enter the SAVE TERMINAL command. Once saved in this way, the new configuration console settings remain stored in memory after you log off and in case of a power failure.

For more information on how to reconfigure and save configuration console settings, see the sections describing the SET TERMINAL commands in the *IBM 8285/8260: ATM Command Reference Guide*, SA33-0385.

Part 4. Device Attachment Procedures

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Chapter 17. Attaching 25.6Mbps Devices to the ATM Workgroup Switch

Before You Begin Cabling

Remember these tips when connecting cables to the ATM Workgroup Switch:

- Avoid stretching and bending the cables too much.
- Avoid routing the cables near potential sources of electromagnetic interference, such as motorized devices and fluorescent lights.
- Avoid trip hazards by routing the cables away from aisles and other areas where people walk. If such routes cannot be avoided, use floor cable covers or similar material to secure and protect the cables.
- Be sure that the cables connected to the ATM Workgroup Switch are supported so that the cable connectors are not excessively strained. The cable management bracket shipped with the Base Unit helps prevent strain on the cables.
- Use a Category 3 or better UTP cable or a 150-ohm STP cable for each of the 25.6Mbps ATM ports.

UTP/FTP/STP Cabling Information

Table 3 details the accepted UTP/FTP/STP cables for the 25.6Mbps ATM ports.

Table 3. UTP/FTP/STP Cabling Details

Cable Type	Impedance	Category	Trunk Attenuation @ 100 MHz	Patch Attenuation @ 100 MHz	RFI Class
UTP-5	100 ohm	5 / Class D	22db MAX / 100m	33db MAX / 100m	A
FTP/SFTP	100 ohm	5 / Class D	22db MAX / 100m	33db MAX / 100m	B
FTP/SFTP	120 ohm	5 / Class D	17db MAX / 100m	25db MAX / 100m	B
STP	150 ohm		IBM type 1/1A 12.3db MAX / 100m	IBM type 6/6A 18.4db MAX / 100m	B

Legend:

UTP-5 Unshielded Twisted Pair (Category 5)

FTP Foiled Twisted Pair

SFTP Screened and Foiled Twisted Pair

STP Shielded Twisted Pair

TRUNK Rigid cable

PATCH Flexible cable

For more information, refer to the *IBM 8250/8260/8285: Planning and Site Preparation Guide*, GA33-0285.

Cabling Distances

Table 4 lists the maximum cabling distances for devices attached to the 25.6Mbps ATM ports.

Table 4. ATM Device Cabling Distances

Cable Type	Maximum Allowable Distance (m)
UTP Category 3	100 (330 ft)
UTP Category 4	150 (495 ft)
UTP Category 5	160 (528 ft)
STP	300 (990 ft)

Note: The minimum UTP cable quality must meet EIA/TIA-568 specification for Category 3 or equivalent UTP wiring.

Connecting Devices to the 25.6Mbps ATM Ports

You can connect devices to the 25.6Mbps ATM ports on an ATM Workgroup Switch Base Unit either through the building wiring or by a direct connection.

Via Building Wiring

To connect an ATM device to the Base Unit via building wiring, follow the steps listed below.

Note: This procedure begins with the cabling of the ATM device (such as a 25.6Mbps ATM adapter installed in a workstation) to the building faceplate; then it describes connecting the Base Unit to the patch panel in the wiring closet.

- ___ **1** Look at the cabling chart, which your network planner provided, to determine how the ATM Workgroup Switch should be connected to the network.
- ___ **2** In the work area, connect one end of a straight-through cable (with ATM-compliant pin assignments) to the 25.6Mbps ATM connector on the device and the other end to the 25.6Mbps ATM connector on the faceplate where the building wiring terminates.
- ___ **3** Label the faceplate if it does not already have a cable label. Follow your enterprise's procedures for cable labeling. If there is more than one wiring closet on a floor, record the wiring closet identifier or location and the cable identifier on the same line.
- ___ **4** In the wiring closet, connect the cable that originated at the 25.6Mbps ATM device to the appropriate connector on the patch panel or other equipment where the building wiring terminates. Connect the other end of the cable to a 25.6Mbps ATM port on the Base Unit.
- ___ **5** Label the connector on the patch panel (or other equipment used to terminate the building wiring).
- ___ **6** Return to "Procedure 3: Attaching ATM Devices to the ATM Workgroup Switch" on page 26.

Direct Cabling

To cable a 25.6Mbps ATM device directly to the Base Unit:

- ___ **1** Look at the cabling chart, which your network planner provided, to determine how the ATM Workgroup Switch should be connected to the network.
- ___ **2** Connect the cables between the Base Unit and other devices as indicated by the connections in the cabling chart.
- ___ **3** Label the cables, following your enterprise's procedures for cable labeling.
- ___ **4** Return to "Procedure 3: Attaching ATM Devices to the ATM Workgroup Switch" on page 26.

Chapter 18. Attaching 155Mbps Devices to the I/O card

Before You Begin Cabling

Remember these tips when connecting cables to the ATM Workgroup Switch:

- Avoid stretching and bending the cables too much. Optical fiber cable is easily damaged.
- Avoid trip hazards by routing the cables away from aisles and other areas where people walk. If such routes cannot be avoided, use floor cable covers or similar material to secure and protect the cables.
- Be sure that the cables connected to the ATM Workgroup Switch are supported so that the cable connectors are not excessively strained. The cable management bracket shipped with the Base Unit helps prevent strain on the cables.
- Use multimode or single-mode optical fiber cable that is appropriate for the drive distance required for the 155Mbps ATM I/O Card port.

Planning Cabling Distances in a Fiber Network

This section describes how to plan the cabling distance between two 155Mbps ATM ports (or between a 155Mbps I/O Card feature and an ATM user device) in a fiber network. To ensure that a 155Mbps link will be valid for data transmission, collect the following information:

- Type and length of fiber cable
- Type and number of connectors used
- Type and number of splices used
- Type and number of patch panels used
- Number of jumper cables used

Once you have the necessary information, you can plan the cabling distance between ATM ports by following these steps:

1. Determine the optical power budget for the 155Mbps port and cable size using Table 11 and Table 12 on page 201.
2. Verify that the overall power loss in the 155Mbps link due to connectors, splices, fiber cable type, patch panels, and jumper cables is less than the optical power budget.

Each step is described in the following sections.

Note: When you use fiber cable, the (conservative) recommended distances between workgroup switch ports and transceivers are:

Multimode fiber 2 kilometers (1.24 miles)
Single mode fiber 20 kilometers (12.4 miles)

If the distance is greater than two kilometers (for multimode) or twenty kilometers (for single mode), you must carefully calculate the total power loss across the link to make sure that it does not exceed the total power budget.

Connecting a Device to the Optional 155Mbps ATM I/O Card Port

You can connect devices to the 155Mbps ATM port on an Base Unit either through the building wiring or by a direct connection.

Make sure that Transmit and Receive cables are clearly marked or color coded before attaching them to the appropriate sides of the optional 155Mbps ATM I/O Card port on the Base Unit. Also, make sure that each cable has been properly cleaned with the appropriate cleaning solution for optical fiber before you attach it.

Via Building Wiring

To connect the Base Unit to a 155Mbps ATM device via building wiring, follow the steps listed below.

Note: This procedure describes the cabling from the Base Unit to the patch panel in the wiring closet, and does not include cabling from the wiring closet to the 155Mbps ATM device.

- ___ **1** As indicated on the cabling chart, connect one end of the multimode or single-mode fiber to the 155Mbps port on the Base Unit and the other end to the 155Mbps ATM connector on the patch panel or other equipment where the building wiring terminates. Make sure that each Transmit cable end connects to a Receive ATM port. Transmit and Receive are marked on the ATM port. See Figure 41 on page 192 for an illustration of the Transmit and Receive parts of the 155Mbps ATM port.
- ___ **2** Label the connector on the patch panel (or other equipment used to terminate the building wiring).
- ___ **3** Label the cable, following your enterprise's procedures for cable labeling.
- ___ **4** Return to "Procedure 3: Attaching ATM Devices to the ATM Workgroup Switch" on page 26.

Direct Cabling

To connect the ATM Workgroup Switch Base Unit directly to a 155Mbps ATM device:

- ___ **1** As indicated on the cabling chart, connect one end of the multimode or single-mode fiber to the 155Mbps port on the Base Unit and the other end to the appropriate 155Mbps ATM port on the ATM device. Make sure that each Transmit cable end connects to a Receive ATM port. Transmit and Receive are marked on the ATM port. See Figure 41 on page 192 for an illustration of the Transmit and Receive parts of the 155Mbps ATM port.
- ___ **2** Label the cable. Place a label near each visible end of the cable: at the point where the cable is attached to the Base Unit and at the point where the cable is attached to the ATM device. Follow your enterprise's procedures for cable labeling.
- ___ **3** Return to "Procedure 3: Attaching ATM Devices to the ATM Workgroup Switch" on page 26.

Part 5. Management, Code Updates and Troubleshooting

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Chapter 19. Network and Switch Management

This chapter gives an overview of management options for the IBM 8285 Nways ATM Workgroup Switch.

Managing the ATM Subsystem

You can manage the ATM Workgroup Switch in any of the following ways:

- From the configuration console, which can be connected directly to the RS-232 Console port on the workgroup switch.

This is an inexpensive solution well-suited for a workgroup installation.

- Login from a remote console via TELNET. Management traffic flows via the network. You can start only one remote session on an ATM Workgroup Switch.

This is ideal for small and medium installations with remote occasional monitoring.

- From a network management station running IBM Nways Campus Manager ATM or another network management application that supports SNMP protocols and the ATM Workgroup Switch SNMP-compliant Management Information Base (MIB) enterprise extensions.

This is suited for medium and large installations with remote permanent monitoring.

For information on the SNMP functions supported, see "SNMP Support" on page 140. For instructions on how to access the Internet library to view the available MIB commands, see "Accessing MIB Files" on page 141.

SNMP Support

In a campus environment managed by the Simple Network Management Protocol (SNMP), the ATM Workgroup Switch acts as an SNMP agent allowing you to configure the workgroup switch using SNMP.

ATM Workgroup Switch software contains a community table with up to ten IP addresses. Each IP address has one of the following access attributes assigned:

- Read-only
- Read-write
- Read-trap
- Trap
- All (read-write and trap).

The ATM Workgroup Switch sends alerts to the IP addresses in the community table that have either trap, read-trap, or all assigned. The workgroup switch can be configured via SNMP from stations whose IP addresses have either read-write or all assigned. The workgroup switch can be monitored from stations whose IP addresses have read-write, read-trap, read-only, or all assigned.

After the IP address of an SNMP station is entered in the community table, the workgroup switch can send SNMP alarms and alerts to the SNMP station.

Accessing MIB Files

For information on the commands that can be used to manage an ATM Workgroup Switch from SNMP, refer to the Management Information Base (MIB) documents for ATM.

MIB documents are available over Internet and intended to help you with Configuration and Performance management. MIBs are stored in files on an anonymous FTP server. The MIB files are regularly updated.

To access the MIB files on Internet, proceed as follows:

1. FTP to `www.raleigh.ibm.com`.
2. Enter `anonymous` as the login name.
3. Enter your full Internet E-Mail address as the password.
4. Change to the HUB directory by entering `cd /pub/products/lanprods/hub` and pressing Enter.
5. Display the contents of the HUB directory by entering `ls -l |more` and pressing Enter.
6. Copy the MIB files to your current directory by entering the appropriate command; for example, `get 8285.mib`.
7. To exit the FTP session, enter `quit` and press Enter.

If you have a problem accessing the Internet library, please contact your IBM representative.

Chapter 20. Updating Microcode and Picocode

This chapter describes procedures for uploading and downloading from the IBM 8285 Nways ATM Workgroup Switch.

Accessing Microcode and Picocode Updates

Microcode and picocode updates may be downloaded via the Internet or the IBM Bulletin Board System:

Internet

You may access updated versions of the software through FTP or the World Wide Web.

- FTP: [lansupport.raleigh.ibm.com](ftp://lansupport.raleigh.ibm.com)
- WWW: <http://www.raleigh.ibm.com/> - This is the IBM Networking home page. From here, you can access product announcements, publications information, and information regarding hardware and software updates.

IBM Bulletin Board System

Using a modem you can access the IBM BBS to obtain latest versions of software. Set your modem and communications software to 8 data bits, no parity, and 1 stop bit. Dial one of the following numbers:

- United States: (919) 517-0001
- Toronto: (905) 316-4255
- Toronto: (416) 956-7877
- Vancouver: (604) 664-6464
- Montreal: (514) 938-3022
- Halifax: (902) 420-0300

For information about IBM's Automatic Update Service (AUS), see "Automatic Update Service" on page xxiv.

UPLOAD and DOWNLOAD Operations

FPGA picocode and microcode for your ATM Workgroup Switch and ATM media modules can be updated by inband, manual, and out-of-band operations, as shown in Figure 38.

For more information on the commands used to start these operations, see the *IBM 8285/8260: ATM Command Reference Guide*.

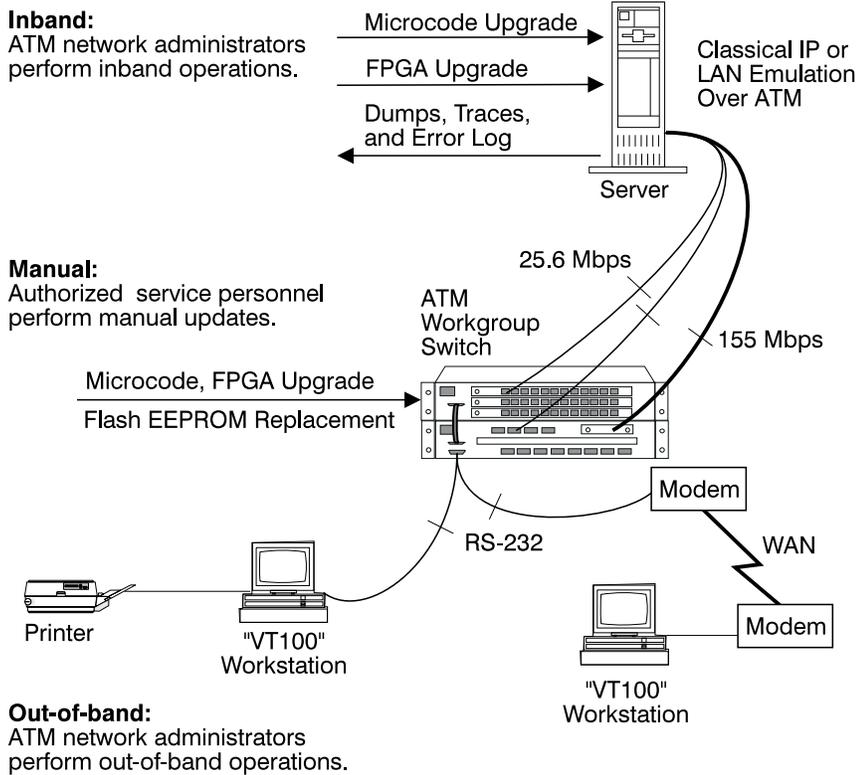


Figure 38. Upload and Download Operations for the ATM Workgroup Switch

Inband Operations

To update ATM microcode, ATM network administrators use the configuration console to perform inband operations from a server connected to an ATM Workgroup Switch. After locating the directory where the microcode updates are stored, log on using the administrator password and perform one of the following operations:

- Update workgroup switch microcode.
- Update hardware picocode in the Field Programmable Gate Array (FPGA) of the workgroup switch and ATM media modules.

See the Release Notes for further information on the order of performing these operations.

Note: The ATM Workgroup Switch gives priority to normal traffic over maintenance tasks. It is recommended to stop normal traffic before performing a download.

Updating Workgroup Switch Microcode

To update workgroup switch microcode,

- **Stop all traffic**
- Make sure the workgroup switch can still PING the TFTP server
- Enter the following ATM Workgroup Switch commands:
 1. SET TFTP SERVER_IP_ADDRESS (to define the server where the microcode is stored)
 2. SET TFTP FILE_NAME (to define the pathname of the file on the server)
 3. SET TFTP FILE_TYPE (to specify boot or operational microcode)
 4. DOWNLOAD INBAND (to load the workgroup switch microcode)
 5. SWAP MICROCODE (this will reset the ATM subsystem with the new code).

Updating FPGA Picocode in the Workgroup Switch

To update hardware picocode in the FPGA of the ATM Workgroup Switch, enter the following commands at the directory prompt:

1. SET TFTP SERVER_IP_ADDRESS (to define the server where the picocode is stored)
2. SET TFTP FILE_NAME (to define the file on the server)
3. SET TFTP FILE_TYPE (to specify FPGA)
4. SET TFTP TARGET_MODULE (to specify the slot number of the workgroup switch) or ATM media module)
5. DOWNLOAD INBAND (to load new hardware picocode)
6. SWAP FPGA_PICOCODE (this will reset the ATM subsystem with the new picocode).

Refer to the module-specific documentation for information on updating hardware picocode in Expansion Unit modules.

Uploading Dumps

To upload a dump to the host, enter the following ATM Workgroup Switch commands at the directory prompt:

1. DUMP TRS (to take a dump of the topology of the network)
2. SET TFTP SERVER_IP_ADDRESS (to define the server connected to the workgroup switch)
3. SET TFTP FILE_NAME (to define the pathname of the file on the host)
4. SET TFTP FILE_TYPE (to specify a dump)
5. UPLOAD INBAND (to upload the dump).

Uploading Traces

To upload a trace log to the host, enter the following ATM Workgroup Switch commands at the directory prompt:

1. SET TRACE (to enable and disable trace recording)
2. SET TFTP SERVER_IP_ADDRESS (to define the server connected to the workgroup switch)
3. SET TFTP FILE_NAME (to define the pathname of the file on the host)
4. SET TFTP FILE_TYPE (to specify the trace type)
5. UPLOAD INBAND (to upload the trace).

Uploading the Error Log

To upload the error log to the host, enter the following ATM Workgroup Switch commands at the directory prompt:

1. SET TFTP SERVER_IP_ADDRESS (to define the server connected to the workgroup switch)
2. SET TFTP FILE_NAME (to define the pathname of the file on the host)
3. SET TFTP FILE_TYPE (to specify the error log)
4. UPLOAD INBAND (to upload the error log).

Manual Update Operations

To update ATM microcode and picocode, authorized service personnel can perform manual updates (such as replacing the flash EEPROM or updating the FPGA) by following these steps:

1. Remove an ATM module and update the microcode manually.
2. Replace the failing component in the module and then re-insert the module in the hub.
3. Enter the RESET ATM_SUBSYSTEM command to reboot all ATM modules.

Out-of-band Operations

ATM network administrators can update workgroup switch microcode (but not ATM media modules) using an out-of-band operation with an RS-232 plug. To do this, you must attach a workstation (with an emulated VT-100 protocol installed) to the ATM Workgroup Switch.

After locating the directory where the microcode updates are stored, use the workstation as the configuration console. Log on using the administrator password and enter the following commands:

1. MAINTAIN (to activate Maintenance mode)
2. DOWNLOAD OUT_OF_BAND (to specify boot or operational code and to load it in the flash EEPROM of the workgroup switch). Start the file transfer in the workstation using X-modem protocol. The transfer takes about 6 minutes (boot microcode) or 30 minutes (operational microcode) at 9600 bps.

If you enter DOWNLOAD OUT_OF_BAND BOOT, you automatically quit Maintenance mode and activate the new microcode. (Boot code is automatically activated, but operational code still needs a SWAP command to be activated.)

3. BOOT (to restore normal operation), if you did not enter DOWNLOAD OUT_OF_BAND BOOT in Step 2.

Fault Management

Workgroup Switch fault management functions allow the administrator to report information on ATM media modules and ports.

For example, to display the status of all ATM ports in the workgroup switch ('slot' 1), you enter:

```
8285> show port 1.all [ENTER]
```

```
Port Display for Module:
```

Port	Type	Mode	Status
1.01	UNI	ENABLED	UP-OKAY
1.02	NNI	DISABLED	UP-NO ACTIVITY
1.03	UNI	ENABLED	UP-OKAY
1.04	UNI	DISABLED	NOT IN SERVICE
1.05	UNI	DISABLED	NOT IN SERVICE
1.06	UNI	DISABLED	NOT IN SERVICE
1.07	UNI	DISABLED	NOT IN SERVICE
1.08	UNI	DISABLED	NOT IN SERVICE
1.09	UNI	DISABLED	NOT IN SERVICE
1.10	UNI	DISABLED	NOT IN SERVICE
1.11	UNI	DISABLED	NOT IN SERVICE
1.12	UNI	DISABLED	NOT IN SERVICE
1.13	SSI	ENABLED	UP-OKAY

Chapter 21. Troubleshooting

This chapter describes how to diagnose and solve problems associated with the installation and operation of the IBM 8285 Nways ATM Workgroup Switch Base Unit and Expansion Unit

Procedure

1. Do all LEDs display the correct pattern after a POST?

If YES, go to step 2. If NO, see the following sections:

Problems with Status LEDs on the Base Unit	page 150
Problems with Status LEDs on the Expansion Unit	page 151
Problems with Port LEDs on the Base Unit	page 153
Problems with LEDs on Expansion Unit Modules	page 154

If the problem is still unsolved after following these troubleshooting procedures, see "Further Assistance" on page 179.

2. Are the workgroup switch, Expansion Unit modules, and ports successfully configured?

If YES, go to step 3. If NO, see the following sections:

Problems with the Configuration Console	page 155
Problems with Configuring Expansion Unit Modules	page 158
Problems with Configuring Ports	page 159

If the problem is still unsolved after following these troubleshooting procedures, see "Further Assistance" on page 179.

3. Are all ATM devices successfully attached to the workgroup switch?

If YES, go to step 3. If NO, see the following sections:

Problems with ATM Ports Attached to ATM Devices	page 162
Problems with ATM Address Registration	page 164
Problems with Hardware Configuration	page 165

If the problem is still unsolved after following these troubleshooting procedures, see "Further Assistance" on page 179.

4. Are all ATM devices successfully attached to the workgroup switch?

See the following sections:

Problems with PINGing	page 166
Problems with Management (Netview/SNMP/TELNET)	page 168
Problems with IBM Proprietary LAN Emulation	page 171
Problems with ATM Forum Compliant LAN Emulation	page 174
Problems with Connections Between Switches	page 176
Other Problems	page 177

If the problem is still unsolved after following these troubleshooting procedures, see "Further Assistance" on page 179.

Problems with Status LEDs on the Base Unit

After a POST, the Base Unit Status LEDs should display the following pattern:

- Power LED (green) ON
- OK LED (green) ON
- Fault LED (yellow) OFF

If any of the LEDs are incorrectly lit, follow the troubleshooting procedures listed below.

Power LED (green) is OFF after the power cable is plugged in.

Steps to Take:

1. Press the RESET button on the workgroup switch to check that the LEDs are functioning properly.
 - If only the OK and Fault LEDs light ON, then the workgroup switch is receiving power, but the Power LED is KO. Call your IBM service representative. Failing part: Power LED.
 - If no LEDs light, then the workgroup switch is not receiving power. Call your IBM service representative. Possible failing parts: Power Supply, Mother Board or Box.

OK LED (green) remains OFF after completion of POST.

Steps to Take:

1. Press the RESET button on the workgroup switch to check that the LEDs are functioning properly.
 - If only the Power and Fault LEDs light ON, then the OK LED is KO. Call your IBM service representative. Failing part: OK LED.
 - If, after the POST finishes, the OK LED still does not light, there is a severe problem. Call your IBM service representative. Possible failing parts: Mother Board or Box.

Fault LED (yellow) remains ON after completion of POST.

Steps to Take:

1. Press the RESET button on the workgroup switch to check that the LEDs are functioning properly. If, after the POST finishes, the Fault LED remains ON, there is a severe problem. Call your IBM service representative. Possible failing parts: Mother Board or Box.

Problems with Status LEDs on the Expansion Unit

After a POST, the Expansion Unit Status LEDs should display the following pattern:

- Power LED (green) ON
- OK LED (green) ON
- Fault LED (yellow) OFF

If any of the LEDs are incorrectly lit, follow the troubleshooting procedures listed below.

Power LED (green) is OFF after the power cable is plugged in.

Steps to Take:

1. Press the RESET button on the Base Unit to check that the LEDs are functioning properly.
 - If only the OK and Fault LEDs light ON, then the Expansion Unit is receiving power, but the Power LED is KO. Call your IBM service representative. Failing part: Power LED.
 - If no LEDs light, then the Expansion Unit is not receiving power. Call your IBM service representative. Possible failing parts: Expansion Unit Power Supply, Switch Board.

Attention: Pressing the RESET button resets the entire workgroup switch, interrupting all connections in the switch. Any configuration settings that have not been saved will be lost.

OK LED (green) remains OFF after completion of POST.

Steps to Take:

1. Press the RESET button on the Base Unit to check that the LEDs are functioning properly.
 - If only the Power and Fault LEDs light ON, then the OK LED is KO. Call your IBM service representative. Failing part: OK LED.
 - If, after the POST finishes, the OK LED still does not light, there is a severe problem. Test the Base Unit with the wrap test described in "Expansion Unit Wrap Test" on page 152.

Attention: Pressing the RESET button resets the entire workgroup switch, interrupting all connections in the switch. Any configuration settings that have not been saved will be lost.

Fault LED (yellow) remains ON after completion of POST.

Steps to Take:

1. Press the RESET button on the Base Unit to check that the LEDs are functioning properly. If, after the POST finishes, the Fault LED remains ON, there is a severe problem. Test the Base Unit with the wrap test described in "Expansion Unit Wrap Test" on page 152.

Attention: Pressing the RESET button resets the entire workgroup switch, interrupting all connections in the switch. Any configuration settings that have not been saved will be lost.

Expansion Unit Wrap Test

An Expansion Connector Wrap Plug (P/N 58G9869) is required to test the Expansion Connector interface. To perform the wrap test:

1. Power-OFF the Base Unit and Expansion Unit
2. Unplug the cable from the Expansion Connector on the Base Unit
3. Plug the Expansion Wrap Plug into the Expansion Connector.
4. Power on the Base Unit

Results:

- The Wrap Test is OK if the Base Unit enters 'maintenance mode' and displays the '>>' prompt. Call your IBM service representative. Possible failing parts: Expansion Unit Switch Board, Expansion Cable.
- The Wrap Test is KO if the Base Unit enters 'maintenance mode' and displays the '>>' prompt with an **error code**. Call your IBM service representative. Possible failing parts: Base Unit Mother Board or Box, Wrap Plug.

Problems with Port LEDs on the Base Unit

The pattern displayed after a POST by some Base Unit Port LEDs depends on whether or not the ports have previously been enabled:

25.6Mbps ATM Port LEDs should display the following pattern:

- Port Enable LED (green) OFF (not enabled) / ON (enabled)
- Output Activity LED (green) OFF

The (optional) 155Mbps ATM Port LEDs should display the following pattern:

- Status LED (green) OFF (not enabled) / ON (enabled)
- Output Activity LED (yellow) OFF
- Error LED (yellow) OFF

If any of the LEDs are incorrectly lit, follow the troubleshooting procedures listed below.

No LED is ON.

Steps to Take:

1. This is the default behavior when you install a Base Unit or 155Mbps ATM I/O Card that has never been configured. All ports are initially disabled, so the LEDs are OFF.
2. Port is not enabled. From the console, check that the Base Unit and ports are working correctly by issuing the SHOW MODULE and SHOW PORT commands.

Problems with LEDs on Expansion Unit Modules

Before trying to diagnose a problem with the Expansion Unit modules, make sure that all modules are properly inserted in their slots and are plugged into the connectors in the ATM backplane.

No LED is ON.

Steps to Take:

1. This is the default behavior when you install an Expansion Unit module that has never been configured. All ports are disabled so the LEDs are OFF.
2. Module is not connected to the backplane correctly. Unplug the module, then plug it back in carefully. When you feel that the module is almost inserted, use the levers to push it in completely.
3. Press the RESET button on the Base Unit to check that all LEDs on all Expansion Unit modules are functioning properly.
4. Ports not enabled. From the console, check that the module is working correctly by issuing the SHOW MODULE and SHOW PORT commands.

Problems with the Configuration Console

If the normal console prompt does not appear after attaching the configuration console to the workgroup switch, or if you have problems entering configuration commands on the console, follow the troubleshooting procedures listed below.

No prompt appears on the console screen after you press Enter.

Steps to Take:

1. Perform the wrap test described in "Console Port Wrap Test" on page 157. If the wrap test is OK, proceed to step 2.
2. Check that the RS-232 cable meets the specifications described in Appendix B, "Cables, Pins and Connectors" on page 189.
3. Check that the RS-232 cable is securely plugged into the workgroup switch and the console using the correct ports.
4. If you know that the IP parameters are already set on the workgroup switch, try to open a TELNET session to it. Then, change the RS-232 parameters using the SET TERMINAL commands.
5. Try using the default settings on the console (the default parameters are: 9600 bauds, 8 data bits, 1 stop bit, no parity). If this does not work, try different settings until you find the right configuration.

Characters appear on the screen but they are not legible.

Steps to Take:

1. Make sure that the attached console is an ASCII terminal.
2. Check the console parameters, especially the baud-rate, parity, and data bits. The default parameters are: 9600 bauds, 8 data bits, 1 stop bit, no parity. If these values do not work, try different settings until you find the right configuration.
3. Replace the ASCII terminal.

Random characters are lost.

Steps to Take:

1. Set the flow control on the console to XON/XOFF.

Some characters are lost when you are connected to the workgroup switch through a modem.

Steps to Take:

1. Make sure that the STOP_BITS parameter on the console is set to 1.

When you power ON the workgroup switch, your last configuration settings are not loaded. A different configuration is activated.

Steps to Take:

1. Re-enter the configuration settings and save them using the SAVE command.

The passwords do not work or you forgot a password.

Steps to Take:

1. Enter force at the password prompt. Then press the RESET button on the front panel of the Base Unit within 3 seconds. This will reboot the workgroup switch to the factory default settings.

You cannot enter commands reserved for the ATM network administrator or the SET commands do not work.

Steps to Take:

1. Make sure that you are logged on as the administrator.

After you enter the first part of an ATM Workgroup Switch command and press the space bar, the rest of the command is not automatically filled in.

Steps to Take:

1. Enter more letters in the command in order to distinguish it from other commands that are written similarly. Then press the space bar again.

The >> prompt appears on the screen and you have not entered the MAINTAIN command.

Explanation: The workgroup switch is running in maintenance mode.

Steps to Take:

1. Verify that the expansion connector wrap plug is not attached.
2. To return to normal operation mode, enter the BOOT command.

The >>abcd>> prompt appears, where a,b,c,d are 4 hexadecimal digits.

Explanation: The workgroup switch entered maintenance mode because of an error, which is indicated by the error-code prompt.

Steps to Take:

Prompt: 0020, 0021, 0030, 0032, 0033, 0034

Possible failing parts: Mother Board. Call your IBM service representative.

Prompt: 0023, 0031

Possible failing parts: 155Mbps ATM I/O Card or Mother Board

To isolate the failing part:

1. Power OFF the workgroup switch
 2. Replace the 155Mbps ATM I/O Card
 3. Power ON the workgroup switch
- If the normal prompt appears on the console, the fault is in the 155Mbps ATM I/O Card
 - If the maintenance prompt reappears, the fault is in the Mother Board.

Call your IBM service representative.

Console Port Wrap Test

An RS-232 Wrap Plug (P/N 58G9868) is required to test the Console Port interface. To perform the wrap test:

1. Power-OFF the workgroup switch
2. Unplug the RS-232 cable from the Console Port on the Base Unit
3. Plug the RS-232 Wrap Plug into the Console Port.
4. Power on the Base Unit

Results: During the POST the OK and Fault LEDs blink alternately. After 5 seconds, if:

- The OK LED (green) lights ON and the Fault LED (yellow) is OFF, the wrap test is OK.
- The OK LED (green) continues blinking and the Fault LED (yellow) lights ON, the wrap test is KO. Call your IBM service representative.
- The Fault LED (yellow) lights ON, call your IBM service representative. Possible failing parts: Base Unit Mother Board or Box.

Problems with Configuring Expansion Unit Modules

If the cause of a Phase 2 problem is not due to the workgroup switch console connection, and if your workgroup switch includes the Expansion Unit feature, make sure that all Expansion Unit modules are operational by following the troubleshooting procedures listed below.

Possible problem with Expansion Unit module

Steps to Take:

1. Enter the SHOW MODULE ALL command as described in the *IBM 8285/8260: ATM Command Reference Guide*, SA33-0385.
2. Check that each module is installed, connected, and functioning properly. Normal operation is indicated when **Y** appears in the `Install`, `Connect`, and `Operation` columns for all slot numbers except the row where `<extension>` appears. In the row for this slot, normal operation is indicated by **Y** in the `Install` column and **N** in the `Connect` and `Operation` columns.

If **N** appears for `Install`, make sure that the module is properly plugged into the backplane connectors in the hub.

If **N** appears for `Connect`, use the SET MODULE command to reconnect the module for ATM traffic.

If **N** appears for `Operation`, the module, slot, or backplane may be faulty. Insert the module into other slots to see if the slot or backplane is the cause.

If the problem persists, enter the SHOW MODULE VERBOSE command to display more detailed information on the module's status.
4. If the status of the module in the SHOW MODULE VERBOSE screen is `hardware KO` and `permanent failure`, reset the module. If the problem persists and if the module's status does not change to `HARDWARE OKAY` and `NORMAL`, replace the module.

If the module's status continues as `under recovery` for a long time, reset the module. If the problem persists, replace the module.

Problems with Configuring Ports

If the ATM Workgroup Switch, configuration console and all Expansion Unit modules are operational (connected, `HARDWARE OKAY`, and `NORMAL` displayed with `SHOW MODULE ALL VERBOSE`), the cause of the problem may be due to an inoperational ATM port.

To see if the ATM ports on the Base Unit and on Expansion Unit modules are functioning correctly, use the `SHOW MODULE` and `SHOW PORT` commands to display port status. Any of the following types of port status may appear:

- UNKNOWN
- ERROR
- NO ACTIVITY
- NOT IN SERVICE
- OKAY
- OKAY PVC-ONLY

The problem associated with each port status (except `OKAY`) and the action to take to correct it are listed below.

If, after trying to solve the problem, the status of ATM media ports does not change to `OKAY`, perform the Wrap test as described in the *IBM 8285/8260: ATM Command Reference Guide*. For assistance, contact your IBM service representative.

Status: UNKNOWN

Explanation: Port status is not available because port is not reachable.

Steps to Take:

1. Use the `SHOW MODULE` command to check if the Expansion Unit module is connected to the ATM Workgroup Switch.
2. If the Expansion Unit module is:
 - Not connected, use the `SET MODULE` command to set the network parameter to `connected`.)
 - Connected, reset it using the `RESET MODULE` command.
3. Reset the workgroup switch using the `RESET ATM_SUBSYSTEM` command.
4. If the problem persists on **ports 1-12** on the Base Unit, replace the failing ports. Possible failing parts: 25Mbps 4-Port Expansion or mother board.
5. If the problem persists only on **port 1.13**, replace the 155Mbps ATM I/O Card.
6. If the problem persists only on an Expansion Unit module, refer to the documentation of the specific module for troubleshooting procedures.

Status: ERROR

Explanation: An internal error is detected on the port.

Steps to Take:

1. Same as for 'UNKNOWN'.

Status: NO ACTIVITY

Explanation: No physical layer activity is detected (either there is no cable/fiber attached, or there is no signal on the Receive cable/fiber).

Steps to Take:

1. See if the port is enabled by entering the SHOW PORT command.
2. If the port is not enabled, use the SET PORT command to set the mode parameter to enable.
3. If the port is enabled, make sure that the remote device is operational and that its adapter is securely plugged in.
4. Make sure that the fiber/cable is securely plugged on the hub.
5. Perform the wrap test described in "ATM Port Wrap Tests" on page 161.
6. If the wrap test result is K0, the problem is associated with the workgroup switch.
7. For SC-type connectors, check that the receive and transmit cables/fibers are not swapped.
8. On SSI ports, make sure that you are using UTP/STP (ATM standard) cables to interconnect switches.

Status: NOT IN SERVICE (UNI port)

Explanation: Physical layer activity is detected (there is a receive signal on the Receive fiber/cable) but the remote device is not responding to ILMI polling.

Steps to Take:

1. See if the port is enabled by entering the SHOW PORT command.
2. If the port is not enabled, use the SET PORT command to set the mode parameter to enable.
3. If the port is enabled, make sure that the remote device is operational and that its adapter is securely plugged in.
4. Make sure that the fiber/cable is securely plugged on the hub.
5. Perform the wrap test described in "ATM Port Wrap Tests" on page 161.
6. If the wrap test result is K0, the problem is associated with the workgroup switch.
7. The peer device does not support ILMI. Change the UNI port configuration to suppress ILMI.
8. A PVP with VPI=0 is or was defined on that port. Release the PVP and disable/enable the port.
9. The transmit wire/fiber of the cable is defective. Replace the cable.
10. The UNI port is defined with ILMI enabled, but the workstation connected to it has a device driver that does not support the LECS well-known ATM address, and an LECS address is defined in your 8285.
Check that you have an LECS address configured in your 8285 with the command SHOW LAN_EMUL CONFIGURATION_SERVER command. If there should not be any LECS address defined, clear it with the CLEAR LAN_EMUL CONFIGURATION_SERVER ALL command.
11. Take traces from both the hub and the remote device for an IBM service representative.

Status: NOT IN SERVICE (SSI port)**Steps to Take:**

1. Use the command SHOW PORT slot.port VERBOSE command to determine the problem.
2. There may be a problem of bandwidth availability on the module. Spread the SSI ports over several modules.

ATM Port Wrap Tests

To test the port interface of an ATM port, you need a wrap plug that is appropriate for the type of port you are testing:

Port Type	Part Number
25.6Mbps (RJ-45) Base Unit ports	42H0540 (included with Base Unit shipping group)
155Mbps ATM I/O Card (SC) port	16G5609
Expansion Unit module ports	(see module documentation)

To perform the wrap test:

1. Disable the port with the `SET PORT x.x DISABLE` command.
2. Unplug the device cable from the port connector
3. Plug the appropriate wrap plug into the port connector
4. Enter the `WRAP` command on the configuration console (See the *IBM 8285/8260: ATM Command Reference Guide*, SA33-0385 for further information on the `WRAP` command.)

Results:

- If the message `Test successful` is displayed on the console, the wrap test is OK.
- If the message `Port K0` is displayed on the console, call your IBM service representative.

Problems with ATM Ports Attached to ATM Devices

After you attach ATM devices to ATM media ports, the status of the ports may still not change to OKAY (ready for ATM traffic). To diagnose this type of Phase 3 problem, use the SHOW PORT VERBOSE command (described in the *IBM 8285/8260: ATM Command Reference Guide*) to display the status of each port. Any of the following types of port status may appear:

- NO ACTIVITY
- NOT IN SERVICE
- OKAY
- OKAY PVC-ONLY
- ACN MISMATCH
- MISCONFIGURED

The problem associated with each port status (except OKAY) and the action to take to correct it are listed below.

The status of an SSI or UNI port is NOT IN SERVICE.

Steps to Take:

1. Refer to "Problems with Configuring Ports" on page 159.
2. Make sure that the attached ATM device is operating properly (for example, the daemon is running).
3. Make sure the cable to an attached workstation was not removed, or that the workstation was powered-off, without disabling the port first. If so, disable and then re-enable the port.
4. Check the ATM address registration as described in "Problems with ATM Address Registration" on page 164.
5. Perform the wrap test described in "ATM Port Wrap Tests" on page 161, using the WRAP EXTERNAL command.

A workstation with a Turboways* 25 ATM adapter is attached to the port, and the status of a port is NO ACTIVITY.

Steps to Take: Make sure that the device is correctly installed:

1. Refer to "Problems with Configuring Ports" on page 159.
2. Make sure that the adapter is securely plugged into the port.
3. Make sure that the cable is securely plugged into the adapter.
4. If the adapter is an older model, check whether the wiring conforms to ATM Forum specifications. If not, the device must be cabled with special twisted-pair cable for non-ATM Forum compliant devices (see "Twisted-Pair Cable" on page 189 for further information.)
5. Make sure that the device driver is correctly installed by de-installing it and re-installing a new one.

The status of a UNI port is OKAY PVC-ONLY.

Steps to Take:

1. Make sure that the ATM address of the attached device supports the ATM address registration of the UNI port.

Important: When a port's status is OKAY PVC-ONLY, only PVC connections are supported.

2. If the UNI port is attached to another switch, you may prefer to define the port as an SSI or NNI port, to be able to establish SVCs. (For SSI ports, the bandwidth allocation must be the same at both ends of the trunk. See the *IBM 8285/8260: ATM Command Reference Guide*.)

The status of an SSI port is ACN mismatch.

Steps to Take:

1. Make sure that the workgroup switch belongs to the same ATM cluster as the attached device. Enter the SHOW DEVICE command to check the configured ATM address.

The status of an SSI port is Misconfigured.

Steps to Take:

1. Make sure that the device is attached to an SSI port.

Problems with ATM Address Registration

If you suspect that a Phase 3 problem is due to faulty ATM address registration between an ATM Workgroup Switch and an attached ATM device, follow the troubleshooting procedures listed below.

Possible problem with ATM address registration

Steps to Take:

1. Enter the `SHOW PORT` command to make sure that the ATM media port is configured with a UNI interface. If not, enter the `SET PORT` command and specify `uni` for the interface parameter.
2. Make sure that the attached device supports the ATM network prefix used by the workgroup switch.
To display the network prefix, enter the `SHOW DEVICE` command and note the leftmost thirteen bytes of the workgroup switch's ATM address.
Check the ATM network prefix supported by the device. If it is different from the prefix set for the workgroup switch, use the `SET DEVICE ATM_ADDRESS` command to change the workgroup switch's ATM address so that its network prefix is the same as the network prefix used by the ATM device. Be sure to reconfigure the ATM addresses of other switches that are attached to the workgroup switch.
3. Make sure that the device supports ATM address registration. To check whether the device registered its ATM address, use the command `SHOW ATM_ESI`. If you do not find the ATM address, enter the command `SHOW PORT slot.port VERBOSE` corresponding to the port attached to the device, and check that the status is `OKAY`. If, for example, the port on the ATM device is configured as `okay PVC-ONLY`, the device supports only PVC connections.
4. Make sure that the device is not using a protocol for ATM address registration that is incompatible with the ILMI protocol used by the workgroup switch.
5. Contact your IBM service representative.

Problems with Hardware Configuration

If you suspect that a Phase 3 problem is due to a problem in your hardware configuration (for example, using a LAN Emulation server, 8282 host, 25Mbps client, and so on), follow the troubleshooting procedures listed below.

Possible problem with hardware configuration

Steps to Take:

1. If the attached device is an 8282 host, enter the SHOW PORT command to see if the port's status is OKAY. If the status is not OKAY, follow the steps in "Problems with Configuring Ports" on page 159.
2. If a trap or error message is displayed on the client when you start the workgroup switch, enter the SHOW PORT command to make sure that the ATM media port's status is OKAY. If the status is not OKAY, restart the client.

If the port's status does not change to OKAY, run a trace by entering the SET TRACE and UPLOAD INBAND commands. Then contact your IBM service representative.
3. Use the MIB browser or the ATM Campus Manager for AIX Version 1 to make sure that the client addresses are configured in the workgroup switch's ATM address table.

If the ATM media port's status does not change to OKAY, contact your IBM service representative.
4. If the attached device is a LAN Emulation server (LES), make sure that it is installed and running properly, and that:
 - The status of the port that connects the LES to the workgroup switch is OKAY.
 - The LES is configured with the ATM network prefix used by the workgroup switch.

Problems with PINGing

Workgroup Switch Cannot PING the ARP Servers and Vice-versa

First: Use the SHOW DEVICE command to determine the Q.2931 cause code. Follow the steps that correspond the cause code:

31 **Explanation:** The IP address of the workgroup switch is not in the same IP subnet as the ARP server.

Steps to Take:

1. Change the IP address or IP subnet mask of the workgroup switch.

1 **Explanation:** A wrong ARP server address was entered with the SET DEVICE ARP_SERVER command, or the port of the ARP server is NOT IN SERVICE or NO ACTIVITY status.

Steps to Take:

1. Check that the port attached to the ARP server is OKAY, then check that the ATM address shown by the ARP server is exactly the same as the one entered in the workgroup switch (by entering the SHOW DEVICE command).

3 (SS1 links to ARP server in the same cluster)

Steps to Take:

1. An SSI port does not have enough bandwidth. Having several SSI ports on the module may reach the bandwidth limit.

Spread the SSI ports over several modules.

2. The ATM address of an workgroup switch located on the PING path has been changed.

Disable the SSI link and re-enable it.

If the above does not solve the problem, take a TRS dump (with the DUMP TRS command), and contact your IBM service representative.

3 (NNI links to ARP server in another cluster)

Steps to Take:

1. The NNI network-side/user-side definition rules have not been applied.

Check that one side of the NNI link is defined as user, and that the other side is defined as network.

2. No logical-link has been defined for the NNI port.

Define the logical link, using the SET LOGICAL_LINK command.

3. The peer logical links do not match (bad vpi match, bad cluster match, bad bandwidth match).

Check that the logical links on both sides do match, and if necessary, clear those logical links and re-define them.

4. No static route has been defined, if the workgroup switch and the ARP-server are in different ATM subnetworks.

Define the static routes using the SET STATIC_ROUTE command.

5. A static route was badly configured.

Check the static routes, using the SHOW STATIC_ROUTE command.

6. The VP-tunnel is defective.

Ask your VP-tunnel provider to test it.

Workgroup Switch Cannot PING an ARP Client

Steps to Take: Check if the workgroup switch can PING the ARP server. If not, then see “Problems with PINGing” on page 166. If it can PING the server:

1. The port of the ARP client is not OKAY.
Check that the port of that ARP client is enabled. If it is enabled, and not OKAY, then the problem comes from the ARP client or from the cable attached to it.
2. The ARP client is not registered in the ARP server.
Check that the ARP client has TCP/IP running, and that the address configured for its ARP server is correct.
3. If the workgroup switch and the ARP client are not in the same IP subnet, there may be a Gateway definition problem.
Check the Default Gateway addresses in both machines. In general, they correspond to one common gateway.
4. The SVC between the workgroup switch and the ARP client cannot be established.
Check the Clear-Log Table in the Nways Campus Manager ATM (ATMC) to see the cause of the failure.

Workgroup Switch LEC Cannot PING another Client and Vice-versa

Steps to Take:

1. Check that the port of the LEC is enabled. If it is enabled, and not OKAY, then the problem comes from the LEC or from the cable attached to it.
2. The LEC does not support the same Ethernet type as the workgroup switch LEC.
Check that the local LEC is emulating the same Ethernet type (802.3 or Ethernet V.2/DIX) as the remote LEC.
3. Check that both LECs are connected to the same LES.
4. If the workgroup switch LEC and the other LEC are not in the same IP subnet, there may be a Gateway definition problem.
Check the Default Gateway addresses in both machines. In general, they correspond to one common gateway.
5. If both a Classical IP subnet and a LAN Emulation subnet have been started, check that they have been defined with different subnetworks.

ARP Client Cannot PING the ARP Server

Explanation: The IP address of the client is not in the same subnet as the ARP server.

Steps to Take:

1. Re-define the IP address of the ARP client so that it is in the same subnet as the ARP server IP address.

Two Devices Using IP Over a PVC Cannot PING Each Other

Steps to Take:

1. If the PVC is not active, make sure that the PVC is 'in-service' from ATMC or 'active' (from the console). If not, then try to re-enable that PVC.
2. The hardware connections may be failing, in which case replugin the cables attached to the devices.
3. If the source and destination IP addresses are not in the same IP subnet, check both IP addresses. Change them so that they belong to the same IP subnet.

Problems with Management (Netview/SNMP/TELNET)

This section details problems occurring during the administration of the workgroup switch (PING, TELNET, TFTP, SNMP/ATMC).

PING: The Workgroup Switch cannot PING the management station.

Steps to Take:

1. Since all the management services are running over IP, you have to ensure that the workgroup switch can PING the destination station where you will run either TELNET, the TFTP daemon (TFTP server), or the SNMP manager (ATMC). If the PING fails, see previous sections on PING failures in Classical IP or LAN emulation networks.

TELNET: You cannot TELNET to the Workgroup Switch from the management station.

Steps to Take:

1. If the PING does not work, see previous sections on PING failures.
2. Someone is already logged on the workgroup switch by another TELNET session. It is not possible to have more than one TELNET session per workgroup switch.

To know from which station the other TELNET session is active, use the ATMC SVC Tracking tool to determine at least which SVCs are connected to the internal port of the workgroup switch (interface 1). You will then know the ATM addresses of the remote ends, as well as the workgroup switch ports to which they are connected to.

Note: It is recommended to set the Terminal Timeout parameter to a non-zero value, to force TELNET sessions to close themselves after some inactivity.

TFTP: Upload fails from the Workgroup Switch

Explanation: The upload can be done either from the configuration console (local console or TELNET) or from the SNMP Manager (ATMC or MIB Browser).

Before performing any upload, make sure that the machine hosting the TFTP server can PING the workgroup switch.

When an upload fails, an error code is returned. That error code can be different between the terminal dialog and the ATMC/MIB browser, which is why both return codes are documented.

Note: When the upload fails from the terminal dialog (console or TELNET), check the return code by using the SHOW TFTP command.

Steps to Take:

1. Messages: Error/generic error..Host Access Violation...Access Rights Violation/access-rights-violation...File already exists/file-already exists.
 - The file that you want to upload already exists on the target machine, and is read-only.
Change the attributes of the file on the target machine or change the name of the file to be uploaded.
 - You are trying to upload to a directory that is not uploadable by TFTP.
If the target host runs AIX or Unix, use the directory /tmp, or configure the file /etc/tftpaccess.ctl with lines beginning with 'allow:'. Check the documentation of the daemon/server TFTP. If you use another operating system (OS/2 or others), configure the TFTP daemon on that system to accept uploads in the desired directory.
 - You are trying to upload a file that can only be downloaded (operational code, boot code, or FPGA picocode).
Check the file type of the file to be uploaded.

2. Messages: Cannot connect to Host/no-response-from-host
 - Check that you can PING the host from the workgroup switch. If the PING fails, see the previous sections on PING failures.
3. Messages: Connection lost/connection-lost
 - The SVC connection between the workgroup switch and the host has been cleared during the file transfer. Retry the upload. Look at all the Clear Tables of all intermediate switches that are on the path between the workgroup switch and the host. To do that, use the ATMC Control Panel (Statistics) and choose 'node' and 'Call-Logging' for all the intermediate switches.
4. Messages: File not found/file-not-found
 - You tried to upload without specifying the name of the file to be uploaded. Specify the name of the file.
5. Messages: File too big/file-too-big
 - There is no space left on the server. Check that space is made available before retrying the upload.

TFTP: Download Inband fails from the Workgroup Switch

Explanation: The download inband can be done either from the terminal console (console or TELNET) or from the SNMP Manager (ATMC or MIB Browser).

Before performing any download, make sure that the machine hosting the TFTP server can PING the workgroup switch.

When an download fails, an error code is returned. That error code can be different between the terminal dialog and the ATMC/MIB browser, which is why both return codes are documented.

Note: When the download fails from the terminal dialog (console or TELNET), check the return code by using the SHOW TFTP command.

1. Messages: Error/generic error..Host Access Violation...Access Rights Violation/access-rights-violation...File already exists/file-already exists.
 - The file that you want to download does not have read permission for TFTP.
Change the attributes of the file on the host.
 - You are trying to download to a directory that is not downloadable by TFTP.
If the source host runs AIX or Unix, use the directory /tmp, or configure the file /etc/tftpaccess.ctl with lines beginning with 'allow:'. (check the documentation of the daemon/server TFTP.D. If you use another operating system (OS/2 or others), configure the TFTP daemon on that system to accept downloads in the desired directory.
 - You are trying to download a file that can only be uploaded (traces, error-log, dumps).
Check the file type of the file to be downloaded.
2. Messages: Cannot connect to Host/no-reponse-from-host.
 - Check that you can PING the host from the workgroup switch. If the PING fails, see the previous sections on PING failures.
3. Messages: Connection lost/connection-lost.
 - The SVC connection between the workgroup switch and the host has been cleared during the file transfer. Retry the download. Look at all the Clear Tables of all intermediate switches that are on the path between the workgroup switch and the host. To do that, use the ATMC Control Panel (Statistics) and choose 'node' and 'Call-Logging' for all the intermediate switches.
4. Messages: File not found/file-not-found.
 - You tried to download without specifying the name of the file to be downloaded. Specify the name of the file.

- You tried to download a file that does not exist on the host. Check that you have not misspelled the name (blank spaces are treated as normal characters).
5. Messages: File too big/file-too-big.
- You tried to download an operational code to the boot sector of the workgroup switch. Check the filetype for the download, and check the file name of the file to be downloaded.
6. Messages: Bad file header/Cannot interpret file/invalid-file-header.
- You tried to download a file that is not downloadable. If the source file name is correct, and it was obtained by FTP, it might have been transferred in ASCII mode instead of binary. Check the size of the downloadable file, and compare it with the theoretical size provided by your IBM service representative. If the size is correct, contact your IBM service representative.
7. Messages: Checksum Error/Packet error/checksum-error.
- There has been a problem during the transfer.
Download the file again.
 - A byte is corrupted in the source file.
Either get a new source (re-install the source file from your installation package), or, if it fails again, contact your IBM service representative.
8. Messages: Flash memory failure/hardware-error.
- Try to download several times. If it always fails, contact your IBM service representative.
9. Messages: Target Blade Mismatch.
- You tried to download FPGA picocode that is incompatible with the target module number. Check the type of module (A4-FB100, A2-MB155 etc.) and the TFTP parameter.

Workgroup Switch cannot restart after a download inband operation is performed and TFTP-supported services are operational.

Steps to Take:

1. Use the DOWNLOAD OUT_OF_BAND command to load the microcode that was previously active. Then restart the workgroup switch.
2. Contact your IBM service representative.

Problems with IBM Proprietary LAN Emulation

This section details the problems that may occur during the setup of an IBM proprietary LAN emulation environment. Such an environment may include concentrators (8282) and bridges (8281), an external IBM LAN Emulation Server (LES), workstations (WS), ATM Workgroup Switches (workgroup switch), and 8260 hubs.

A workstation/bridge cannot connect to another workstation/bridge.

Steps to Take:

1. Using the LES monitor, check in the list of registered end stations that both workstation/bridge addresses are present. If you do not know the ATM addresses of your workstation/bridge, use the ATMC Interface Configuration panel for the ports attached to your workstation/bridge. If both addresses are registered in the LES, then proceed to point 3.
2. If one workstation/bridge address is missing, then use the Call Status History provided by the LES monitor to get the Q.2931 cause of the failing call. The missing station/bridge has probably a wrong LES ATM address defined in its configuration. Check the missing station's configuration.
3. Both workstation/bridges are registered to the LES, but one cannot call the other one, because the LES is not available any more (port disabled, or not-in-service). The LES does not tell you that it has lost its address, because it only tells that once the connection to the switch is returned.

Check that the LES cable is well plugged, then check that the LES port is enabled. If it stays enabled and not-in-service, then the LES is faulty. Contact your IBM service representative for investigation, or re-boot the LES.

LES Monitor Statistics: Default Vccs counter oscillating, too few registered workstations.

Explanation: The workstation knows its ATM address, but that address has been deregistered at the Switch/Control-point level. This happens when the workstation is behind a concentrator (8282) that has been disconnected from the switch for a short time.

Note: You can check whether the station is registered in the workgroup switch by using the command SHOW ATM_ESI.

Steps to Take:

1. Wait a few minutes for the new registration to take place.

Workgroup Switch Clear Table: a lot of SVCs were cleared with Cause 31.

Explanation:

- A high-bandwidth (100Mbps or 155Mbps) workstation or bridge has tried to call a low-bandwidth workstation (25.6Mbps). The call was rejected by the low-bandwidth workstation because the bandwidth specified in the Q.2931 parameters (even for a UBR call) was too large. This is normal.
- The source or bridge retried to call the destination station with a lower bandwidth/bit-rate successfully.

Steps to Take:

1. No action required.

Some ATM stations cannot talk to LAN stations behind PARALLEL bridges.**Explanation:**

- The 8281 bridge has a limitation of 256 ATM connections. One would think that multiplying the number of 8281 bridges (in parallel) would multiply the number of available connections. Doing so will lead to the problem that only 256 stations can immediately establish connections with the bridges.
- In a configuration with parallel 8281 bridges (those bridges register to the same LAN Emulation Server, and they connect to the same LAN), there may be collisions in terms of connections. Indeed, when an ATM station calls a LAN station behind the 8281 bridges, each 8281 bridge will respond by establishing a connection to the originating ATM station. In a network where the number of ATM stations exceeds 256, which is the maximum number of SVCs per 8281, some stations will not be able to connect until the bridges clear their SVCs that are unused (aging out process).

Steps to Take:

1. Just wait up to 4 minutes (aging time on the 8281 bridge), or avoid parallel bridging.

LES Monitor: after 3 minutes, the workstation is deregistered from the LES.

Explanation: The workstation did not send the re-registration message within 3 minutes.

Steps to Take:

1. Ensure that the port for the workstation is connected properly. If not green, ensure that the cable between the workgroup switch and the workstation is connected properly. Shutdown, then power off the workstation and restart. If the problem persists, contact your workstation/adaptor supplier.

In a multiple Token-ring bridges configuration, a Token-ring bridge cannot register to the LES.

Explanation: Different ring numbers are assigned to the ATM ports of two bridges connected to the same LES. The numbers should be equal.

Steps to Take:

1. Check the ring numbers of the ATM ports of all the bridges attached to the same LES. Change them if necessary.

LES Monitor: Bridge is on General Multicast Tree, but not on Bridge Multicast Tree.

Explanation: The bridge did not send its route descriptors to the LES.

Steps to Take:

1. The bridge is faulty. Contact your IBM service representative.

At workstation reboot: the ATM adapter initialization failed.

Explanation: The port is not enabled on the switch or concentrator that is attached to the workstation, or it is not a UNI port.

1. From the console, or from the SNMP Manager (ATMC), enable the corresponding port as a UNI port.

A station cannot register to an LES located behind a WAN (VP-tunnel).**Explanation:**

- Some of the connections through the VP tunnel work, but not all, especially the ADD_PARTY to put the stations on the LES Multicast Tree. The workgroup switch error-log is full of messages like 'Invalid Message Length'.
- The WAN (public network proving the VP-tunnel) uses the VCI=5 for its own purposes, and there is a conflict with the workgroup switch which also uses VCI=5 (ATM-Forum Signalling VCI).

Steps to Take:

1. Ask your public network provider if they use the VCI=5. If necessary, put an ATM device between the WAN and the workgroup switch to do the translation of Signalling VCI to a value other than 5.

No Traffic in a Client Environment.**Steps to Take:**

1. Make sure that each LES client does not have more than 12 virtual connections.

Problems between two LAN-emulated stations, or between a LAN-emulated station and a LAN station located behind a bridge.**Steps to Take:**

1. For performance problems, first consider the frame sizes defined at the workstation level and at the bridge level.
2. For connection problems, first consider the Nways Campus Manager (ATMC) and LAN emulation server, which can provide you with a lot of information through the LES monitor.
 - If you know neither the emulated MAC addresses of the stations nor the ATM addresses of these stations, use the ATMC Interface Configuration panel to get their ATM addresses.
 - Once you know either the ATM addresses or emulated MAC addresses of the stations, look at the Registered End-systems window of the LES monitor and check that the stations are registered.
 - Once you know which station is NOT registered, record its ATM address and look at the Call Status History window of the LES monitor. You should find a recorded call from that ATM address that failed for a certain 'cause X, reason Y'. The cause X shows you the Q.2931 cause of the failure. Refer to "Q.2931 Error Codes for Clear Causes" on page 207.
 - If you not find any call from that ATM address, that station has not been able to reach the LES. Use the ATMC Statistics Control Panel to open the Clear Table of the workgroup switch directly attached to the failing station (select 'Node' and 'Call Logging'). That table should have entries with a source ATM address being the one of the failing station. You will get a Q.2931 cause of the failure. Refer to "Q.2931 Error Codes for Clear Causes" on page 207.

Problems with ATM Forum Compliant LAN Emulation

This section details the problems that may occur during the setup of an ATM Forum compliant LAN emulation environment.

Workgroup Switch LEC Cannot Initialize to the LES/BUS

First: Use the SHOW DEVICE command and look at the subnet lan emulation status message:

If the message is:

```
Abnormal Termination: LES connection cleared. ATM Forum cause xx.
```

follow the steps below that correspond the cause code:

- 1** **Explanation:** A wrong LES address was entered using the SET DEVICE LAN_EMULATION_CLIENT command (les_atm_addressr parameter), or the port attached to the LES is not in service.

Steps to Take:

1. Check if the port status is UP-OKAY (via the SHOW PORT command), then check that the LES ATM address is exactly the same as the one entered in the workgroup switch.

3 **Steps to Take:**

1. If the LE server is in the same cluster (SSI links):

- An SSI port has not enough bandwidth. Having several SSI ports on the module may reach the bandwidth limit.
Spread the SSI ports over several modules.
- The ATM address of an workgroup switch located on the PING path has been changed.
Disable the SSI link and re-enable it.

If the above does not solve the problem, take a TRS dump (with the DUMP TRS command), and contact your IBM service representative.

2. If the LE server is in another cluster (NNI links):

- The NNI network-side/user-side definition rules have not been applied.
Check that one side of the NNI link is defined as user, and that the other side is defined as network.
- No logical-link has been defined for the NNI port.
Define the logical link, using the SET LOGICAL_LINK command.
- The peer logical links do not match (bad vpi match, bad cluster match, bad bandwidth match).
Check that the logical links on both sides do match, and if necessary, clear those logical links are re-define them.
- No static route has been defined, if the workgroup switch and the LE server are in different ATM subnetworks.
Define the static routes using the SET STATIC_ROUTE command.
- A static route was badly configured.
Check the static routes, using the SHOW STATIC_ROUTE command.
- The VP-tunnel is defective.
Ask your VP-tunnel provider to test it.

16/31 Explanation:

The connection has been voluntarily rejected by the LE server. The reason depends on LE server implementation.

18/102

Explanation:

The LE server is present, but not started.

47 Explanation:

Steps to Take: There may be a lack resources on the LE server side preventing connection to it.

If the message is:

LAN Emulation JOIN failed. ATM Forum LE status xx.

follow the steps below that correspond the status code:

1 Explanation:

The LE version for the LEC is not compatible with the LES/BUS version.

2 Explanation:

The workgroup switch LEC parameters are incompatible with the LES/BUS. For example, the emulated LAN type of the workgroup switch LEC (IEEE 802.3) does not correspond to that of the LES.

Steps to Take:

1. Change the LES ATM address to reach a LES with the same LAN type (IEEE 802.3).

4 Explanation:

The same MAC address is already registered to the LES.

Steps to Take:

1. Change the workgroup switch MAC address (with the SET DEVICE LAN_EMULATION_CLIENT command), or deregister the LEC with the same MAC address from the LES.

Problems with Connections Between Switches

No Connection Between Two Workgroup Switches in the Same ATM Cluster

Steps to Take:

1. Use the SHOW PORT command to:
 - Make sure that the ATM media port at each end of the connection is configured with an SSI interface. If not, use the SET PORT command and specify SSI as the interface parameter.
 - Make sure that the status of each port is OKAY. If not, follow the procedure described in "Problems with ATM Ports Attached to ATM Devices" on page 162.
2. Make sure the bandwidth allocated is the same on both ends.
3. Contact your IBM service representative.

No Connection Between Two Clusters in the Same ATM Subnetwork

Steps to Take:

1. Use the SHOW PORT command to:
 - Make sure that the ATM media port at each end of the connection is configured with an NNI interface. If not, use the SET PORT command and specify NNI as the interface parameter.
 - Make sure that the status of each port is OKAY. If not, follow the procedure described in "Problems with ATM Ports Attached to ATM Devices" on page 162.
2. Use the SHOW DEVICE command to:
 - Make sure that the ATM address of each workgroup switch in the subnetwork is configured with the same Routing Domain number (RDN).
 - Make sure that each boundary switch is configured with a different ATM Cluster number (ACN).
3. Use the SHOW LOGICAL LINK command to make sure that the logical link settings of the ATM media port on each boundary switch are correctly configured.
4. Contact your IBM service representative.

No Connection Between Two ATM Subnetworks

Steps to Take:

1. Use the SHOW PORT command to:
 - Make sure that the ATM media port at each end of the connection is configured with an NNI interface. If not, use the SET PORT command and specify NNI as the interface parameter.
 - Make sure that the status of each port is OKAY. If not, follow the procedure described in "Problems with ATM Ports Attached to ATM Devices" on page 162.
2. Use the SHOW LOGICAL LINK command to make sure that the logical link settings of the ATM media port on each boundary switch are correctly configured.
3. Use the SHOW DEVICE command to make sure that the network prefixes and logical ATM cluster number are correctly configured for the boundary switch in each subnetwork.
4. If the connection is over a VP service provider, refer to your contract with the VP service provider to make sure that certain settings (for example, VP identifier) are correct.
5. Contact your IBM service representative.

Other Problems

Cannot create a PVC between two switches located in different clusters.

Explanation:

- This is normal. The ATM Workgroup Switch does not allow the creation of PVCs over network-to-network (NNI) links.
- You have created two different PVCs, each one ending at the NNI port.

Note: Make sure that the VPI used by the PVC on the NNI port corresponds to the VPI of the logical link defined on that port.

ATM server/token-ring client's applications fail: frames are lost. Token-ring clients located behind a Token-ring/ATM bridge can connect to an ATM server, but the applications/sessions keep failing, while clients connected directly to ATM have no problems.

Explanation: The frame size on the ATM server is larger than the maximum frame size allowed by the bridge.

Steps to Take:

1. Change the MAX_FRAME_SIZE on the ATM server to the maximum value allowed by the bridge (8281 max frame size should be 8939 bytes).

Note: You may have to change the MAXDATARCV parameter of the OS/2 token-ring NETBIOS clients to 4168 in the PROTOCOL.INI file.

Workgroup Switch Terminal/TELNET very slow or PING to workgroup switch very slow.

Explanation: The workgroup switch is congested by Signalling Calls.

Steps to Take:

1. If you cannot be in front of the workgroup switch, perform a remote login to it using TELNET. First make sure that the trace is not active, then disable the ports one at a time until the TELNET session gives a normal response time. The last port that you disabled should be the one through which the congesting calls were coming.
2. If you can be in front of the workgroup switch, log on to the configuration console. First make sure that the trace is not active, then look at the Output Activity LEDs and disable the port for which the Output Activity LED is constantly lit. If the workgroup switch has a 155Mbps ATM I/O Card, disable it.

When there is congestion, it is often due to the failure of a major ATM component (ARP server, LAN emulation server, switch down, public network down, file server down). You have to determine which of these ATM components failed.

Problems of ATM connections/performance through a WAN (VP tunnel).

Steps to Take:

1. Check the switch configurations at both sides.
2. Check that the VPI corresponds to the VPI provided by your network provider.
3. Check that the bandwidth is lower or equal to the Maximum Peak Rate negotiated with your network provider.
The actual bandwidth used by the media modules is the maximum one (155Mbps for an A2-155 module, 100Mbps for an A4-FB100 module etc.), even if a lower value is specified with the SET_LOGICAL_LINK command.
4. Check that one NNI port on one side is defined as 'network-side' and that the NNI port on the other side is defined as 'user-side'.

5. If you are using single mode A2-MB155 modules, you probably have to define the clocking as external, using the SET PORT command (the clock is usually provided by the WAN).
6. If you have an workgroup switch with a microcode version greater than 2.0, you have to specify the type of network (SONET or SDH) at the end of the SET PORT command.
7. If the previous steps did not help, then you require an ATM Analyzer for the following tests:
 - Hardware wrap test through the WAN up to the media module. Install the ATM Analyzer at one side of the WAN, and the workgroup switch at the other. Disable the NNI port, and enter the command WRAP slot.port REPLY_MODE ENABLE. The NNI port is now redirecting Received Cells to the transmit side. Now, from the ATM Analyzer, generate traffic on the VCI=5, and compare the outgoing cells with the incoming cells. If some cells are lost or corrupted, contact your public network provider. When you are finished, enter the command WRAP slot.port REPLY_MODE DISABLE.
 - Hardware wrap test through the WAN up to the media module. Install the ATM Analyzer at one side of the WAN, and the workgroup switch at the other. Enable the NNI port, and create a PVC from the VCI=x to a VCI=y on the same port, using the command SET PVC. Check that the PVC is active using the command SHOW PVC ALL. Now, from the ATM Analyzer, generate traffic on the VCI=x, and compare it with the received cells on the VCI=y. If some cells are lost or corrupted, contact your IBM service representative.

Further Assistance

For further assistance with a troubleshooting problem, call your IBM service representative, providing as much of the following information as possible:

- The name of the 'failing part' or 'possible failing part', if indicated in the troubleshooting procedure.
- Types and slot numbers of all modules installed in the Expansion Unit
- Output of the following commands:
 - SHOW DEVICE
 - SHOW PORT ALL
 - SHOW MODULE ALL VERBOSE
 - SHOW LES
 - SHOW LECS
 - SHOW LOGICAL_LINK
 - SHOW STATIC_ROUTE
 - SHOW ATM_ESI
- Type and characteristics of each ATM device attached to the workgroup switch
- ON/OFF condition and color of the all ATM Port LEDs and workgroup switch Status LEDs.
- Last ATM Workgroup Switch commands entered from the local console
- Error log information uploaded to the host by entering the UPLOAD command
- Trace information uploaded to the host by entering the UPLOAD command
- Dump information uploaded to the host by entering the UPLOAD command
- The following reports generated from ATM Campus Manager for AIX Version 1:
 - atmSvcTable from the atmSw MIB
 - atmSvcClearTable from the atmSw MIB
 - interfaceTable from the atmSw MIB
 - atmAtmAddressTable from the ILMI MIB
- Q.2931 error code for the clear cause in the SVC.

Notes:

1. In order to record trace information, perform dumps, and upload the error log, you must use a TFTP file server in Classical IP or LAN Emulation Over ATM mode.
2. For information on how to record trace information, see "TRACE Information" on page 180.
3. For information on how to upload the trace or error log file, see "UPLOAD and DOWNLOAD Operations" on page 144.
4. For more information on the UPLOAD command, see the *IBM 8285/8260: ATM Command Reference Guide*.

TRACE Information: In order to record trace information, follow these steps:

1. Use a TFTP file server in IP or LAN Emulation over ATM mode.
2. Reproduce the problem and activate the trace by entering `set trace main_trace on` or `set trace trs_trace on`, as requested by the IBM service representative
3. Stop the trace by entering the SET TRACE command and specifying off.

Note: The TRACE command may degrade system performance.

For more information on the SET TRACE command, see the *IBM 8285/8260: ATM Command Reference Guide*.

Using Workgroup Switch Trap Messages

A trap message is sent to the ATM Workgroup Switch local console when a configuration change is made or when an error occurs in the ATM subsystem. For example, if an Expansion Unit module is removed from an ATM Workgroup Switch, a message describing this change is sent to the console. A sample message is shown here:

```
*****  
Change trap on module 1  
*****
```

The first field in the trap message is described in Table 5. The other fields of information that can appear are self-explanatory and depend on the type of trap received.

Table 5. Trap Messages

Field	Contents
Enterprise Specific Trap	One of the following messages appears: <ul style="list-style-type: none">• Configuration Change in System• Configuration Change in Module x• Configuration Change in Port x.y• Hello• Authenticity Failure from Manager X

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Appendix A. Specifications

This appendix lists specifications for the IBM 8285 Nways ATM Workgroup Switch:

- Environmental
- Mechanical
- Power Source
- Regulatory Compliance

Environmental

Operating Temperature:	10° to 40°C (50° to 122°F)
Storage Temperature:	1° to 60°C (33.8° to 140°F)
Operating Humidity:	8 to 95% non-condensing
Air Exhaust:	Base Unit: 1.4 m ³ /min
Acoustic:	Base Unit: 5.8Bel / with Expansion Unit: 6Bel

Mechanical

8285-00B (Base Unit)

Dimensions: 17.3 in. W x 20 in. D x 5.25 in. H
(44 cm W x 50.8 cm D x 13.3 cm H)

Weight: 12.8 kg (28.2 lbs)

FC-5502 (Expansion Unit Feature)

Dimensions: 17.3 in. W x 20 in. D x 5.25 in. H
(44 cm W x 50.8 cm D x 13.3 cm H)

Weight: 19.4 kg (36.8 lbs) - fully loaded

Power Source

The power supply in the Base Unit has the following specifications:

Power Source:	3.6 A at 100 V 1.9 A at 240 V
Surge Current:	40 A
Leakage Current:	2.7 mA
Caloric Value:	44 Kcal/hr (174.59 BTU)

Power Budget

Base Unit:

Total budget for I/O card feature :

+5V	15A
+12V	1A
-5V	0
-12V	0

Expansion Unit Feature:

Total budget for ATM media modules:

+5V	24A
+12V	1.3A
-5V	0
-12V	0

Regulatory Compliance

Safety

International	IEC 950 (2nd Edition) plus <ul style="list-style-type: none">• Amendment A1• Amendment A2• National deviations
EEC	EN 60950 (1992) <ul style="list-style-type: none">• Amendment A1• Amendment A2
USA	UL 1950 (1993)
Canada	CSA C22.2 No. 950-93

Emission

International	CISPR22 <ul style="list-style-type: none">• Class B with Shielded cables• Class A with Unshielded cables
EEC	EN 55022 (1994) <ul style="list-style-type: none">• Class B with Shielded cables• Class A with Unshielded cables
EEC	EN 60555-2/3
EEC	EN 50082-1
USA	FCC Part 15 <ul style="list-style-type: none">• Class B with Shielded cables• Class A with Unshielded cables
USA	FCC Part 68
Canada	ICES-003
Japan	VCCI Class 1 <ul style="list-style-type: none">• Class 2 with Shielded cables• Class 1 with Unshielded cables

Appendix B. Cables, Pins and Connectors

This appendix provides information on the cables and connectors that are used to attach devices to the IBM 8285 Nways ATM Workgroup Switch. This chapter concerns connections to:

- The 25.6Mbps ATM ports on the Base Unit
- The optional 155Mbps I/O port
- The Expansion and Base connectors
- The Console connector on the Base Unit

It also provides guidelines for connecting a modem to the Console connector.

Connecting to 25.6Mbps Ports

This section describes:

- Twisted pair cables for 25.6Mbps devices
- RJ-45 connectors
- The RJ-45 wrap plug used to test a 25.6Mbps ATM port

Twisted-Pair Cable

Figure 39 below shows the pin-outs for the straight-through cable required for connecting ATM Forum compliant devices via UNI interface to the 25.6Mbps ports on the Base Unit.

Note: Pins 3, 4, 5, and 6 are *not used*.

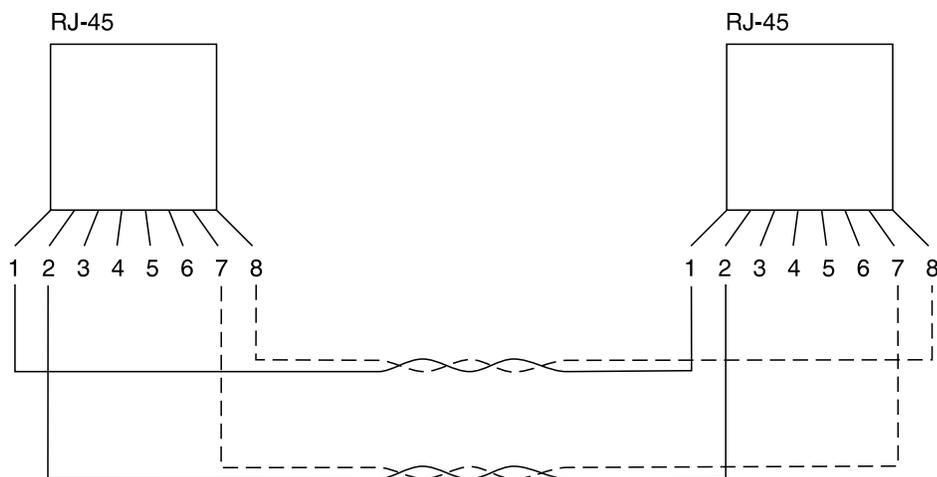


Figure 39. Straight-Through UTP Cable. Note that one cable connects pins 1 and 2 and the other cable connects pins 7 and 8. You will cause an error if you cable any other active pins together, such as 1 and 7, 1 and 8, 7 and 2, or 8 and 2.

Non-ATM Forum Compliant UNI Devices: The ATM Forum has recently defined the wiring of 25.6Mbps twisted-pair cables. Some devices, such as early models of the Turboways 25 ATM adapter, do not comply with this new specification.

To connect non-ATM Forum compliant devices to the Base Unit, you must use a twisted-pair cable that connect the pins as listed below:

Table 6. Pin Assignments for Cabling Non-ATM Forum Compliant Devices

Base Unit 25.6Mbps Port		Non-Compliant 25.6Mbps Device	
1	RD+	3	TD+
2	RD-	6	TD-
7	TD+	4	RD+
8	TD-	5	RD-

IBM also makes a converter/interposer for such non-ATM Forum compliant devices (P/N 10H3904) which may be ordered separately.

SSI and NNI Connections: To create SSI or NNI connections via twisted-pair cable, you must use a twisted-pair cable that connect the pins as listed below:

Table 7. Pin Assignments for Cabling SSI and NNI Connections

Base Unit 25.6Mbps Port		Remote 25.6Mbps Device	
1	RD+	7	TD+
2	RD-	8	TD-
7	TD+	1	RD+
8	TD-	2	RD-

IBM makes a cable with this pin arrangement (P/N 51H3971) which may be ordered separately.

RJ-45 Connectors

The RJ-45 connector is the 8-pin male connector that joins UTP Category 3, 4, or 5 cable or STP category 1, 1A, 9, or 9A cable to a 25.6Mbps port on the Base Unit. Table 8 lists the signal name associated with each pin on this connector, and Figure 40 shows how the pins are numbered.

Table 8. Pin-Signal Assignments for 25.6Mbps Port Connectors

Pin Number	Signal Name
1	RD+
2	RD-
3-4-5-6	—
7	TD+
8	TD-

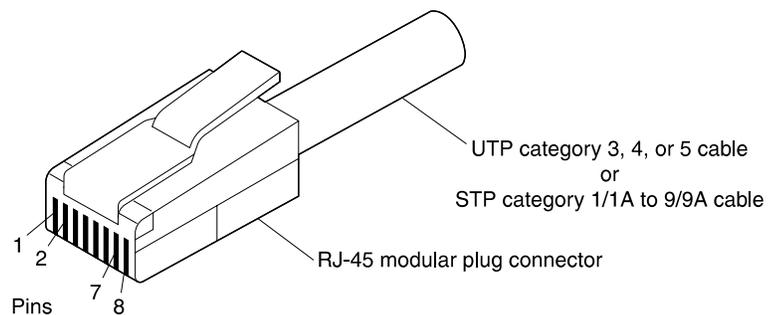


Figure 40. RJ-45 Connector

RJ-45 Wrap Plug

The wrap plug for 25.6Mbps ports on the Base Unit (P/N 42H0540) is included in the Base Unit shipping group.

Connecting to the 155Mbps I/O Port

This section describes:

- The SC connector
- The SC wrap plug and attenuator

SC Connector

The SC connector is the duplex, optical fiber connector on the 155Mbps ATM I/O Card that attaches to a multimode or single mode optical fiber cable.

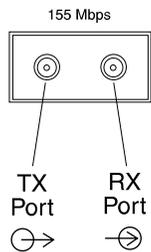


Figure 41. SC Connector

SC Wrap Plug and Attenuator

The wrap plug (P/N 81G3185, FC 8032, or the AMP SC wrap plug P/N 19G5609) for the SC connector on the 155Mbps ATM I/O Card and the required attenuator (P/N 80G3425) can be ordered separately.

Connecting the Expansion Unit to the Base Unit

This section describes:

- The Expansion Interface cable
- The Expansion and Base connectors
- The Expansion Connector wrap plug

Expansion Interface Cable

The cable that attaches the optional Expansion Unit to the Base Unit is a 34-pair shielded male-to-male cable with 68-pin connectors.

Expansion and Base Connectors

The Expansion Interface cable connects the Base connector on the Expansion Unit to the Expansion connector on the Base Unit. Each connector is a 68-pin female connector with the following pin assignments:

Table 9. Pin-Signal Assignments for the Expansion and Base Connectors

Pin Number	Signal Name
1–8	DATAOUT7–DATAOUT0
9	DDELOUT
10	BPOUT
11	SPAREOUT
12–19	DATAIN7–DATAIN0
20	DDELIN
21	PKT-SYNC
22	SPAREIN
23	+CLOCKIN
24	–CLOCK WRAP
25	PKT-SYNC WRAP
26	PRIZMA TX
27	PRIZMA RX
28	EXPANSION VPD
29	VPD CLOCK
30	BLADE 1 VPD
31	–BLADE 2 PRESENT
32	BLADE 2 VPD
33	+BLADE 3 RESET
34	–BLADE 3 PRESENT
57	–CLOCKIN
58	+CLOCK WRAP
59	BPOUT WRAP
60	EXPANSION PRESENT
61	EXPANSION PWR ON
62	–BOX RESET
63	8kHz
64	+BLADE 1 RESET
65	–BLADE 1 PRESENT
66	+BLADE 2 RESET
67	BLADE 3 VPD
68	–WRAP PLUG SW PRESENT

Expansion Connector Wrap Plug

The wrap plug for testing the Expansion connector (P/N 58G9869) is included with the Expansion Unit shipping group. The pin assignments for the wrap plug are shown in Figure 42 on page 194.

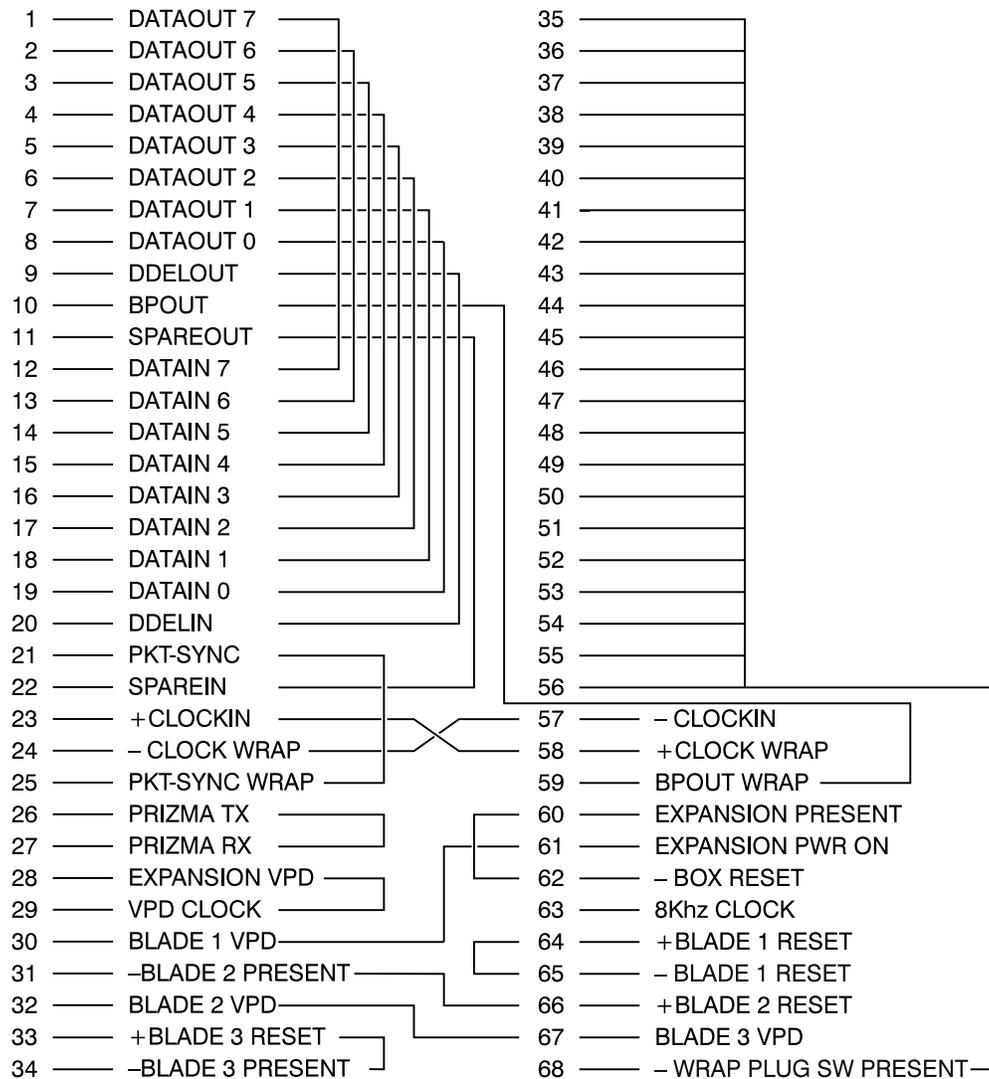


Figure 42. Pin Assignment: Expansion Connector Wrap Plug

Connecting Devices to the Console Connector

The Console Connector may be used to attach the configuration console, a modem or a server to the workgroup switch. This section describes:

- The RS-232 Connector
- The RS-232 Null-Modem Interposer
- The RS-232 Wrap Plug

For specific information on connecting the configuration console to the Console connector, see “Attaching the Configuration Console to the Workgroup Switch” on page 196.

For specific information on connecting a modem to the Console connector, see “Attaching a Modem to the Workgroup Switch” on page 196.

For information on connecting a server to the Console Connector, refer to the documentation supplied with the server.

RS-232 Connector

The RS-232 connector is the 25-pin female connector on the Base Unit that attaches to an EIA 232 cable. Table 10 lists the signal name associated with each pin on this connector, and Figure 43 shows how the pins are numbered.

Table 10. Pin-Signal Assignments for RS-232 Console Connector

Pin Number	Signal Name	Description
1	—	—
2	SOUT	Transmit data
3	SIN	Receive data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
7	GND	Signal ground
8	DCD	Data carrier detect
9 – 19	—	—
20	DTR	Data terminal ready
21 – 25	—	—

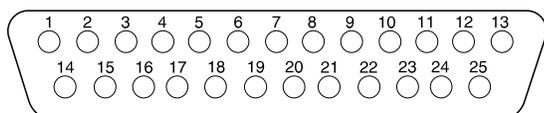


Figure 43. RS-232 Connector

Null-Modem Interposer

Figure 44 on page 196 shows the pin assignment of the interposer (null modem) used for a console attachment.

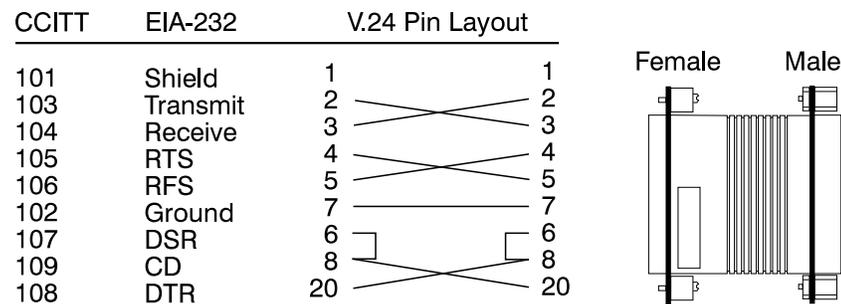


Figure 44. Pin Assignment: RS-232 Interposer

Attaching the Configuration Console to the Workgroup Switch

The following parts are used to connect the configuration console to the Console connector on the workgroup switch:

- Female-to-male modem cable (P/N 6323741)
- Female-to-male null-modem interposer (P/N 58F2861)
- Gender changer (P/N 58G4422)

All parts are included in the ATM Workgroup Switch shipping group.

When attaching the configuration console to the workgroup switch, follow these steps:

1. Attach the Null-Modem Interposer to either end of the RS-232 modem cable.
2. Plug one end of the RS-232 modem cable into the 25-pin Console port on the front panel of the Base Unit. For the exact position of the Console connector on the Base Unit, see Figure 2 on page 5.
3. Plug the other end of the cable into the appropriate connector on the console, using the Gender Changer, if necessary.

Make sure that the console is set up for asynchronous serial communication.

Attaching a Modem to the Workgroup Switch

Modems are connected to the Console connector on the workgroup switch with the female-to-male RS-232 cable (P/N 6323741). The RS-232 cable is included in the ATM Workgroup Switch shipping group.

When attaching the modem to the workgroup switch, follow these steps:

1. Plug one end of the RS-232 cable into the 25-pin Console port on the front panel of the Base Unit. For the exact position of the Console connector on the Base Unit, see Figure 2 on page 5.
2. Plug the other end of the cable into the appropriate connector on the modem.

Modem Requirements

The ATM Workgroup Switch supports the use of dial-in modems with the following requirements:

- **The modem must be 100% Hayes-compatible.**
- Any valid baud rate (300, 1200, 2400, 4800 9600, 19200) may be used. 2400 and 9600 are recommended.
- The modem must be set to Dumb/Auto Answer mode.

Modem Attachment

The RS-232 modem cable (Part Number 6323741) is a standard 25-pin female-to-male cable, three meters (10 feet) long.

After connecting a modem to the to the Console connector, configure the modem by following the procedure in "Modem Requirements."

Modem Configuration

To configure a modem, enter the following commands from the console to which the modem is attached:

1. Type `at&F` and press Enter (to restore the factory default settings).
2. Type `at&d0` and press Enter (to ignore changes in DTR status).
If you have enabled automatic modem hangup with the `SET TERMINAL HANGUP ENABLE` command and want to keep this setting, enter `at&d2` and press Enter. This sets the DTR parameter so that hangup remains enabled when DTR switches from ON to OFF.
3. Type `ats0=1` and press Enter (to auto-answer on the first ring).
4. Type `ats0?` and press Enter (to verify the auto-answer if 001 is returned).
5. Type `atq1` and press Enter (to ignore the result codes).
6. Type `at&W` and press Enter (to save the configuration changes).
7. Type `at&Y` and press Enter (to define the configuration as the new default).
8. Set the modem to Dumb mode (with command recognition disabled) by following the instructions in the modem's user guide.

An example of an IBM 7855-10 modem configuration is shown in Figure 45 on page 198.

```

DTE Interface
Data Type      Idle/Data ASYNC Async Format.8N1 XmitClock 7855
Async DTE Speed DTS Speed..TELCO Connect Char..YES
Async Data Path Direct Path...NO
Escape Sequence Asynchronous <ESC>...YES <ESC>...043 <ESC>(/50)...050
Signals 7855 to DTE
                RFS(106)      RFS On...ALWAYS
                RLS(109)      RLS On...ALWAYS
                DSR(107)PSN    DSR On...ALWAYS
DTR(108)Drop    Polling...NO DTR Off...V24 DTR Delay...000
Break Signals   From DTE...QUICK From Telco.QUICK
Commands,Results
Async Characters <CR>.....013 <LF>...010 <BS>...008
Async.Cmd Echo  Cmd Echo.....ON
Async Speed Msg Rate used..TELCO
Messages        Messages.....OFF
ECL Message     Messages.....OFF
DataFlow Control
  To stop DTE    7855 using...RFS
  To stop 7855   DTE using...NONE
Char Pass-thru  Flow Pass.....NO

Telco Interface
PSN Telco Speed PSN bps..9600 TC
LL Telco Speed  LL bps...9600 TC
Type of Network Network.....PSN
DataFlow Control Telco Flow...NO
Adaptation
PSN
  Dialing        Dial Mode...TONE
  Dial Delays    First Delay..007 Other Delay..001
  Calling Tone    Call Tone...V25
  Call Process    Detect.....ALL
  Calling Timer   Call Abort...060
  Answering       Auto Answer..YES Rings.....002
  Attachment      PSN Level..FIXED Guard Tone..1800
Disconnect
  From TELCO line Disconnect RLSD CD loss(/10).015
  To TELCO line  Call End..REMOTE
  Inactivity     On Hook.....YES No Data(min).03
General
  Receiver        Echo Adapt...NO Receiver Setup.0
  Transmitter     Preemphasis...2
  Modem to Modem Handshake...BELL Fast Train...NO
LL
  Receiver        LL RLS dBm..-43
  Transmitter     LL Signal...DTR - - - - -
Automatic Change
Retrain         Retrain...SHORT Trigger (dBm)..6
Speed Change
  Allow 7200 bps 7200 bps.....NO
  Fall Back      FallBack.....NO
  Fall Forward    Fall Forward..NO
Change Timing For FF and SNBU Check Line...YES Check(x5min).024
LL Change to PSN SNBU.....NO
User Interface  ECL Control
Starting        ECL Start.ACCEPT Accepted.CONNECT
Operating       Compression...YES Block Size..64 Protocol..NORMAL

```

Figure 45. Example: IBM 7855-10 Modem Configuration

Fiber Cabling Guidelines

Some general guidelines to follow when planning and setting up an ATM network **using fiber as the backbone medium** are as follows:

- When you use multimode fiber, it is recommended that you use 62.5 micron fiber that conforms with IEEE 10BASE-F standards.
- When you use singlemode fiber, it is recommended that you use 9 micron fiber that conforms with IEEE 10BASE-F standards.
- Carefully note all sources of optical power loss, such as connectors, splices, patch panels, and type of cable used.
- Calculate the total power loss in each ATM fiber link and verify that the distance between the two workgroup switch ports or between the workgroup switch port and an ATM user device does not exceed the optical power budget.
- The power loss you calculate is valid for an ATM connection between two workgroup switch ports or an workgroup switch port and an ATM user device. **Each workgroup switch port regenerates the optical signal at full strength as it was originally transmitted from the source end system in the connection.** Therefore, the difference between the total power loss and the optical power budget should be re-calculated at each workgroup switch port in the end-to-end connection.

Optical Power Budget

When validating cabling distances in workgroup switch 155Mbps links, network planners and installers should calculate for maximum optical power losses in each end-to-end connection. Table 11 and Table 12 on page 201 do this for you by taking the minimum amount of power that can be transmitted and the maximum amount of power that can be received for different types of fiber cable.

The optical power budget for the workgroup switch port-to-port or port-to-device connection is shown in the column on the far right-hand side of each table. By not exceeding this value, you can ensure the integrity of the ATM connections you create.

The Optical Power Budget value shows the amount of optical power left to compensate for power losses from connectors, splices, patch panels, and so on (see the following sections) in each workgroup switch link of an ATM connection. **In order for an workgroup switch 155Mbps link to transmit ATM data effectively, the optical power budget must be greater than the total power loss.**

When taking the optical power budget for an ATM link between an workgroup switch port and an end user device, be sure to use the values specified in the *ATM User-Network Interface (UNI) Specification V3.1*, ATM Forum. These values are shown in Table 11 on page 201.

Table 11. Optical Power Budget for workgroup switch 155Mbps Port-to-Device Connections (ATM Forum V3.1)

Fiber Cable: Type and Size	Minimum Transmitted Power	Maximum Received Power	Optical Power Budget	Maximum Link Distance
Multimode 50/125 micron NA 0.20	-21 dB	-30 dB	9 dB	2 km (1.24 miles)
Multimode 62.5/125 micron NA 0.275	-20 dB	-29 dB	9 dB	2 km (1.24 miles)
Singlemode 9/125 micron	—	—	—	20 km (12.4 miles)

Table 12. Optical Power Budget for workgroup switch 155Mbps Port-to-Port Connections

Fiber Cable: Type and Size	Minimum Transmitted Power	Maximum Received Power	Optical Power Budget	Maximum Link Distance
Multimode 50/125 micron NA 0.20	-22.5 dB	-30 dB	7.5 dB	2 km (1.24 miles)
Multimode 62.5/125 micron NA 0.275	-19 dB	-30 dB	11 dB	2.2 km (1.36 miles)
Singlemode 9/125 micron	-15 dB	-32.5 dB	17.5 dB	20 km (12.4 miles)

Optical Power Loss Through Connectors

When calculating optical power loss in ATM connections, you must take into account the number and types of connectors used. In your calculation, use the average power loss for connectors with physical and non-physical contacts as shown in Table 13.

It is recommended that high-quality, low-loss connectors be used in your ATM connections.

Table 13. Optical Power Loss per Connector

Connector Type	Cable Size (microns)	Average Loss (dB)
Physical contact	62.5 to 62.5	0.4
	50 to 50	0.4
	100 to 100	0.4
	62.5 to 50	4.8
	50 to 62.5	0.0
	62.5 to 100	0.0
	100 to 62.5	4.72
	9 to 9	0.35
Non-physical contact	62.5 to 62.5	0.7
	50 to 50	0.7
	100 to 100	0.7
	62.5 to 50	5.0
	50 to 62.5	0.3
	62.5 to 100	0.3
	100 to 62.5	4.9

Optical Power Loss Through Splicing

If a fiber cable breaks, it is usually repaired by splicing the broken ends together. Two types of splice are normally used: mechanical and fusion. A fusion splice results in lower power loss, but requires expensive equipment. A mechanical splice is simple to perform on site when fusion splicing is not available.

If you repair a broken cable using either type of splice, make sure that the power loss in the cable does not exceed the value for "Maximum Power that can be Received" in Table 11 and Table 12 on page 201. Table 14 shows the average power loss for each splice type according to cable size.

When calculating the total power loss for ATM connections in your network, you should use the Maximum Loss values whenever possible as a "worst case" scenario. If a Maximum Loss value is not given for a certain splice type and cable size, use the Average Loss value.

Table 14. Optical Power Loss per Splice

Splice Type	Cable Size (microns)	Maximum Loss (dB)	Average Loss (dB)
Mechanical	62.5 to 62.5	—	0.15
	50 to 50	—	0.15
	100 to 100	—	0.15
	9 to 9	—	0.15
Fusion	62.5 to 62.5	1.0	0.4
	50 to 50	1.0	0.4
	100 to 100	1.0	0.4
	9 to 9	1.0	0.4

Optical Power Loss by Fiber Cable Type

Although fiber optic cable can carry light signals over long distances, optical power loss can reduce this capability. Table 15 shows the ranges and typical amounts of power loss for different types of fiber cables. To determine the power loss in your fiber cable, refer to the loss characteristic established by the cable manufacturer.

When calculating the total power loss for an ATM connection, be sure to use the highest value in the range given in the Power Loss column. In this way, your calculation covers a "worst case" scenario.

Table 15. Optical Power Loss by Cable Type

Type of Fiber Cable	Power Loss (dB/km)	Typical Loss (dB/km)
50/125 micron @ 1300 nM	0.5 to 2.5	1.5
62.5/125 micron @ 1300 nM	0.5 to 2	1.5
85/125 micron @ 1300 nM	3 to 6	4.0
100/140 micron @ 1300 nM	3 to 6	5.0
9/125 micron @ 1300 nM	—	0.5

Optical Power Loss Through Patch Panels

In fiber optic networks, patch panels are often used to allow for network expansion and topological changes. In an ATM network, a patch panel consists of a pair of female-to-female bulkhead barrel connectors which connect to the male fiber connectors from workgroup switch 155Mbps ports.

The optical power loss through a patch panel includes the loss resulting from the two connectors and the bulkhead. Table 16 shows the ranges and typical amounts of power loss for different types of patch panels.

When calculating the total power loss for an ATM connection, be sure to use the highest value in the range given in the Power Loss column. In this way, your calculation covers a "worst case" scenario.

Table 16. Optical Power Loss per Patch Panel

Type of Patch Panel	Power Loss	Typical Loss
SC to MIC	0.1 to 1.0 dB	0.6 dB
ST to SC	0.1 to 1.0 dB	0.6 dB
SC to SC	0.1 to 1.0 dB	0.6 dB

Optical Power Loss Through Jumper Cables

When ATM Workgroup Switches are installed in patch panel racks, jumper cables are often used to connect a workgroup switch port to the patch panel. The use of jumper cables in this type of configuration is recommended in your ATM network because **each workgroup switch port regenerates the optical signal at full strength as it was originally transmitted from the source end system in the connection.**

The total power loss at each jumper cable is shown in Table 17. Note that this value includes the combined power loss from the two connectors (workgroup switch and patch panel) and the length of the jumper cable itself.

Table 17. Optical Power Loss per Jumper Cable

Cable Type	Total Loss	By Component
Singlemode	0.75 dB	0.7 (0.35 × 2 connectors) + 0.05 (cable loss for 100 meters)
Multimode	1.5 dB	1.4 (0.7 × 2 connectors) + 0.1 (cable loss for 100 meters)

Appendix C. Error and Information Codes

This appendix contains explanations of:

- The error and information codes displayed for the Q.2931 protocol
- The codes issued from Maintenance Mode
- The IBM LAN Emulation Server error codes.

Q.2931 Error Codes for Clear Causes

Table 18 lists the error codes from the Q.2931 protocol for clear causes generated by the ATM Workgroup Switch. For a detailed explanation of each cause, see the *ATM User-Network Interface Specification - Version 3.0 and Version 3.1*.

The decimal and hexadecimal values of the codes are both given below. The terminal dialog issues the codes in hexadecimal format.

Table 18 (Page 1 of 2). Q.2931 Error Codes for Clear Causes in the ATM Workgroup Switch

Error Code Decimal	Error Code Hex	Meaning of Clear Cause
1*	0x1*	ATM address not defined/assigned.
2	0x2	There is no route to the transit network.
3*	0x3*	There is no route to the destination.
10*	0x0A*	VPI/VCI is unacceptable.
16	0x10	Normal clearing (UNI 3.1)
17	0x11	User is busy.
18*	0x12*	No user is responding.
21	0x15	Call has been rejected.
22	0x16	ATM address has changed.
27*	0x1B*	Destination is out of order.
28	0x1C	Invalid ATM address format (address incomplete).
30*	0x1E*	Response to STATUS ENQUIRY.
31*	0x1F*	Normal, unspecified (UNI 3.0)
35*	0x23*	Requested VPI/VCI is unavailable.
36	0x24	VPI/VCI assignment failed (on user side) (UNI 3.1).
37	0x25	User cell rate not available (UNI 3.1).
38*	0x26*	Network is out of order.
41*	0x29*	Temporary failure.
43	0x2B	Access information has been discarded.

Table 18 (Page 2 of 2). Q.2931 Error Codes for Clear Causes in the ATM Workgroup Switch

Error Code Decimal	Error Code Hex	Meaning of Clear Cause
45*	0x2D*	No VPI/VCI is available.
47*	0x2F*	Resource is unavailable, unspecified.
49*	0x31*	Quality of Service is unavailable.
51*	0x33*	User cell rate is not available (UNI 3.0).
57	0x39	Bearer capability is not authorized.
58	0x3A	Bearer capability is not available.
63*	0x3F*	Service or option is not available, unspecified.
65	0x41	Bearer capability is not implemented.
73*	0x49*	Unsupported combination of traffic parameters.
81*	0x51*	Invalid call reference value.
82	0x52	Identified channel does not exist.
88	0x58	Incompatible destination.
89*	0x59*	Invalid endpoint reference.
91	0x5B	Invalid transit network selection.
92*	0x5C*	Too many pending add-party requirements.
93*	0x5D*	AAL parameters cannot be supported.
96*	0x60*	Mandatory information element is missing.
97*	0x61*	Message type is non-existent or not implemented.
99*	0x63*	Information element is non-existent or not implemented.
100*	0x64*	Invalid information element contents.
101*	0x65*	Message is not compatible with call state.
102*	0x66*	Expiry of recovery on timer.
104*	0x68*	Incorrect message length.
111*	0x6F*	Protocol error, unspecified.

Note: Q.2931 codes generated by the ATM Workgroup Switch are shown with an asterisk (*).

Maintenance Codes

The following table explains the prompts that can be displayed in Maintenance Mode.

Table 19. Maintenance Codes and Meanings

Code	Meaning
>>0020>>	The NVRAM diagnostics failed, the battery may be low.
>>0021>>	Bad checksum, the loading or de-compression of the operational code failed.
>>0023>>	After 3 retries, the switch FPGAs did not initialize properly.
>>0030>>	The initialization or the diagnostics failed for the switch, the SPU (Switch Processing Unit), or the serial link.
>>0031>>	The ATM wrap test from the Control-point board to the switch board failed.
>>0032>> >>0033>> >>0034>>	The initialization of the operational code was halted due to insufficient memory.
>>00BA>>	Maintenance mode is running with the backup daemon.

IBM LAN Emulation Server Error Codes

Table 20. IBM LAN Emulation Server Error Codes

Error Code	Meaning
1	Network cause
2	Internal cause
3	Memory exhausted
4	Network is down

Appendix D. ATM Address Formats in the ATM Workgroup Switch

The IBM 8285 Nways ATM Workgroup Switch ATM subsystem supports the addressing scheme defined by the ATM Forum for addressing endpoints in private ATM networks. The scheme is modeled after the format of the OSI Network Service Access Point (NSAP) as specified in ISO-8348 (CCITT X.213).

As shown in Figure 46, the ATM Workgroup Switch supports the three initial domain identifier (IDI) formats specified by the ATM Forum:

- DCC (Data Country Code)
- E.164 (Specific Integrated Service Digital Network Number).
- ICD (International Code Designator)

Each of the three ATM address formats is 20 bytes long and consists of two main parts:

- Network Prefix (13 bytes)
- End System Part (7 bytes).

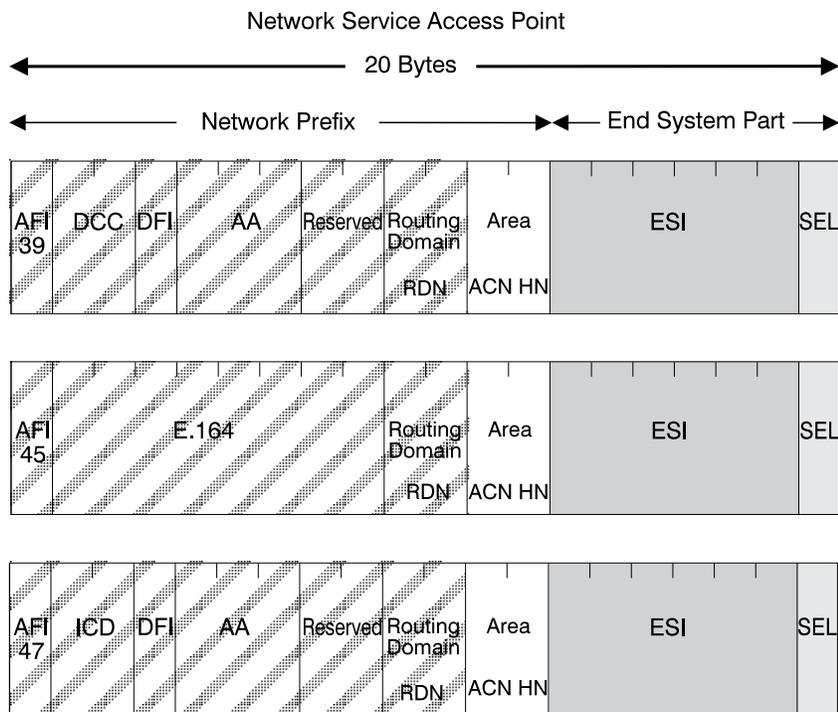


Figure 46. NSAP Address Formats Supported in the Workgroup Switch ATM Subsystem

Network Prefix

The fields that make up the Network Prefix part of an ATM address include:

- AFI** The one-byte AFI identifies the authority allocating the portion of the address that follows. It defines the structure of the NSAP format. The AFI values accepted by the workgroup switch ATM subsystem are as follows:
- 39 (ATM format of the Domain-Specific Part)
 - 45 (ATM format of the E.164 Initial Domain Identifier)
 - 47 (ATM format of the International Code Designator).
- DCC** Data Country Code (2 bytes)
- Specifies the country in which the address is registered. The codes are given in ISO-3166. This value is handled as a bit mask and is not checked by the ATM subsystem.
- DFI** Domain-specific Format Identifier (1 byte)
- Specifies the structure, semantics, and administrative requirements for the remainder of the address.
- This value is handled as a bit mask and is not checked by the ATM subsystem.
- AA** Administrative Authority (3 bytes)
- Identifies the organizational entity that allocates addresses for the remainder of the domain-specific part.
- This value is handled as a bit mask and is not checked by the ATM subsystem.
- E.164** E.164 IDI (8 bytes)
- Specifies the international addressing format used by B-ISDN public transport providers and is up to 15 digits long (BCD syntax). This field is padded with leading '0000' semi-bytes to reach the maximum length. A closing semi-byte '1111' is used to obtain an integral number of bytes.
- This code is handled as a bit mask and is not checked by the ATM subsystem.
- ICD** International Code Designator (2 bytes)
- Identifies an international organization. Values and codes (BCD syntax) are assigned by the ISO-6523 registration authority.
- This code is handled as a bit mask and is not checked by the ATM subsystem.

Reserved 2 bytes set to binary zero.

RDN Routing Domain Number (2 bytes)

Specifies a domain that is unique within one of the following:

- E.164
- DCC/DFI/AA
- ICD/DFI/AA

and that allows for the same addressing scheme and administrative authority to be used.

Area Area (2 bytes)

Specifies an area unique within a routing domain for the purpose of hierarchical routing and efficient use of resources based on topological significance.

In an workgroup switch ATM subsystem, this value consists of two 1-byte subfields:

ACN The ATM Cluster Number

HN The Hub Number

End System Part

The fields that make up the End System part of an ATM address are:

ESI End System Identifier (6 bytes)

Identifies an end system unique within an area or within any larger addressing structure such as the IEEE MAC address space. Not used for routing within the ATM network.

SEL SElector (1 byte)

Has local significance only within the end system.

Glossary

This glossary defines terms and abbreviations used in this manual. It includes terms and definitions from the *IBM Dictionary of Computing* (New York; McGraw-Hill, Inc., 1994).

- (A) Identifies definitions from the *American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies can be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018.
- (E) Identifies definitions from the *ANSI/EIA Standard - 440A: Fiber Optic Terminology*, copyright 1989 by the Electronics Industries Association (EIA). Copies can be purchased from the Electronic Industries Association, 2001 Pennsylvania Avenue N.W., Washington, DC 20006.
- (I) Identifies definitions from the *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1).
- (T) Identifies definitions from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1.

The following cross-references are used in this glossary:

Contrast with

This refers to a term that has an opposed or substantively different meaning.

See

This refers the reader to multiple-word terms in which this term appears.

See also

This refers the reader to terms that have a related, but not synonymous, meaning.

Synonym for

This indicates that the term has the same meaning as a preferred term, which is defined in the glossary.

If you do not find the term you are looking for, refer to the index or to the *IBM Dictionary of Computing*.

A

A. ampere.

AAL. ATM Adaptation Layer

ac. Alternating current.

active. (1) Able to communicate on the network. A token-ring network adapter is active if it is able to transmit and receive on the network. (2) Operational. (3) Pertaining to a node or device that is connected or is available for connection to another node or device. (4) Currently transmitting or receiving.

adapter. In a LAN, within a communicating device, a circuit card that, with its associated software and/or microcode, enables the device to communicate over the network.

address. (1) In data communication, the IEEE-assigned unique code or the unique locally administered code assigned to each device or workstation connected to a network. (2) To refer to a device or an item of data by its address (A).

address mask. For internet subnetting, a 32-bit mask used to identify the subnetwork address bits in the host portion of an IP address. Synonymous with *subnet mask* and *subnetwork mask*.

Address Resolution Protocol (ARP). A protocol for converting a higher level protocol address (for example, an IP address) into a physical network address (for example, an ATM address).

AFI. Authority and Format Identifier (1 byte) in an ATM address.

AIX. Advanced Interactive Executive.

alert. (1) For IBM LAN management products, a notification indicating a possible security violation, a persistent error condition, or an interruption or potential interruption in the flow of data around the network. In SNA, a record sent to a system problem management focal point to communicate the existence of an alert condition. In the NetView for AIX program, a high-priority event that warrants immediate attention. This database record is generated for certain event types that are defined by user-constructed filters.

American National Standard Code for Information Interchange (ASCII). The standard code, using a coded character set consisting of 7-bit coded characters (8 bits including parity check), used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of control characters and graphics characters. (A)

ARP. Address Resolution Protocol.

ASCII. American National Standard Code for Information Interchange.

Asynchronous Transfer Mode (ATM). A transfer mode in which the information is organized into cells. It is asynchronous in the sense that the recurrence of cells containing information from an individual user is not necessarily periodic.

ATM. Asynchronous Transfer Mode.

ATM campus network. A union of privately-owned ATM subnetworks interconnected by network node interfaces (NNIs). See also *network node interface (NNI)*.

ATM device. An end system that encapsulates data into ATM cells and forwards them to the ATM subsystem across an UNI interface.

ATM subnetwork. A set of ATM subsystems interconnected by ATM interfaces (UNI, SSI, NNI).

ATM subsystem. The ATM components in an ATM switch.

attach. To make a device a part of a network logically. Contrast with *connect*, which implies physically connecting a device to a network.

attenuation. Level of optical power loss expressed in units of dB.

Authority and Format Identifier. One byte in an ATM address.

B

bandwidth. (1) The difference, expressed in hertz, between the highest and the lowest frequencies of a range of frequencies. For example, analog transmission by recognizable voice telephone requires a bandwidth of about 3000 hertz (3 kHz). (2) The bandwidth of an optical link designates the information-carrying capacity

of the link and is related to the maximum bit rate that a fiber link can support.

baud. The rate at which signal conditions are transmitted per second. Contrast with *bits per second (bps)*.

BER. Bit error rate.

bit error rate (BER). The ratio of the number of bits experiencing error on a telecommunications link divided by the number of bits sent over the link.

bits per second (bps). The rate at which bits are transmitted per second. Contrast with *baud*.

bridge. (1) An attaching device that connects two LAN segments to allow the transfer of information from one LAN segment to the other. A bridge may attach the LAN segments directly by network adapters and software in a single device, or may connect network adapters in two separate devices through software and use of a telecommunications link between the two adapters. (2) A functional unit that connects two LANs that use the same logical link control (LLC) procedures but may use the same or different medium access control (MAC) procedures. (T) Contrast with *gateway* and *router*.

broadband. A frequency band divisible into several narrower bands so that different kinds of transmissions such as voice, video, and data transmission can occur at the same time. Synonymous with *wideband*.

broadcast. Simultaneous transmission of data to more than one destination.

buffer. (1) A portion of storage used to hold input or output data temporarily. (2) A routine or storage used to compensate for differences in data rate or time of occurrence of events, when transferring data from one device to another. (A)

bus. (1) In a processor, a physical facility on which data is transferred to all destinations, but from which only addressed destinations may read in accordance with appropriate conventions. (1) (2) A network configuration in which nodes are interconnected through a bidirectional transmission medium. (3) One or more conductors used for transmitting signals or power. (A)

BUS. Broadcast and Unknown Server.

byte. (1) A string that consists of a number of bits, treated as a unit, and representing a character. (T) (2) A binary character operated upon as a unit and usually

shorter than a computer word. (A) (3) A string that consists of a particular number of bits, usually 8, that is treated as a unit, and that represents a character. (4) A group of 8 adjacent binary digits that represent one extended binary-coded decimal interchange code (EBCDIC) character.

C

C. Celsius.

cable loss (optical). The loss in an optical cable equals the attenuation coefficient for the cabled fiber times the cable length.

CBR. Constant bit rate.

CCITT. Comité Consultatif International Télégraphique et Téléphonique. The International Telegraph and Telephone Consultative Committee.

Class A network. In Internet communications, a network in which the high-order (most significant) bit of the IP address is set to 0, and the host ID occupies the three low-order bytes.

Class B network. In Internet communications, a network in which the two high-order (most significant and next-to-most significant) bits of the IP address are set to 1 and 0, respectively, and the host ID occupies the two low-order bytes.

Class C network. In Internet communications, a network in which the two high-order (most significant and next-to-most significant) bits of the IP address are both set to 1, and the next high-order bit is set to 0. The host ID occupies the low-order byte.

CLP. Cell loss priority.

community. An administrative relationship between Simple Network Management Protocol (SNMP) entities.

community name. An opaque string of bytes identifying a community.

configuration. (1) The arrangement of a computer system or network as defined by the nature, number, and chief characteristics of its functional units. More specifically, the term may refer to a hardware configuration or a software configuration. (I) (A) (2) The devices and programs that make up a system, subsystem, or network.

connect. In a LAN, to physically join a cable from a station to an access unit or network connection point. Contrast with *attach*.

connection. (1) In data communication, an association established between functional units for conveying information. (I) (A) (2) In Open Systems Interconnection architecture, an association established by a given layer between two or more entities of the next higher layer for the purpose of data transfer. (T) (3) In SNA, the network path that links two logical units (LUs) in different nodes to enable them to establish communications. (4) In X.25 communication, a virtual circuit between two data terminal equipments (DTEs). A switched virtual circuit (SVC) connection lasts for the duration of a call; a permanent virtual circuit (PVC) is a permanent connection between the DTEs. (5) In TCP/IP, the path between two protocol applications that provides reliable data stream delivery service. In Internet, a connection extends from a TCP application on one system to a TCP application on another system. (6) The path between two protocol functions, usually located in different machines, that provides reliable data delivery service. (7) A logical association between a call participant (party) and a switch. A party's connection represents that party's participation in a telephone call.

CPE. Customer premises equipment.

customer-replaceable unit (CRU). An assembly or part that a customer can replace in its entirety when any of its components fail. Contrast with *field replaceable unit (FRU)*.

D

daemon. A program that runs unattended to perform a standard service. Some daemons are triggered automatically to perform their task; others operate periodically. Synonymous with *demon*.

data communication. (1) Transfer of information between functional units by means of data transmission according to a protocol. (T) (2) The transmission, reception, and validation of data. (A)

data transfer rate. The average number of bits, characters, or blocks per unit of time passing between equipment in a data-transmission system. (I) The rate is expressed in bits, characters, or blocks per second, minute, or hour.

data transmission. The conveying of data from one place for reception elsewhere by telecommunication means. (I)

dB. Decibel.

dBm. Decibels based on 1 milliwatt.

dc. Direct current.

decibel (dB). (1) One tenth of a bel. (2) A unit that expresses the ratio of two power levels on a logarithmic scale. (3) A unit for measuring relative power. The number of decibels is 10 times the logarithm (base 10) of the ratio of the measured power levels; if the measured levels are voltages (across the same or equal resistance), the number of decibels is 20 times the log of the ratio.

decibels based on 1 milliwatt (dBm). A unit of absolute power measurement that is scaled such that 0 dBm equals 1 milliwatt.

default. Pertaining to an attribute, condition, value, or option that is assumed when none is explicitly specified. (I)

destination. Any point or location, such as a node, station, or particular terminal, to which information is to be sent.

device. (1) A mechanical, electrical, or electronic contrivance with a specific purpose. (2) An input/output unit such as a terminal, display, or printer.

diagnostics. Modules or tests used by computer users and service personnel to diagnose hardware problems.

Disk Operating System (DOS). An operating system for computer systems that use disks and diskettes for auxiliary storage of programs and data.

DMM. Distributed Management Module.

DOS. Disk operating system.

dump. (1) To record, at a particular instant, the contents of all or part of one storage device in another storage device. Dumping is usually for the purpose of debugging. (T) (2) Data that has been dumped. (T) (3) To copy data in a readable format from main or auxiliary storage onto an external medium such as tape, diskette, or printer. (4) To copy the contents of all or part of virtual storage for the purpose of collecting error information.

E

EIA. Electronic Industries Association.

EEPROM. Electrically erasable programmable read-only memory.

electrically erasable programmable read-only memory (EEPROM). A PROM that can be erased by a special process and reused. (T)

Electronic Industries Association (EIA). An organization of electronics manufacturers that advances the technological growth of the industry, represents the views of its members, and develops industry standards.

equipment rack. Synonym for *rack*.

Ethernet. A local area network that allows multiple stations to access the transmission medium at will without prior coordination, avoids contention by using carrier sense and deference, and resolves contention by using collision detection and delayed retransmission.

F

F. Fahrenheit.

FCC. Federal Communications Commission (USA).

FDDI. Fiber Distributed Data Interface.

fiber. Synonym for *optical fiber*.

fiber budget. The optical power loss as a result of the number of connections in the optical fiber link subtracted from the working budget. The loss as a result of connections includes the connector loss and the splice loss. The fiber budget is expressed in decibels.

Fiber Distributed Data Interface (FDDI). A high-performance, general-purpose, multi-station network. It uses token-ring architecture with optical fiber as the transmission medium over distances of several kilometers.

fiber optic cable. Synonym for *optical cable*.

fiber optics. The technology whereby optical signals from light-generating transmitters are propagated through optical fiber waveguides to light-detecting receivers.

field. On a data medium or a storage medium, a specified area used for a particular category of data; for example, a group of character positions used to enter or display wage rates on a panel. (T)

field-replaceable unit (FRU). An assembly that is replaced in its entirety when any one of its components fails. In some cases a FRU can contain other FRUs; for example, a brush and a brush block that can be replaced individually or as a single unit. Contrast with *customer-replaceable unit (CRU)*.

file. A named set of records stored or processed as a unit. (T)

File Transfer Protocol (FTP). (1) In TCP/IP, an application protocol used for transferring files to and from host computers. FTP requires a user ID and possibly a password to allow access to files on a remote host system. FTP assumes that the Transmission Control Protocol is the underlying protocol. (2) In the Internet suite of protocols, an application layer protocol that uses TCP and Telnet services to transfer bulk-data files between machines or hosts. See also *TFTP*.

FRU. Field-replaceable unit.

FTP. (1) File Transfer Protocol. (2) Foiled twisted pair.

G

gateway. A device and its associated software that interconnect networks or systems of different architectures. The connection is usually made above the reference model network layer. For example, a gateway allows LANs access to System/370 host computers. Contrast with *bridge* and *router*.

GFC. Generic Flow Control.

H

hardware. Physical equipment as opposed to programs, procedures, rules, and associated documentation. (I) (A)

header. The portion of a message that contains control information for the message such as one or more destination fields, name of the originating station, input sequence number, character string indicating the type of message, and priority level for the message.

HEC. Header Error Control.

host computer. (1) The primary or controlling computer in a multi-computer installation or network. (2) In a network, a processing unit in which resides a network access method. Synonymous with *host processor*.

Hz. Hertz; frequency in cycles/second.

I

I/O. Input/output.

ILMI. Interim Local Management Interface.

InARP. Inverse Address Resolution Protocol.

input/output (I/O). (1) Pertaining to input, output, or both (A). (2) Pertaining to a device, process, or channel involved in data input, data output, or both.

interface. (1) A shared boundary between two functional units, defined by functional characteristics, signal characteristics, or other characteristics, as appropriate. The concept includes the specification of the connection of two devices having different functions. (T) (2) Hardware, software, or both, that links systems, programs, or devices.

International Organization for Standardization (ISO).

An organization of national standards bodies from various countries established to promote development of standards to facilitate international exchange of goods and services, and develop cooperation in intellectual, scientific, technological, and economic activity.

internet. A collection of networks interconnected by a set of routers that allow them to function as a single, large network. See also *Internet*

Internet. The internet administered by the Internet Architecture Board (IAB), consisting of large national backbone networks and many regional and campus networks all over the world. The Internet uses the Internet suite of protocols.

Internet address. See *IP address*.

Internet Protocol (IP). (1) A protocol that routes data through a network or interconnected networks. IP acts as an interface between the higher logical layers and the physical network. This protocol, however, does not provide error recovery, flow control, or guarantee the reliability of the physical network. IP is a connectionless

protocol. (2) A protocol used to route data from its source to its destination in an Internet environment.

interoperability. The capability to communicate, execute programs, or transfer data among various functional units in a way that requires the user to have little or no knowledge of the unique characteristics of those units. (T)

Inverse Address Resolution Protocol (InARP). A protocol for converting a physical network address (for example, an ATM address) into a higher level protocol address (for example, an IP address).

IP. Internet Protocol.

IP address. The 32-bit address defined by the Internet Protocol, standard 5, Request for Comment (RFC) 791. It is usually represented in dotted decimal notation.

ISO. International Organization for Standardization.

J

jumper cable. Synonym for *patch cable*.

K

Kbps. Kilobits per second.

kilobit (Kb). (1) For processor storage, real and virtual storage, and channel volume, 2^{10} or 1024 bits. (2) For disk storage capacity and communications volume, 1000 bits.

kilobyte (KB). (1) For processor storage, real and virtual storage, and channel volume, 2^{10} or 1024 bytes. (2) For disk storage capacity and communications volume, 1000 bytes.

L

LAN. Local area network.

LE. LAN emulation.

LEC. LAN emulation client.

LECS. LAN emulation configuration server.

LED. Light-emitting diode.

LES. LAN emulation server.

local. (1) Pertaining to a device accessed directly without use of a telecommunication line. (2) Contrast with *remote*.

local area network (LAN). (1) A computer network located on a user's premises within a limited geographical area. Communication within a local area network is not subject to external regulations; however, communication across the LAN boundary may be subject to some form of regulation. (T) (2) A network in which a set of devices are connected to one another for communication and that can be connected to a larger network. (3) See also *Ethernet* and *token ring*. (4) Contrast with *metropolitan area network (MAN)* and *wide area network (WAN)*.

M

m. meter

MAC. Medium access control.

MAN. Metropolitan area network.

Management Information Base (MIB). A tree-like data structure for the definition and use of information.

Mb. Megabit; 1 048 576 bits.

Mbps. One million bits per second.

MB. Megabyte; 1 048 576 bytes.

medium access control (MAC). In LANs, the sublayer of the data link control layer that supports medium-dependent functions and uses the services of the physical layer to provide services to the logical link control (LLC) sublayer. The MAC sublayer includes the method of determining when a device has access to the transmission medium.

megabyte. (1) For processor storage and real and virtual memory, 2^{20} or 1 048 576 bytes. (2) For disk storage capacity and transmission rates, 1 000 000 bytes.

MIB. Management Information Base.

mm. Millimeter, millimeters.

multimode optical fiber. (1) A graded-index or step-index optical fiber that allows more than one bound mode to propagate. (E) Contrast with *single mode optical fiber*. (2) In FDDI, an optical fiber waveguide

usually characterized by a core diameter of 50 to 100 μm that will allow a large number of modes to propagate.

N

network. (1) A configuration of data processing devices and software connected for information interchange. (2) An arrangement of nodes and connecting branches. Connections are made between data stations. (T)

network administrator. A person who manages the use and maintenance of a network.

network node interface (NNI). The interface between two network nodes.

NNI. Network node interface.

node. A generic term applying to an active element in an ATM network (station or concentrator).

NSAP. Network Service Access Point.

O

optical cable. A fiber, multiple fibers, or a fiber bundle in a structure built to meet optical, mechanical, and environmental specifications. (E)

optical fiber. A small-diameter strand made from glass and/or polymer that consists of a core surrounded by a lower-index-of-refraction cladding. It guides light from one end to another by a combination of a graded index in the core and internal reflectance.

optical fiber cable. Synonym for *optical cable*.

optical fiber connector. A hardware component that transfers optical power between two optical fibers or bundles and is designed to be repeatedly connected and disconnected.

OSPF. Open Shortest Path First

output device. A device in a data processing system by which data can be received from the system. (I) (A) Synonymous with *output unit*.

output unit. Synonym for *output device*.

P

Packet Internet Groper (PING). (1) In Internet communications, a program used in TCP/IP networks to test the ability to reach destinations by sending the destinations an Internet Control Message Protocol (ICMP) echo request and waiting for a reply. (2) In communications, a test of reachability.

parameter. (1) A variable that is given a constant value for a specified application and that may denote the application. (I) (A) (2) An item in a menu or for which the user specifies a value or for which the system provides a value when the menu is interpreted. (3) Data passed between programs or procedures.

parity. (1) A transmission error-checking scheme in which an extra bit is added to some unit of data, usually a byte, in order to make the total number of one bits even or odd. No-parity means that no parity bit is sent or expected. Mark and space mean that the parity position is always set to one or zero, respectively, and that received parity is not checked. (2) The state of being either even-numbered or odd-numbered.

parity (even). A condition when the sum of all of the digits in an array of binary digits is even.

parity (odd). A condition when the sum of all of the digits in an array of binary digits is odd.

patch cable. A length of cable with data connectors at both ends that is normally used to interconnect two sections of building cable at a patch panel or to connect a product to the building cable. Synonymous with *jumper cable*.

patch panel. An organized concentration of cable terminations, usually mounted in a flat panel, that facilitates the interconnection of communication cables.

path. (1) In a network, any route between any two nodes. (T) (2) The route traversed by the information exchanged between two attaching devices in a network.

PC. Personal computer

permanent virtual connection (PVC). (1) In X.25 and frame-relay communications, a virtual connection that has a logical channel permanently assigned to it at each data terminal equipment (DTE). Call-establishment protocols are not required. Contrast with *switched virtual connection (SVC)*. (2) The logical connection between two frame-relay terminating equipment stations, either

directly or through one or more frame-relay frame handlers. A PVC consists of one or more PVC segments.

PING. Packet Internet Groper.

port. (1) An access point for data entry or exit. (2) A connector on a device to which cables for other devices such as display stations and printers are attached. Synonymous with *socket*. (3) A PHY entity and a PMD entity in a node, together creating a PHY/PMD pair, that may connect to the fiber media and provide one end of a physical connection with another node.

POST. Power-on self-test.

power budget. Synonym for *fiber budget*.

power-on self-test (POST). A series of diagnostic tests that are run automatically by a device when the power is switched on.

protocol. (1) A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication. (I) (2) In SNA, the meanings of and the sequencing rules for requests and responses used for managing the network, transferring data, and synchronizing the states of network components. (3) A specification for the format and relative timing of information exchanged between communicating parties.

PS/2. Personal System/2.

PVC. Permanent virtual connection.

Q

QOS. Quality of service

quality of service (QOS). A set of communication characteristics required by an application. Each QOS defines a specific transmission priority, level of route reliability, and security level. Each QOS also defines whether the sessions are interactive.

R

rack. Synonym for *equipment rack*.

RAM. Random access memory.

random access memory (RAM). A computer's or adapter's volatile storage area into which data may be entered and retrieved in a nonsequential manner.

receiver (optical). An optoelectronic circuit that converts an optical signal to an electrical logic signal.

remote. (1) Pertaining to a system, program, or device that is accessed through a telecommunication line. (2) Contrast with *local*.

Request for Comments (RFC). In Internet communications, the document series that describes a part of the Internet suite of protocols and related experiments. All Internet standards are documented as RFCs.

RFC. Request for Comments.

router. An attaching device that connects two LAN segments, which use similar or different architectures, at the reference model network layer. Contrast with *bridge* and *gateway*.

routing. (1) The assignment of the path by which a message will reach its destination. (2) In SNA, the forwarding of a message unit along a particular path through a network, as determined by the parameters carried in the message unit, such as the destination network address in a transmission header.

RS-232. In data communications, a specification of the Electronic Industries Association (EIA) that defines the interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE), using serial binary data interchange.

RX. Receive.

S

server. (1) A device, program, or code module on a network dedicated to providing a specific service to a network. (2) On a LAN, a data station that provides facilities to other data stations. Examples are a file server, print server, and mail server.

session. (1) In network architecture, for the purpose of data communication between functional units, all the activities which take place during the establishment, maintenance, and release of the connection. (T) (2) The period of time during which a user of a terminal can communicate with an interactive system, usually, elapsed time between logon and logoff.

SFTP. Screened and foiled twisted pair.

signaling. Establishment of an ATM connection from a call set up by an end device.

Simple Network Management Protocol (SNMP). In the Internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application layer protocol. Information on devices managed is defined and stored in the application's Management Information Base (MIB).

single mode optical fiber. (1) An optical fiber in which only the lowest-order bound mode (which can consist of a pair of orthogonally polarized fields) can propagate at the wavelength of interest. (E) Contrast with *multimode optical fiber*.

SLIP. Serial Line Internet Protocol.

SNMP. Simple network management protocol.

SMIT. System Management Interface Tool used on RISC System/6000.

SSI. Switch-to-switch interface.

station. (1) A communication device attached to a network. The term most often used in LANs is an *attaching device* or *workstation*. (2) An input or output point of a system that uses telecommunication facilities. (3) An addressable node on an FDDI network capable of transmitting, repeating, and receiving information. A station has exactly one SMT, at least one MAC, at least one PHY, and at least one PMD.

STP. Shielded twisted pair.

subnet. (1) In TCP/IP, a part of a network that is identified by a portion of the IP address. (2) Synonym for *subnetwork*.

subnet address. In Internet communications, an extension of the basic IP addressing scheme where a portion of the host address is interpreted as the local network address.

subnet mask. Synonym for *address mask*.

subnetwork. (1) A group of nodes that have a set of common characteristics, such as the same network ID. (2) Synonymous with *subnet*.

SVC. Switched virtual connection.

switch-to-switch interface (SSI). The interface between &amm. subsystems in a cluster.

T

TCP/IP. Transmission Control Protocol/Internet Protocol

Telnet. In TCP/IP, an application protocol that allows a user at one site to access a remote system as if the user's display station were locally attached. Telnet uses the Transmission Control Protocol as the underlying protocol.

TFTP. Trivial File Transfer Protocol.

token ring. A network with a ring topology that passes tokens from one attaching device (node) to another. A node that is ready to send can capture a token and insert data for transmission.

topology. The physical or logical arrangement of nodes in a computer network. Examples include ring topology and bus topology.

trace. (1) A record of the execution of a computer program. It exhibits the sequences in which the instructions were executed. (A) (2) A record of the frames and bytes transmitted on a network.

transceiver. Any terminal that can transmit and receive data.

Transmission Control Protocol (TCP). A communications protocol used in the Internet. TCP provides a reliable host-to-host protocol between hosts in packet-switched communications networks and in interconnected systems of such networks. It uses the Internet Protocol (IP) as the underlying protocol.

Transmission Control Protocol/Internet Protocol (TCP/IP). A set of communications protocols that support peer-to-peer connectivity functions for both local and wide area networks.

transmission medium. (1) A physical carrier of electrical energy or electromagnetic radiation. (2) The physical medium that conveys data between data stations; for example, twisted-pair wire, optical fiber, coaxial cable. (T)

transmit. (1) The action of a station in generating a token, frame, or other symbol sequence and placing it on the outgoing medium. (2) The action of a station that consists of generating a frame, token, or control sequence, and placing it on the medium to the next station.

trap. Trajectory analysis program.

trunk. A physical topology, either open or closed, employing two optical fiber signal paths, one in each direction (that is, counter-rotating), forming a sequence of peer connections between FDDI nodes. When the trunk forms a closed loop it is sometimes called a trunk ring.

TRS. Topology Routing Service.

twisted pair. A transmission medium that consists of two insulated conductors twisted together to reduce noise. (T)

TX. Transmit.

U

UNI. User-network interface.

UNIX operating system. An operating system developed by Bell Laboratories that features multiprogramming in a multiuser environment. The UNIX operating system was originally developed for use on minicomputers, but has been adapted for mainframes and microcomputers.

Note: The AIX operating system is IBM's implementation of the UNIX operating system.

user-network interface (UNI). Physical and logical definition of the interface between an ATM user device and the ATM network.

UTP. Unshielded twisted pair.

V

V. Volt.

V ac. Volts alternating current.

variable. (1) In computer programming, a character or group of characters that refers to a value and, in the

execution of a computer program, corresponds to an address. (2) A quantity that can assume any of a given set of values. (A)

VBR. Variable bit rate.

VCC. Virtual channel connection.

VCI. Virtual channel identifier (in ATM cell header).

VPI. Virtual path identifier (in ATM cell header).

W

WAN. Wide area network.

wide area network (WAN). (1) A network that provides communication services to a geographic area larger than that served by a local area network or a metropolitan area network, and that may use or provide public communication facilities. (T) (2) A data communications network designed to serve an area of hundreds or thousands of miles; for example, public and private packet-switching networks and national telephone networks. (3) Contrast with *local area network (LAN)* and *metropolitan area network (MAN)*.

wiring closet. A room that contains one or more distribution panels and equipment racks that are used to interconnect cables. Sometimes called a *network wiring closet* to distinguish it from a telephone wiring closet.

workstation. (1) A functional unit at which a user works. A workstation often has some processing capability. (T) (2) One or more programmable or nonprogrammable devices that allow a user to do work. (3) A terminal or microcomputer, usually one that is connected to a mainframe or to a network, at which a user can perform applications.

Bibliography

Related in the IBM 8285 Nways ATM Workgroup Switch library include:

- *IBM 8250/8260/8285: Planning and Site Preparation Guide*, GA33-0285
- *IBM 8285 Nways ATM Workgroup Switch: Safety and Service Catalog*, SA33-0398
- *IBM 8285/8260: ATM Command Reference Guide*, SA33-0385

For supplementary information on the functions and technology in the ATM Workgroup Switch, please refer to the following documents:

- *IBM 8281 ATM LAN Bridge Hardware Installation and Service Manual*, SY27-0346-00

The hardware installation and service manual describes the physical installation of the standalone ATM LAN bridge, describes the meaning of the light-emitting diodes (LEDs), and explains how to remove and replace the field replaceable units (FRUs).

- *IBM 8281 ATM LAN Bridge Maintenance Information*, GX27-3987.

This is a reference card that includes an area for recording cabling information and a description of the meanings of the light emitting diodes (LEDs).

- *IBM Token-Ring Network Architecture Reference*, SC30-3374-02

Describes the architecture of the IBM Token-Ring Network, including descriptions of the Token-Ring frame formats.

- *IBM Token-Ring Network Introduction and Planning Guide*, GA27-3677-05

Describes how to plan for an IBM Token-Ring Network, including cabling for the network and organizing various devices on the network.

- ISO / IEC 8802-3: ANSI/IEEE Std 802.3 *Information processing Systems - Local Area Networks - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

Specifications for Ethernet LANs.

The following publications contain supplementary information about ATM:

- De Prycker, M., *Asynchronous Transfer Mode — Solution for Broadband ISDN*. New York: Ellis Horwood, 1991
- Handel, R., and Huber, M.N., *ATM Networks—Concepts, Protocols, Applications*. Wokingham, England: Addison-Wesley, 1991
- Onvural, R., *Asynchronous Transfer Mode Networks: Performance Issues*. Norwood, MA: Artech House, 1994

This two-volume set of books is a useful guide to understanding and using TCP/IP:

- Comer, Douglas E., *Internetworking With TCP/IP, Vol I: Principles, Protocols, and Architecture*. Second Edition, Englewood Cliffs, NJ: Prentice Hall, 1991
- Comer, Douglas E. and Stevens, David L., *Internetworking With TCP/IP, Vol II: Design, Implementation, and Internals*. Englewood Cliffs, NJ: Prentice Hall, 1991

The following specifications and standards are relevant for the ATM Workgroup Switch:

- *ATM User-Network Interface Specification Version 3.0*, dated Sept 10, 1993, also known as the *ATM UNI Spec V3.0*.

Copies of the specification are available from Prentice Hall and in bookstores. You can contact Prentice Hall at (515) 284-6751.

- EIA/TIA-568 *Commercial Building Telecommunications Wiring Standard* provides information about optical and twisted-pair cabling.

This publication is available for a fee from Global Engineering Documents at 1-(800) 854-7179.

The following Internet Request for Comments (RFCs) are relevant for the ATM Workgroup Switch:

- 1155** Structure and Identification of Management Information (SMI) for TCP/IP-based Internets
- 1156** Management Information Base (MIB) for Network Management of TCP/IP-based Internets (MIB-I)
- 1157** Simple Network Management Protocol (SNMP)
- 1212** Concise MIB Definitions
- 1213** Management Information Base for Network Management of TCP/IP-Based Internets (MIB-II)

- 1215 Convention for Defining Traps for Use with SNMP
- 1231 IEEE 802.5 Token Ring MIB
- 1493 Definitions of Managed Objects for Bridges
- 1525 Definitions of Managed Objects for Source Routing Bridges
- 1573 Evolution of the Interfaces Group of MIB-II
- 1643 Definition of Managed Objects for the Ethernet-Like Interface Type
- 1695 Definitions of Managed Objects for ATM Management Version 8.0

You can use any of the following methods to obtain the RFCs:

File Transfer Protocol (FTP): If you have Internet access with FTP capability, RFCs can be retrieved from the Internet Network Information Center (NIC).

1. Use FTP to connect to host nic.ddn.mil.
2. Issue the command **user anonymous** to identify yourself to the host.
3. When prompted for a password, type **guest**.
4. Type the command **cd rfc** to change to the RFC directory.

5. Type the command **get rfcnnnn.txt**, where *nnnn* is the number of the RFC number you are requesting.

Electronic Mail: SERVICE@NIC.DDN.MIL is an automated service provided by the NIC. It allows access to RFCs (and other documents) via ordinary e-mail. This is especially useful for users who do not have access to the NIC via a direct Internet link.

To use the mail service, send a mail message to SERVICE@NIC.DDN.MIL. Type **RFC nnnn** in the SUBJECT field, where *nnnn* is the RFC number, or type **INDEX**. The recipient of your message will normally respond only to the information in the SUBJECT field and will ignore anything that you type in the message field. The information you request will be sent to you as soon as possible. Large files will be broken into smaller, separate messages.

Paper Copies: Hardcopy RFCs are available for a fee from:

SRI International, Room EJ291
 333 Ravenswood Avenue
 Menlo Park CA 94025

415-859-3695
 415-859-6387
 Fax: 415-859-6028

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