IBM 8260/8285 ATM WAN Module

Installation and User's Guide

SA33-0396-00

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Note!

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First Edition (May 1996)

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Industry Standards Reflected in This Product

The 8260 Nways ATM WAN (A2-WAN) module complies with the the ATM User-Network Interface (UNI) Specification V3.0 and V3.1, ATM Forum.

The A2-WAN module 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

The A2-WAN module singlemode and multimode fiber daughter cards operate at a nominal wavelength of 1300nm, and the interface conforms to the ATM Forum.

For OC3 and STM-1 singlemode, 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
US regulations on lasers (CFR 21-J).

For more information, see the *IBM Telecommunication Products Safety Handbook*, GA33-0126.

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Korean Communications Statement

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Safety

This product complies with IBM* safety standards.

For OC3 and STM-1 singlemode, a combination of novel optical subassembly design and careful control of the characteristics of the laser chip creates a laser emission that complies with Class 1 specifications. As a result, the laser transmitter provided on A2-WAN module singlemode daughter cards is eye-safe.

For more information, see the *IBM Telecommunication Products Safety Handbook*, GA33-0126.

How to Use This Guide

This guide presents information on how to install and configure the IBM 8260 Nways* ATM WAN Module (A2-WAN module) in the IBM 8260 Nways Multiprotocol Switching Hub or IBM 8285 Nways ATM Workgroup Switch expansion unit. It describes how to:

- Plan and set up valid links in an 8260 or 8285 based ATM subnetwork using the A2-WAN module.
- Install daughter cards on the A2-WAN module
- Install the A2-WAN module in an 8260 hub or 8285 workgroup switch expansion unit
- Configure the module and its ports
- Diagnose and solve problems associated with the operation of the A2-WAN module.

Who Should Use This Guide

This guide is intended for the following people at your site:

- ATM network administrator
- ATM network operator
- Hardware installer.

Contents of This Guide

This guide contains six chapters and two appendixes:

Chapter 1, "Overview" on page 1 gives an overview of the main functions of the A2-WAN module, the daughter cards used with the module, and the ATM interfaces used by A2-WAN module ports to interconnect user devices in an ATM campus network.

Chapter 2, "Setting Up a Connection Using Fiber" on page 7 describes how to set up an ATM campus network by laying out valid A2-WAN port-to-port and port-to-device connections using fiber cable (for OC3/STM-1 daughter cards). It also describes how to maintain the ATM connections you create.

Chapter 3, "Cabling Information for DS3/E3 Daughter Cards" on page 23 describes the types of cables used with DS3/E3 daughter cards.

Chapter 4, "Installation" on page 25 describes how to install the A2-WAN module in an 8260 hub or 8285 workgroup switch expansion unit.

Chapter 5, "Configuration" on page 41 describes how to configure the A2-WAN module and its ports.

Chapter 6, "Troubleshooting" on page 61 describes how to diagnose and solve problems associated with the operation of the A2-WAN module.

Appendix A, "Technical Specifications" on page 81 describes the specifications for the A2-WAN module, including the optical specifications for A2-WAN SC transmitters and receivers.

Appendix B, “ATM Components” on page 87 lists the part numbers for the ATM components that you can order for use with the A2-WAN module.

Appendix C, “Default Configuration Settings” on page 89 describes the default configuration parameters and how to change them.

Appendix B, “ATM Components” on page 87 lists the part numbers for the ATM components that you can order for use with the A2-WAN module.

“Glossary” on page 101 describes the terms and abbreviations used in this manual.

“Index” on page 111 lists the concepts, terms, and tasks described in this manual and the page numbers on which you can find the information.

Terms Used in This Book

The term *ATM Control Point* used in this book refers to the ATM Control Point located in the IBM 8260 Nways Multiprotocol Switching Hub or IBM 8285 Nways ATM Workgroup Switch base unit.

The term *Command Reference Guide* used in this book refers to the IBM 8260 Nways Multiprotocol Switching Hub, IBM 8285 Nways ATM Workgroup Switch, ATM Command Reference Guide, SA33-0385.

Related Information

To understand the information presented in this guide, refer to:

- *IBM 8260 Multiprotocol Intelligent Switching Hub Product Description* (GA33-0315) for more information on features and characteristics of the IBM 8260 Nways Multiprotocol Switching hub
- *IBM 8285 Nways ATM Workgroup Switch Installation and User's Guide* (SA33-0381) for more information on features and characteristics of the IBM 8285 Nways ATM Workgroup Switch.
- *IBM 8250 Multiprotocol Hub, IBM 8260 Multiprotocol Intelligent Switching Hub, IBM 8285 Nways ATM Workgroup Switch, Planning and Site Preparation Guide* (GA33-0285) for more information regarding cabling and connectors.
- *IBM 8260 Nways Multiprotocol Switching Hub, IBM 8285 Nways ATM Workgroup Switch, ATM Command Reference Guide* (SA33-0385) for more information regarding ATM commands.
- Publications listed in the “Bibliography” on page 109 for information on the principles of asynchronous transfer mode (ATM) technology
- ATM Forum UNI Specification V3.0 and V3.1.

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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.
Italics	Special term	This is known as a *hot swap*.
	Document titles	Refer to the *ATM User-Network Interface Specification - Version 3.0* 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 4.2 verbose [ENTER]`

	System messages and screen displays	`Port display for 8260 ATM WAN Module:`
		`Port Type Mode Status`
		`---`
		`4.02 NNI enabled UP-OKAY`

Chapter 1. Overview

This chapter presents an overview of the 8260 Nways ATM WAN module (A2-WAN module). It describes the main functions of the module, the daughter cards used with the module, and how the module operates as part of the ATM subsystem when installed in the IBM 8260 Nways Multiprotocol Switching hub or IBM 8285 Nways ATM Workgroup Switch expansion unit.

A2-WAN Module in the 8260 Hub or 8285 ATM Workgroup Switch

The A2-WAN module is a single-slot, two-port 34-45/155 Mbps ATM module that functions as part of the IBM 8260 Nways Multiprotocol Switching hub or 8285 ATM Workgroup Switch, and provides all standard ATM functions as well as access to 8260 or 8285 management services. Up to two DS3/E3/OC3/STM-1 standard daughter cards, can be installed on the motherboard. You can "mix and match" different types of daughter cards according to your ATM networking needs.

A2-WAN modules can be used in any of the following ways:

- To send and receive data from an ATM subsystem via a public network or Wide Area Network (WAN).
- To send to and receive data from an ATM subsystem in another ATM 8260 hub or workgroup switch
- To attach high capacity workstations and servers that function in ATM mode.

8260 Nways ATM WAN modules interface to the 8260 hub or 8285 workgroup switch by means of the ATM Control Point, located in either the ATM Control Point and Switch (A-CPSW) module of the 8260 hub or 8285 base unit. A2-WAN modules process ATM cells of data by:

- Checking their validity
- Accessing the switching tables to locate the destination module
- Preparing the internal ATM format required by the ATM Control Point
- Sending the cells to the ATM Control Point.

A2-WAN modules can be installed in any vacant slot in the 8285 workgroup switch expansion unit or any vacant slot in the 8260 hub, except for slots 9, 10, and (for 17-slot models) 11. These slots are reserved for A-CPSW modules. In 17-slot models, although slot 12 is also reserved, you can insert an A2-WAN module provided an A-CPSW module is not installed in slot 11.

Like other ATM media modules, such as the A4-FB100 module, the A2-WAN module can be inserted while the hub or workgroup switch is operating without disturbing data traffic on other modules. Before removing the module, however, you must first isolate it by using the SET MODULE command.

For more information on how to install and change modules, see the *IBM 8260 Multiprotocol Switching Hub Installation Guide*, SA33-0251 or *IBM 8285 Nways ATM Workgroup Switch Installation and User's Guide*, SA33-0381 as appropriate.

Module Functions

The A2-WAN module has the following characteristics:

- Two ports, each operating at 34 Mbps (E3), 45 Mbps (DS3), or 155 Mbps (OC3/STM-1), to connect to stations, servers, and other hubs or workgroup switches. Each port may connect to:
  - A plug provided by a public network or Wide Area Network (WAN)
  - An ATM or multimedia workstation that requires a high bit rate (UNI connection)
  - A UNI or NNI device using a supported interface.
- UTOPIA interface connecting the daughter cards and the motherboard.

  All ATM data cells are transferred via the UTOPIA interface.

  The IBM implementation of UTOPIA-1 is an 8-bit interface with no parity management and a byte-level handshake. UTOPIA-1 supports a single PHY-layer.
- Clocking may be provided either by the network or internally by the A2-WAN module.
- Motherboard and up to two daughter cards for A2-WAN port-to-port and port-to-device connections.
- Physical interface:
  - coax cable for E3 and DS3 daughter cards
  - fiber cable for OC3 and STM-1 daughter cards.
- A2-WAN connections: port-to-port, hub-to-server, and hub-to-workstation.
- Up to three A2-WAN modules can be used in the 8285 workgroup switch expansion unit, providing a maximum of 6 ATM ports.
- Up to fourteen A2-WAN modules can be used in the 17-slot 8260 hub at the same time (8 in the 10-slot 8260 hub).
- Connectors. The A2-WAN module has four standard connectors:
  - Two backplane connectors, for communication with the 8260 hub or 8285 workgroup switch:
    - The ATM backplane connector, which provides the path for ATM transfer and management functions
    - The Trichannel backplane connector, which provides power and other control signals
  - Two daughter card interface connectors, for communication with the daughter cards.

Supported Interfaces

The A2-WAN module supports the following interfaces:

- User-to-network (UNI)
- Network-to-network (NNI).

The UNI and NNI interfaces supported by the A2-WAN module are defined in the following documents:

- ATM Forum UNI Specification V3.0 and V3.1
- ITU (ex-CCITT) SG13 as defined in the following standards:
  - I.413 (B_ISDN User-Network Interface)
  - I.432, I.610, G.703, G804 (Physical Layer)
  - G.751 and G.832 for E3
  - Q.2931 (Signaling).

All ATM data cells are transmitted via the UTOPIA interface.

The UTOPIA Interface: The ATM Forum has developed and approved a standardized data path interface between the physical layer (PHY) and the ATM layer in an ATM network. This interface was named UTOPIA (Universal Test & Operations PHY Interface for ATM).

UTOPIA allows a common interface between ATM and a wide variety of PHY-layer (physical-layer) protocols, speeds and media types.

By using the UTOPIA interface in the A2-WAN Module, PHY-specific functions are separated from the standard ATM functions that are common to all ATM applications:

- Standard ATM functions are located in the A2-WAN Module
- All PHY-specific functions are concentrated on daughter cards that are mounted on the A2-WAN Module motherboard.
- The daughter cards access all necessary ATM functions via the UTOPIA interface.

Daughter Cards

The A2-WAN module allows you to use different daughter cards to mix and match different media types in an 8260 hub or 8285 workgroup switch-based ATM subnetwork. By taking advantage of this flexibility, you can create customized mixed-media solutions for your individual network needs.

The following daughter cards are supported:

- DS3 (44.736 Mbps)
- E3 (G.832) (34.368 Mbps)
- OC3 (155.520 Mbps)
- STM-1 (155.520 Mbps).

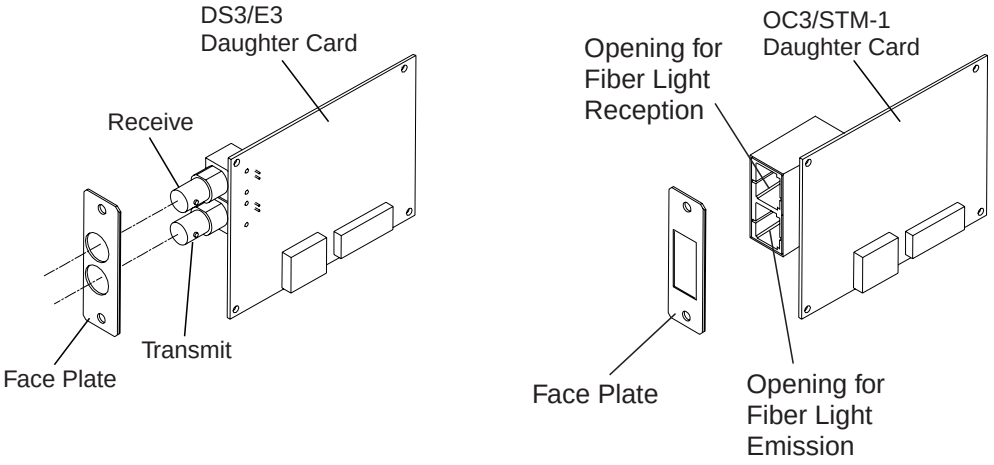

Figure 1. Daughter Cards

ATM Traffic Management Using Reserved Bandwidth

The A2-WAN module provides Reserved Bandwidth (RB) service (specified QOS class 1 in the ATM Forum UNI Specification V3.0).

The traffic of the RB service is controlled at call setup by the Connection Admission Control (CAC) mechanism. Resource allocation is performed according to the Peak Cell Rate (PCR) negotiated in the traffic contract between the user and the network. PCR allocation provides a class A circuit emulation service.

For RB traffic, resource allocation is performed according to the PCR. The maximum bandwidth that can be reserved is eighty-five per cent of the total throughput capacity.

RB cells are immediately transmitted as long as the total aggregate throughput from the 8260 A-CPSW module or 8285 workgroup switch to a given A2-WAN module port does not exceed 85% of the maximum.

Connecting ATM Campus Networks via a WAN

The A2-WAN module can be used to link ATM campus networks via a Wide Area Network (WAN).

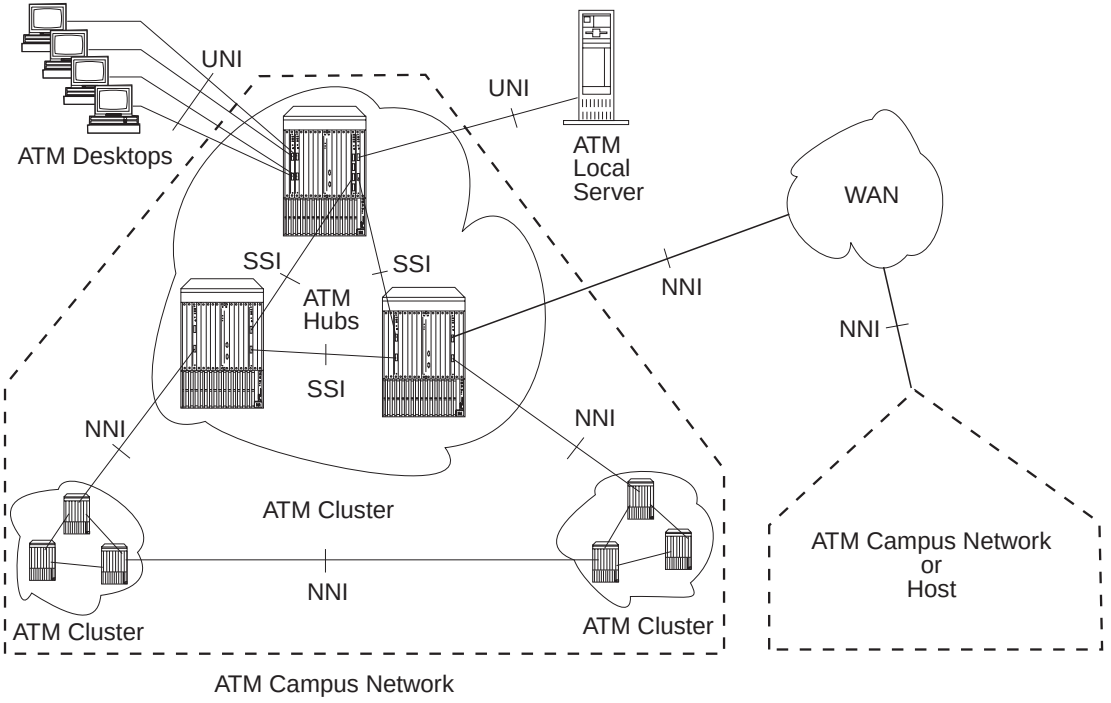

Figure 2. ATM Campus Network

Chapter 2. Setting Up a Connection Using Fiber

This chapter describes the steps necessary for planning and setting up an ATM switch-based ATM network:

- Choosing the type of fiber cable to be used and understanding basic principles of optical power transmission (see “Before You Start: General Guidelines” on page 8)
- Laying out valid A2-WAN module links (A2-WAN module port-to-port and A2-WAN module port-to-device connections) by calculating the optical power budget and computing the optical power losses for each link (see “Planning Cabling Distances in a Fiber Network” on page 9)
- Maintaining the valid ATM connections that you create (see “Maintaining ATM Fiber Connections” on page 21).

In an ATM network, the 8260 Nways ATM WAN module is used to connect ATM devices (workstations, servers, concentrators, bridges, and so on) and other 8260 hub-based ATM hubs. For information on the cabling and connectors required, see Appendix A, “Technical Specifications” on page 81.

Before You Start: General 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, IBM recommends that you use 62.5 micron fiber that conforms with IEEE 10BASE-F standards.
- When you use singlemode fiber, IBM recommends 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 A2-WAN module ports or between the A2-WAN module 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 A2-WAN module ports or an A2-WAN module port and an ATM user device. **Each A2-WAN module 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 A2-WAN module port in the end-to-end connection.

Planning Cabling Distances in a Fiber Network

This section describes how to plan the cabling distance between two A2-WAN module ports (or between an A2-WAN module port and a user device) in a fiber network. To ensure that an A2-WAN module 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 A2-WAN module port and cable size using Table 1 and Table 2 on page 11.
2. Verify that the overall power loss in the A2-WAN module 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 A2-WAN module ports and transceivers are:

Multimode fiber 2 kilometers (1.24 miles)
Singlemode fiber 20 kilometers (12.4 miles).

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

Optical Power Budget

When validating cabling distances in A2-WAN module links, network planners and installers should calculate for maximum optical power losses in each end-to-end connection. Table 1 and Table 2 on page 11 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 A2-WAN module 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 A2-WAN module link of an ATM connection. **In order for an A2-WAN module link to transmit ATM data effectively, the optical power budget must be greater than the total power loss**. See "Calculating Power Loss in an ATM Connection" on page 17 for an example.

When calculating the optical power budget for an ATM link between an A2-WAN module port and an end user device, be sure to use the values specified in the *ATM User-Network Interface (UNI) Specification V3.0*, ATM Forum. These values are shown in Table 1 on page 11.

Table 1. Optical Power Budget for Port-to-Device Connections (ATM Forum V3.0)

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 2. Optical Power Budget for 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	-29 dB	14 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 3.

IBM recommends that high-quality, low-loss connectors be used in your ATM connections.

Table 3. 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 Received Power" in Table 1 and Table 2 on page 11. Table 4 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 4. Optical Power Loss per Splice

Splice Type	Cable Size (microns)	Maximum Loss (dB)	Average Loss (dB)
Fusion	62.5 to 62.5	—	0.15
	50 to 50	—	0.15
	100 to 100	—	0.15
	9 to 9	—	0.15
Mechanical	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 5 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 characteristics 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 5. 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 A2-WAN module ports.

The optical power loss through a patch panel includes the loss resulting from the two connectors and the bulkhead. Table 6 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 6. 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 8260 hubs are installed in patch panel racks, IBM jumper cables are often used to connect an A2-WAN module port in the hub to the patch panel. The use of jumper cables in this type of configuration is recommended in your ATM network because **each A2-WAN module port regenerates the optical signal at full strength as it was originally transmitted from the source end system in the connection**. For more information on IBM ATM jumper cables, see Appendix B, “ATM Components” on page 87.

The total power loss at each IBM jumper cable is shown in Table 7. Note that this value includes the combined power loss from the two connectors (A2-WAN module and patch panel) and the length of the jumper cable itself.

Table 7. Optical Power Loss per IBM 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)

Calculating Power Loss in an ATM Connection

This section contains an example of how to calculate power loss in an A2-WAN module connection; that is, between two A2-WAN module ports and between the A2-WAN module port and ATM device on each end of the connection. The data used to calculate the distances is taken from the tables in the preceding sections:

- "Optical Power Budget" on page 10
- "Optical Power Loss Through Connectors" on page 12
- "Optical Power Loss Through Splicing" on page 13
- "Optical Power Loss by Fiber Cable Type" on page 14
- "Optical Power Loss Through Patch Panels" on page 15.

In the example shown in Figure 3, two ATM desktops communicate across an ATM connection using the following optical fiber components:

- 8260 Nways ATM WAN modules for multimode fiber
- 62.5/125 fiber cable
- 50-meter and 150-meter cables to connect the desktops to the wall sockets
- Physical and non-physical contacts in the wall sockets
- 100-meter and 250-meter cables to connect the wall sockets to the patch panels
- Two jumper cables to connect each patch panel to an A2-WAN module port in the 8260 ATM hubs
- Two other jumper cables to connect another A2-WAN module port in each hub to the patch panels
- A 1.8-kilometer (1.12-mile) cable with a fusion splice to connect the two patch panels.

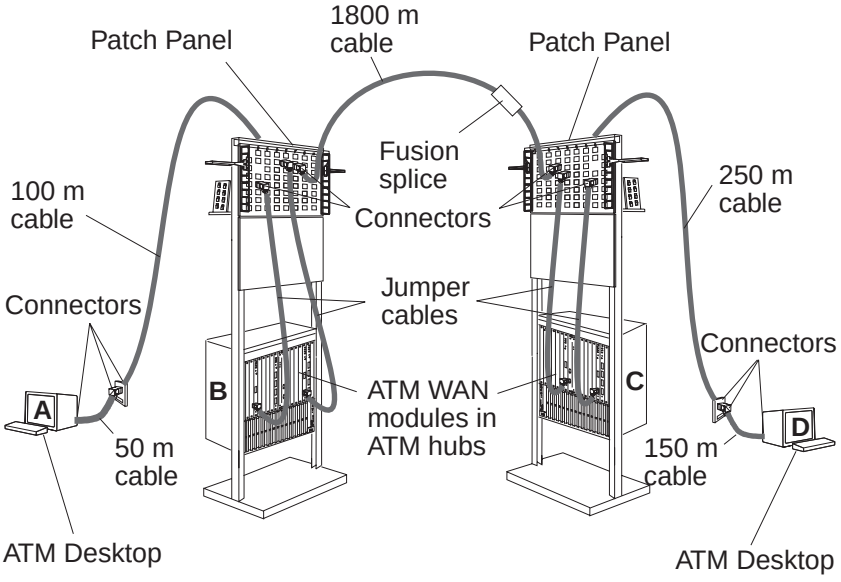

Figure 3. A2-WAN Module Links in an ATM Connection Between Two Desktops

In Figure 3, the ATM multimode fiber connection between Desktop A and Desktop D consists of three separate A2-WAN module links:

- Desktop A to the A2-WAN module port in Hub B
- A2-WAN module port in Hub B to A2-WAN module port in Hub C
- A2-WAN module port in Hub C to Desktop D.

To ensure the validity of the complete ATM connection (Desktop A to Desktop D), it is necessary to perform three separate calculations to verify the validity of each link. The power losses for the individual components in each link are shown in Table 8 on page 19. The number of the table from which each power loss value comes is shown in the Reference column.

Table 8. Power Loss for A2-WAN module Links (by Component)

A2-WAN module Link	Component	Power Loss (dB)	Reference
Desktop A to Hub B	Cable connector (to ATM desktop)	0.7	Table 3
	50-meter cable	0.1 ("worst case")	Table 5
	Cable connector (to wall socket)	0.7	Table 3
	Wall socket (physical contact)	0.4	Table 3
	Wall socket (non-physical contact in wall)	0.7	Table 3
	100-meter cable (in wall)	0.2 ("worst case")	Table 5
	Cable connector (to patch panel)	0.7	Table 3
	Patch panel	1.0	Table 6
	Jumper cable (from patch panel to hub B)	1.5	Table 7
Hub B to Hub C	Jumper cable (from hub B to patch panel)	1.5	Table 7
	Patch panel	1.0	Table 6
	Cable connector (to one patch panel)	0.7	Table 3
	1.8-kilometer cable (between buildings)	3.5 ("worst case")	Table 5
	Fusion splice	0.15	Table 4
	Cable connector (to other patch panel)	0.7	Table 3
	Patch panel	1.0	Table 6
	Jumper cable (from patch panel to hub C)	1.5	Table 7
Hub C to Desktop D	Jumper cable (from hub C to patch panel)	1.5	Table 7
	Patch panel	1.0	Table 6
	Cable connector (to patch panel)	0.7	Table 3
	250-meter cable (in wall)	0.5 ("worst case")	Table 5
	Wall socket (non-physical contact in wall)	0.7	Table 3
	Wall socket (physical contact)	0.4	Table 3
	Cable connector (to wall socket)	0.7	Table 3
	150-meter cable	0.3 ("worst case")	Table 5
	Cable connector (to ATM desktop)	0.7	Table 3

Verifying ATM Fiber Connections

To verify that a fiber connection is valid for ATM data transmission, you add up the power losses for the components in each A2-WAN module link and compare the sums with the optical power budget for each link. The results for the links in Figure 3 on page 17 are shown in Table 9.

Table 9. Power Loss Compared to Power Budget for Each A2-WAN Module Link

A2-WAN Module Link	Total Power Loss	Optical Power Budget	Reference
Desktop A to A2-WAN module port in Hub B	6.0 dB	9.0 dB	Table 1
A2-WAN module port in Hub B to A2-WAN module port in Hub C	10.15 dB	11.0 dB	Table 2
A2-WAN module port in Hub C to Desktop D	6.5 dB	9.0 dB	Table 1

Since the total power losses are less than the optical power budget allotted for each A2-WAN module link, the links are valid and the ATM desktop-to-desktop fiber connection can be successfully made.

Maintaining ATM Fiber Connections

After calculating the optical power loss for A2-WAN module links and allowing for "worst case" scenarios, the data transmission in the ATM connections in your network should be reliable. To ensure that the optical power transmission does not exceed the optical power budget and disrupt the quality of data transmission for your current fiber configuration, IBM recommends that you:

- Do not install additional links (for example, patch panels or jumper cables) in each connection.
- Maintain the homogeneity of ATM links by using the same category of fiber cable (for example, 62.5/125) in each link of an ATM connection.
- When the margin between the total power loss on a connection and the optical power budget is less than or equal to 1dB (≤ **1dB**), check with your vendor to make sure you are using the power loss value set by the manufacturer for your cable type and recalculate the total power loss including the variance value for each component.

  The variance value of each optical fiber component (splices, connectors, cables, and so on) is shown in the tables in Appendix A of the *IBM 8250 Multiprotocol Switching Hub, IBM 8260 Multiprotocol Intelligent Switching Hub, IBM 8285 Nways ATM Workgroup Switch, Planning and Site Preparation Guide*, GA33-0285.

Chapter 3. Cabling Information for DS3/E3 Daughter Cards

This chapter describes the cables and connectors for use with the DS3/E3 daughter cards.

Cabling Information

Table 10 details the accepted coaxial cables for the ATM ports.

Table 10. Cabling Details

Daughter Card Type	Cable Type	Impedance	Attenuation @ 400 MHz
E3	RG59	75 ohm	25db MAX / 100m
DS3	RG59	75 ohm	25db MAX / 100m

Note: The 25 db attenuation @ 400 MHz given corresponds to an attenuation of 12 db @ 17 MHz, assuming that it follows approximately a $\sqrt{f}$ law.

For more information, refer to the *IBM 8250 Multiprotocol Switching Hub, IBM 8260 Multiprotocol Intelligent Switching Hub, IBM 8285 Nways ATM Workgroup Switch, Planning and Site Preparation Guide*, GA33-0285.

Cabling Distances

The values given in Table 11 are for information only, as the distance depends on the quality of cable used.

Table 11. ATM Device Cabling Distances

Daughter Card Type:	Cable Type	Maximum Proposed Distance
E3	RG59 coax	100 m (330 ft) based on a power budget of 12 db @ 17 MHz.
DS3	RG59 coax	68 m (225 ft) default 135 m (450 ft) If cable distance exceeds 68 m (225 ft), the configuration setting for the port must be changed from the default. See “DS3 Line Buildout” on page 97.

Chapter 4. Installation

This chapter describes how to unpack and install the A2-WAN module and connect ATM devices.

Before Unpacking the Module or Daughter Cards

Take the following precautions before unpacking the A2-WAN module or daughter card:

- Do not remove the component from its anti-static shielding bag until you are ready to use it. This avoids the possibility of having electrostatic discharge damage static-sensitive devices on the components.
- When possible, handle the components by their faceplates.
- Always use a foot strap and grounded mat or wear a grounded static discharge wrist strap whenever you inspect or handle a component. Or else, be sure to touch a grounded rack or another source of ground **before** handling it.
- Ensure that you have a clean surface available on which to place the components.

Unpacking the Module or Daughter Cards

The components included in the shipping group depends on whether you have ordered the module and daughter card(s) at the same time or you have ordered daughter cards separately:

- If you have ordered the module and daughter cards at the same time, the shipping group will contain:
  - a motherboard
  - one or two daughter cards, pre-installed on the motherboard
  - one or two Vital Product Data (VPD) Programmable Read Only Memory (PROM) chips (one for each daughter card), pre-installed on the motherboard.
- If you have ordered a daughter card(s) only, the shipping group will contain:
  - one or two daughter cards, to be installed on the motherboard
  - one or two Vital Product Data (VPD) Programmable Read Only Memory (PROM) chips (one for each daughter card), to be installed on the motherboard
  - five screws for each daughter card: three to secure the daughter card to the motherboard, two to secure the daughter card to the module's front panel.

To unpack the components, follow these steps:

1. Verify that the components are the correct models by matching the model number(s) listed on the side of the shipping carton to the model number(s) you ordered.
2. Remove each component from its shipping carton.
3. Remove each component from its anti-static bag and inspect it for damage. Always handle it carefully, trying not to touch any internal components.

   If the component appears to be damaged, put it back into its anti-static bag, and put the bag back into the shipping carton. Then contact your local IBM dealer.

It is recommended that you retain the shipping carton and the anti-static shielding bag in which the component was delivered. These can be reused later if you want to repackage the component for storage or shipment.

IBM also suggests that you record the serial numbers of the A2-WAN motherboard and daughter cards.

Installation Summary

Table 12 lists the steps to follow to install the A2-WAN module. Each step is described in detail in this chapter.

To record configuration information on your complete ATM network, use the ATM cabling charts in Appendix A of the *IBM 8250 Multiprotocol Intelligent Hub, IBM 8260 Multiprotocol Intelligent Switching Hub, IBM 8285 Nways ATM Workgroup Switch, Planning and Site Preparation Guide*, (GA33-0285).

Before installing an A2-WAN module in an 8260, make sure that an A-CPSW module is installed in slots 9-10 (or 11 in A17 models), and that an A-CPSW console has already been configured. If no A-CPSW module is installed in the hub, the Reset LED on the A2-WAN module will start blinking when you insert the module.

Table 12. Installation Steps

Step	Refer to
1. If you are using E3/DS3 daughter cards, ensure that the cards conform to country regulations regarding the earthing of the outer conductor or screen.	"Setting the Earthing on E3/DS3 Daughter Cards" on page 28.
2. Install the daughter card(s) and VPD PROM chip(s) on the motherboard. **Note:** This step is only required if you have ordered daughter cards separately. The daughter cards are pre-installed if you order the motherboard and daughter cards at the same time.	"Installing Daughter Cards" on page 30.
3. Insert the A2-WAN module into a vacant slot: **8260:** 1 to 8 on 10-slot models (or 1 to 8, 12 to 17 on 17-slot models) **8285:** Any vacant slot in the expansion unit.	"Installing the Module in an 8260 Hub" on page 32 (8260) "Installing the Module in the 8285 Expansion Unit" on page 34 (8285)
4. Set up connections between the A2-WAN ports and other ATM devices using the cables and connectors.	"Cabling Up" on page 37

Setting the Earthing on E3/DS3 Daughter Cards

To adhere to country specific regulations regarding the earthing of outer conductors on coaxial pairs (both receive and transmit ports), four jumpers are provided on the rear of the E3/DS3 daughter cards. If the jumpers are not used, the outer connector is earthed through a 10 nF capacitor. Figure 4 shows the location of the four jumpers.

Normally, only the outer connector of the transmit port is to be earthed, and not the receive port. This is dependent on individual country rulings. Check if your country requires the receive port to be earthed as well.

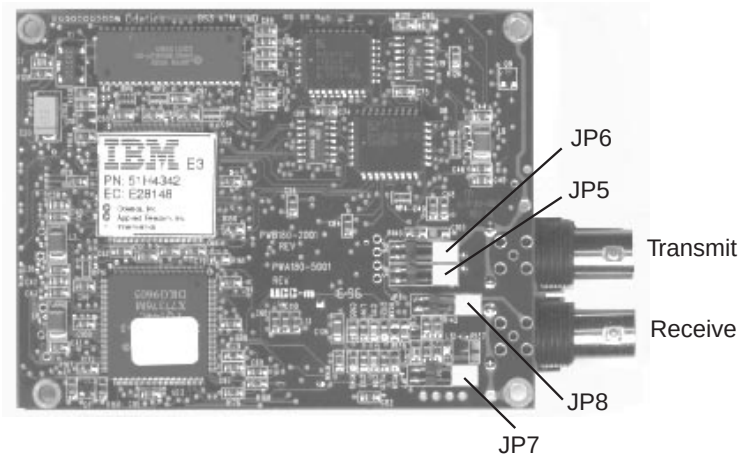

Figure 4. Earthing Jumper Locations

Refer to Table 13 to determine which jumpers you require to meet your country's requirements. Remove any jumpers that are not required, by sliding them gently in the direction of the ports.

CAUTION:
Some of the jumpers MUST be removed from E3 daughter cards.

Table 13. Jumper Settings for E3/DS3 Daughter Cards.

Outer of:	Connected to:	JP5	JP6	JP7	JP8
Transmit	Earth		√		
Transmit	0 volt	√			
Receive	Earth				√
Receive	0 volt			√	
E3 (according to G.703)		√	√		
DS3 (recommended setting)		√	√	√	√

Note: Standard G.703 recommends that the outer conductor of the coaxial pair be connected to earth on the transmit port, and that the same provision be available for the receive port. Some countries however, have different rules, so the setting may be not apply.

Installing Daughter Cards

Before installing daughter cards on an A2-WAN module, the module must be removed from the 8260 hub or 8285 workgroup switch expansion unit. To install a daughter card on to the module, follow these steps:

1. To install daughter cards, it is necessary to remove the motherboard from its frame. To do this:
   a. If there any daughter cards already installed, remove the two screws that secure each daughter card to the front panel.
   b. Remove the ten screws that secure the motherboard to its frame (see **1** on Figure 5 on page 31).
   c. Slide the motherboard from its frame.
2. If necessary, remove the two screws and faceplate that cover the bottom port on the front panel of the motherboard. This is only required when using the bottom port for the first time.
3. Install the faceplate(s) on the daughter card(s) (see Figure 1 on page 5).
4. Hold the daughter card so that its connectors and screw holes are aligned over the connectors and small metal posts on the motherboard. Then gently push the card downwards until you hear it click into the motherboard connectors. Repeat with the second daughter card if you are installing two.
5. Place three of the screws that came with the daughter card into the metal posts and tighten them with a flat-tipped screwdriver. (see **2** on Figure 5 on page 31). Repeat with the second daughter card if you are installing two.
6. Install the VPD PROM chip(s) on the motherboard, making sure that the notch is aligned with the front of the module. (see **3** on Figure 5 on page 31).
7. Slide the motherboard back into its frame.
8. Re-insert the ten screws that secure the motherboard to its frame, and tighten them with a screwdriver.
9. Insert the two screws that came with the daughter card into the front panel to secure the daughter card(s), and tighten them with a screwdriver (see **4** on Figure 5 on page 31).

Note: If you replace a daughter card after configuring the A2-WAN module (see Chapter 5, “Configuration” on page 41) and re-insert the module in the hub or workgroup switch, the new card is automatically configured with the settings of the previous card.

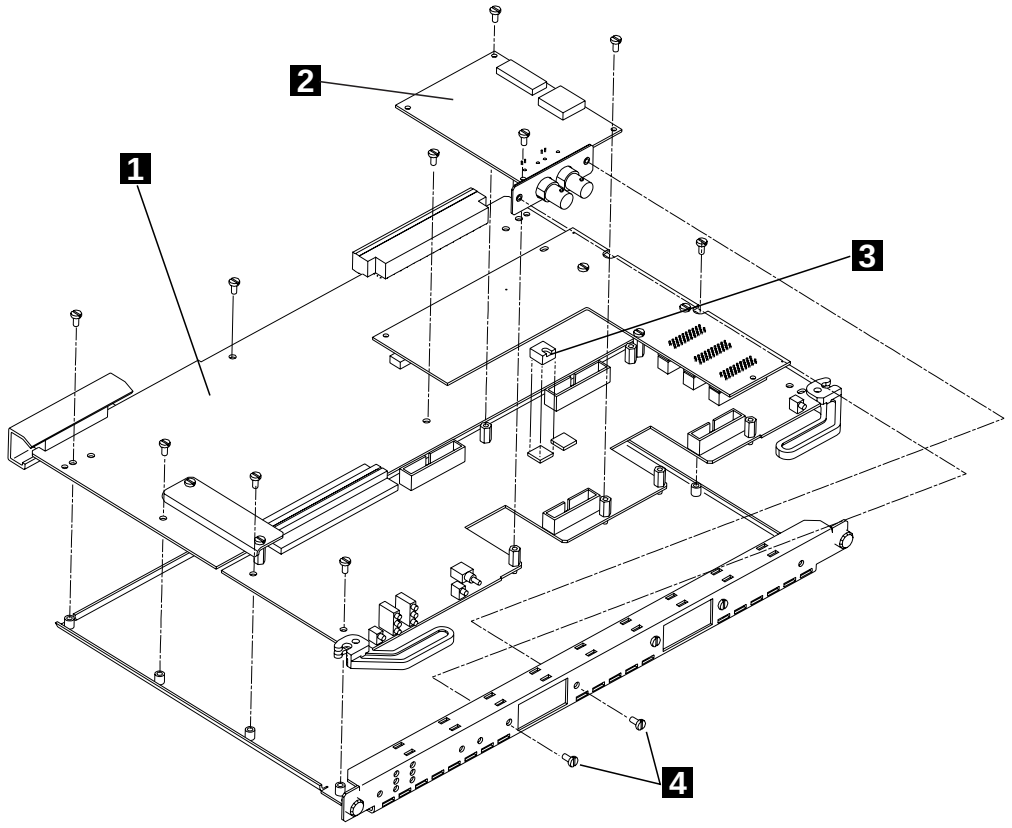

Figure 5. Installing a Daughter Card

CAUTION:
When installing a daughter card on the motherboard, be careful not to touch its components. When possible, hold the card by the faceplate or by its edges.

Installing the Module in an 8260 Hub

Note: You can install the A2-WAN module in an 8260 hub either when the hub is running or turned OFF.

To install an A2-WAN module in an 8260 hub, follow these steps:

1. Locate a blank slot in positions 1 to 8 (or 12 to 17 in 17 slot models). If necessary, remove a panel on the hub to expose a blank slot.
2. Make sure that the slot to be used is in Isolated mode by entering the following command from the A-CPSW console:

   ```
   SET MODULE slot ISOLATED
   ```

   where `slot` specifies the number of the slot to be used. For more information, see the *IBM 8260 Multiprotocol Switching Hub Installation Guide*, SA33-0251.
3. Insert the A2-WAN module into the slot as shown in Figure 6, matching the top and bottom board guides as you slide the module cleanly into place (by pressing evenly on the top and bottom of the faceplate). Do not attempt to push the module all the way into the hub until you have verified that the top and bottom module ejectors are OPEN (see Figure 7 on page 33.)

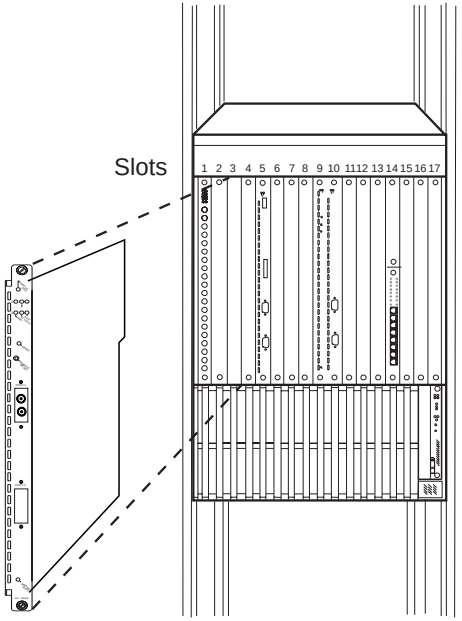

Figure 6. Inserting the Module in an 8260 Hub

4. Close the top and bottom ejectors simultaneously. This secures the module.

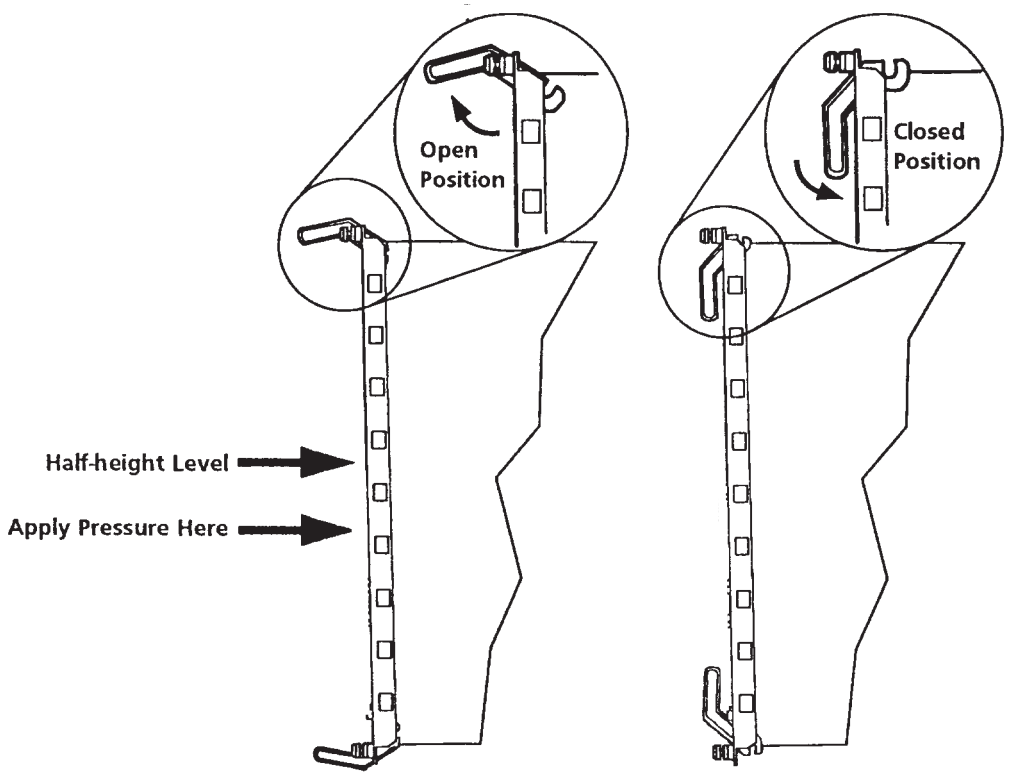

Figure 7. 8260 Module Ejectors

5. The Reset LED should light ON briefly, and then turn OFF. Other LEDs may also light ON if the slot was previously configured for an A2-WAN module.
6. Fasten the spring-loaded screws on the front panel of the module to the hub, using your fingers. Do not overtighten.

Installing the Module in the 8285 Expansion Unit

To install an A2-WAN module in an 8285 expansion unit, follow these steps:

1. Locate a vacant slot in the expansion unit. 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.

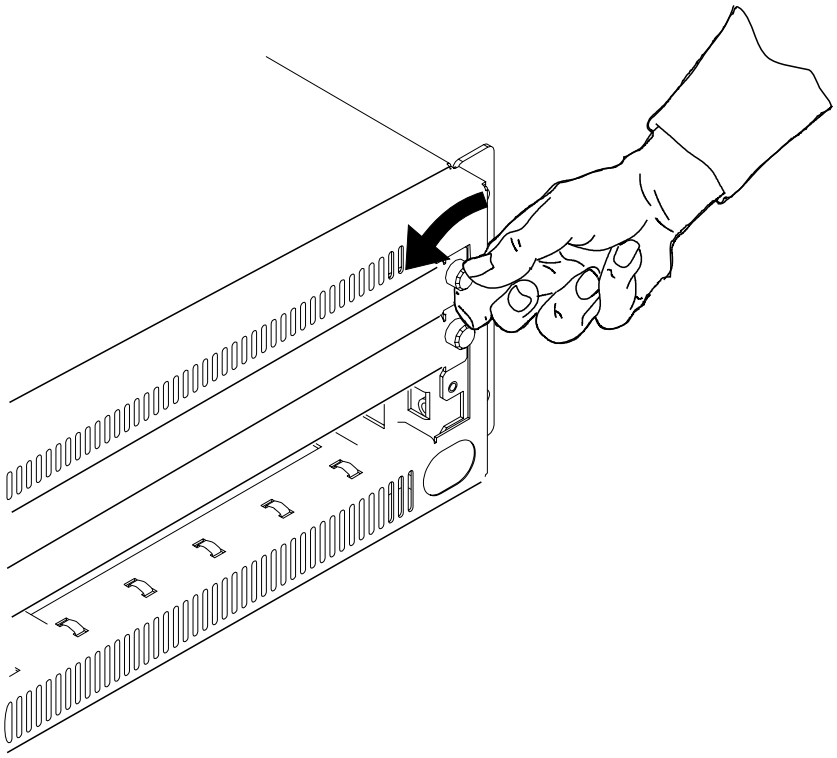

Figure 8. Removing a Dummy Module

   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 the slot to be used is in Isolated mode by entering the following command from the ATM console:

   ```
   SET MODULE slot ISOLATED
   ```

   where `slot` specifies the number of the slot to be used. For more information, see the *IBM 8285 Nways ATM Workgroup Switch Installation and User's Guide*, SA33-0381.

3. Insert the A2-WAN module into the slot in the expansion unit as shown in Figure 9, matching the left and right board guides as you slide the module cleanly into place (by pressing evenly on the top and bottom of the faceplate). Do not attempt to push the module all the way in until you have verified that the left and right module ejectors are OPEN (see Figure 10 on page 36.)

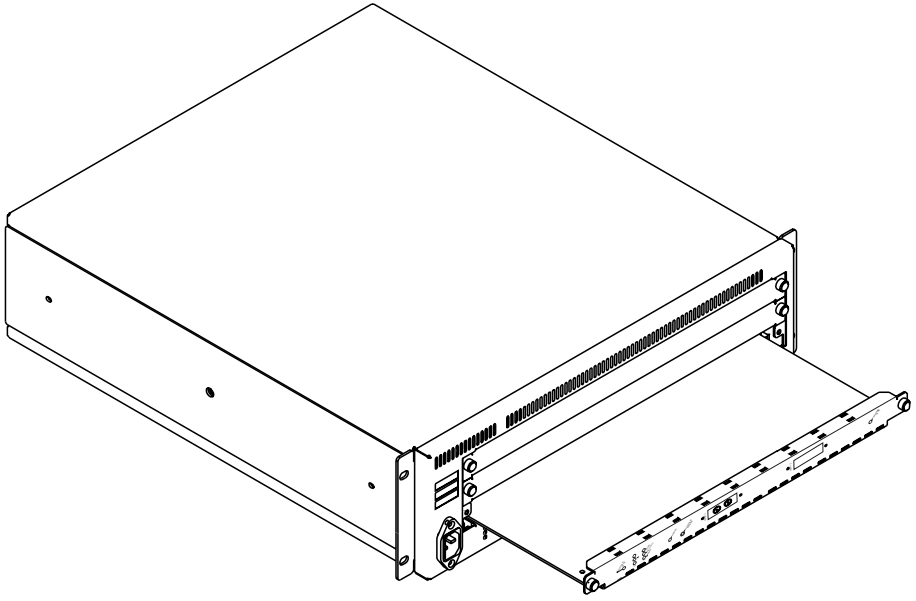

Figure 9. Inserting the Module in an 8285 Expansion Unit

4. Close the left and right ejectors simultaneously. This secures the module.

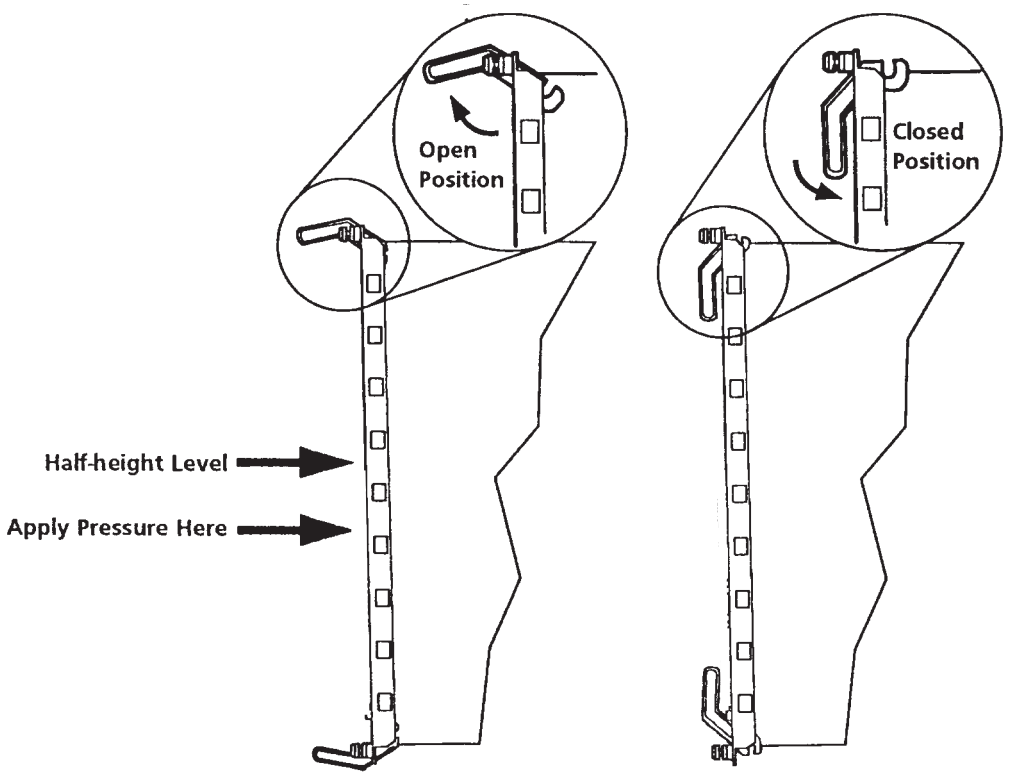

Figure 10. 8285 Module Ejectors

5. The Reset LED should light ON briefly, and then turn OFF. Other LEDs may also light ON if the slot was previously configured for an A2-WAN module.
6. Fasten the spring-loaded screws on the front panel of the module to the expansion unit, using your fingers. Do not overtighten.

Cabling Up

The following sections provide instructions and guidelines for connecting ATM devices (such as switches, servers, personal computers, and workstations). Remember these tips when connecting cables:

- 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.
- Use an RG59 75-ohm coax cable for each of the ATM WAN module ports.

Using Fiber

Make sure that the transmit and receive cables are clearly marked or color coded before attaching them to the appropriate ports. Also, make sure that each cable has been properly cleaned with the appropriate fiber optic cleaning solution before you attach it. Then proceed as follows:

1. Remove the plastic fiber optic covers from the ports that you will use. Leave the covers on used ports to keep them clean.
2. Attach the fiber cables to each port.

   Make sure that you attach an ATM fiber cable that uses the same type of connector as the port. For a singlemode port, you must use 9/125 micron fiber cable. For a multimode port, you must use 50/125 or 62.5/125 micron fiber cable.

   If you loop a fiber cable under the hub or workgroup switch, be sure not to exceed the bend radius of the cable. To find out the bend radius, refer to the cable's specifications.
3. Attach the other end of each cable to an ATM device, such as a server, workstation, or another A2-WAN module in another 8260 hub or workgroup switch. Make sure that each transmit cable end connects to a receiver ATM port.

Connecting Devices to the ATM Ports

You can connect devices to the ATM ports on an A2-WAN module either through building wiring or by a direct connection.

Via Building Wiring: To connect an ATM device to the A2-WAN via building wiring, follow the steps listed below.

__ **1** Look at the cabling chart, which your network planner provided, to determine how the A2-WAN 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 ATM connector on the device and the other end to the 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 ATM device to the appropriate connector on the patch panel or on other equipment where building wiring terminates. Connect the other end of the cable to an ATM port on the A2-WAN.

__ **5** Label the connector on the patch panel (or other equipment used to terminate the building wiring).

Direct Cabling: To cable an ATM device directly to the A2-WAN:

__ **1** Look at the cabling chart, which your network planner provided, to determine how the A2-WAN should be connected to the network.

__ **2** Connect the cables between the A2-WAN and other devices, as indicated by the connections in the cabling chart.

__ **3** Label the cables, following your enterprise's procedures for cable labeling.

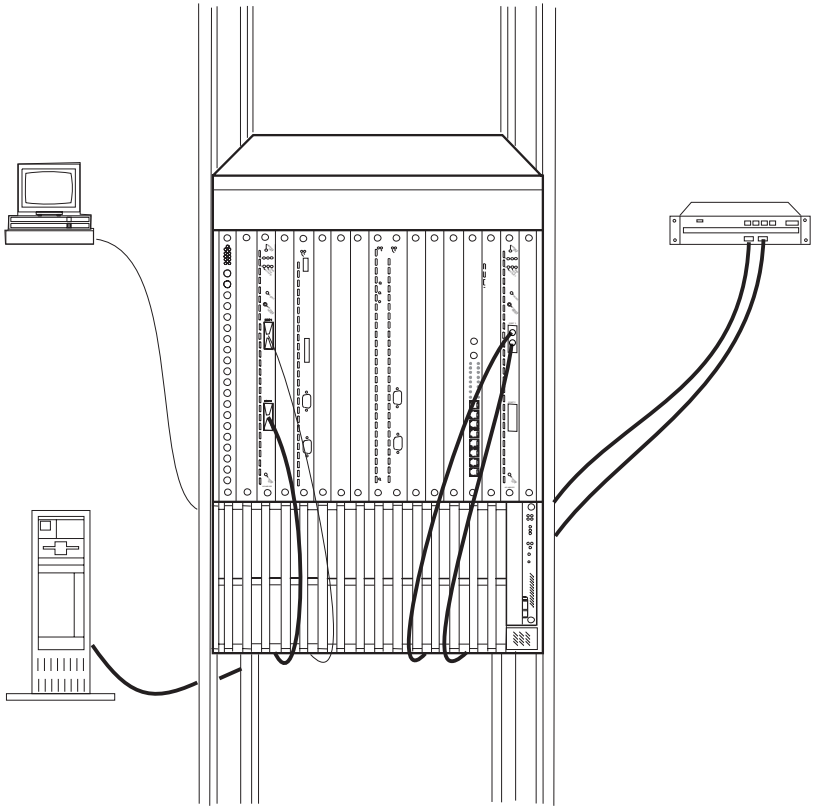

Figure 11. Attaching ATM Devices

Chapter 5. Configuration

After installing the A2-WAN module and attaching media cables to ATM devices, you must enter configuration commands from the ATM console to:

- Configure the port parameters
- Configure logical links for A2-WAN port-to-port connections between two ATM subnetworks (optional).
- Connect the A2-WAN module to the network.
- Enable the A2-WAN ports.

This chapter describes the ATM commands you need to enter to configure each A2-WAN module in the ways described above. For a complete description of all ATM commands, see the Command Reference Guide.

Configuring the Ports

The A2-WAN module uses two types of interfaces within the IBM ATM network, user-to-network and network-to-network:

- A user-to-network interface (UNI) defines the interface between an ATM user device (such as a router, bridge, server, workstation, or concentrator equipped with an ATM adapter) and the ATM network.
- A network-to-network interface (NNI) defines the interface between a pair of ATM clusters. (An ATM cluster is a group of interconnected ATM hubs or workgroup switches.)

Before you connect an A2-WAN module to the ATM network (as described in "Connecting the Module to the Network" on page 53) and enable its ports, you must specify the type of ATM interface used on each port.

In addition, you may:

- set the bandwidth allocation for each port
- specify the ILMI characteristics to be used for UNI ports.

When an A2-WAN port is enabled, it can transmit and receive cells in the ATM network. The port's parameters should be configured **before** the port is enabled. To set individual A2-WAN port parameters, enter the following command at the ATM console prompt:

```
SET PORT slot.port mode type bandwidth ilmi
```

Note: This section only describes the standard parameters that are required the make the port operational. Other default values, which may be modified, are described in Appendix C, "Default Configuration Settings" on page 89.

slot Slot number of the A2-WAN module.

port ATM port number (1 or 2).

mode `enable` or `disable`. Enter `disable` until the port has been configured.

type Type of interface used:

- `NNI` (network-to-network interface)
- `UNI` (user-to-network interface).

Default: Last value entered.

bandwidth Specifies the bandwidth allocation for a port in Kbps. The specified value must be greater than 51 and will be rounded by the system to the next upper multiple of 10 Kbps.

Default: Last value entered.

ilmi Specifies the ILMI characteristics for this UNI port:

`ILMI:NORMAL`	ILMI active with automatic detection of the signalling protocol version (UNI 3.0 or UNI 3.1). ILMI address registration normally performed.
`ILMI:FORCED_SIG_3.0`	UNI 3.0 signalling forced, ILMI address registration active.
`ILMI:FORCED_SIG_3.1`	UNI 3.1 signalling forced, ILMI address registration active.
`ILMI:OFF_SIG_3.0`	UNI 3.0 signalling forced, ILMI address registration inactive.
`ILMI:OFF_SIG_3.1.`	UNI 3.1 signalling forced, ILMI address registration inactive.
	Default: Last value entered.

Example: The following configures and enables a UNI port on an A2-WAN module without ILMI address registration.

```
ATMPROMPT> set port 4.1 enable uni ilmi:off_sig_3.0        [ENTER]

ATMPROMPT> Port set.
ATMPROMPT>
```

Configuring Logical Links

If you are configuring an ATM WAN module connection between two ATM subnetworks over a virtual path service provider or between two ATM clusters in the same subnetwork, you must configure the ATM trunk that connects the two subnetworks or clusters.

To configure an ATM trunk between two clusters, you use the SET LOGICAL_LINK command. If you are configuring a connection between clusters in different ATM subnetworks, you must also map each static route to an ATM cluster number using the SET STATIC_ROUTE command at each 8260 hub or workgroup switch in the subnetwork.

Logical links can be defined only for A2-WAN ports configured with a network-to-network (NNI) interface. You enter the SET LOGICAL_LINK command **only** for the ATM WAN module port on the boundary hub or workgroup switch of each ATM subnetwork or cluster.

For the full syntax of the SET LOGICAL_LINK and SET STATIC_ROUTE commands, see the Command Reference Guide.

```
SET LOGICAL_LINK slot.port vpi acn role uni_version traffic_type bandwidth
```

slot Slot number of the A2-WAN.

port Port number of the A2-WAN port.

vpi Virtual path identifier used to identify the logical link (0-15).

You must assign the same VPI to the ports at each end of a logical link. If you configure more than one logical link for a port, you must assign a different VPI for each link.

If you change the VPI assigned to a port, reset the module or the ATM subsystem.

acn When interconnecting two ATM subnetworks, this value is the ATM cluster number (ACN) of the logical hub or workgroup switch associated with the remote subnetwork and configured with the SET STATIC_ROUTE command (01-FF).

When interconnecting two ATM clusters in the same subnetwork, this is the ATM cluster number of the remote boundary hub or workgroup switch.

role `network_side` or `user_side`.

This parameter defines the Q.2931 role. `network_side` means that the 8260 hub or workgroup switch assigns ATM labels for this logical link. `user_side` means that the hub or workgroup switch does not assign labels.

You can assign `network_side` to only one port in a logical link. The other port must be configured as `user_side`.

uni_version 3.0 or 3.1.

This parameter defines the version of UNI signalling protocol for this logical link.

traffic_type Specifies the type of traffic to be dedicated to this logical link:

- NON_RESERVED_BANDWIDTH
- RESERVED_BANDWIDTH
- ANY (both types are allowed).

bandwidth Required if you specify RESERVED_BANDWIDTH or ANY as the dedicated traffic type, this parameter specifies the maximum bandwidth allocation in kilobits per second to be reserved for this logical link in the ATM network. The total bandwidth reserved for NNI links cannot exceed 85% of the maximum bandwidth used by the ATM port. You can assign different bandwidth values for the two ports in a logical link.

Example: The following example creates a logical link for port 1 on the ATM media module in slot 13 having VPI 9 to ACN 2, a network_side role, and a 500 Kbps bandwidth:

```
ATMPROMPT> set logical_link 13.1 9 2 network_side 3.1 reserved_bandwidth 500 [ENTER]

ATMPROMPT>
```

To display the logical link, see “Logical Link Information” on page 52.

Displaying Configuration Settings

The following section describes how to display information about the module, its port configurations, and any logical links that you have defined. By displaying this information, you can check that the A2-WAN is properly configured before connecting it to the network.

Module Information

To display status information about an A2-WAN module, use the SHOW MODULE command.

For example, to display configuration information about the A2-WAN module in slot 2, you would enter the following command:

```
ATMPROMPT> show module 2 verbose     [ENTER]

Slot Install Connect Operation General Information
--------------------------------------------------------------------
 2      Y       Y        Y     8260 ATM WAN Module with DS3 + E3 Ports

status: connected / hardware okay
        enable  / Normal
P/N:51H3635 EC level:E28056 Manufacturer:VIME
Operational FPGA version : 7
     Backup FPGA version : 7

     Type  Mode      Status                              Daughter Card Description
-------------------------------------------------------------------------------
 2.01:UNI   enabled  UP-OKAY                             E3
 2.02:NNI   enabled  UP-NO ACTIVITY                      DS3

ATMPROMPT>
```

If the value for `port status` indicates that an ATM WAN module port is inoperational or not functioning properly (for example, `NOT IN SERVICE` or `NO ACTIVITY`), refer to "Troubleshooting", in the *IBM 8260 Nways Multiprotocol Switching Hub, ATM Control Point and Switch Module Installation and User's Guide*, SA33-0326 or *IBM 8285 Nways ATM Workgroup Switch Installation and User's Guide*, SA33-0381, as appropriate.

For more information on the SHOW PORT command, see the Command Reference Guide.

Port Information

To display status information about the ports of an A2-WAN module, use the SHOW PORT slot.port command, where slot.port indicates the slot where the module is installed, and the port for which information is to be displayed. The following example shows how to display detailed information about port 2 of the A2-WAN module in slot 1:

```
SHOW PORT 1.2 VERBOSE        [ENTER]
```

The resulting display depends on the type of daughter card used, as illustrated in the sections that follow.

The DIAGNOSTICS fields are described in “On Demand Diagnostics” on page 75.

If the EQUIPMENT TEST RESULT is not OK, additional fields are displayed (refer to “Power On Diagnostics” on page 71).

The FAILURE STATUS fields are described in “Failure Status” on page 77.

For further information on parameters, see Appendix C, “Default Configuration Settings” on page 89.

For more information on the SHOW PORT command, see the Command Reference Guide.

E3 Daughter Card:

```
     Type  Mode      Status                              Daughter Card Description
-------------------------------------------------------------------------------
 1.02:UNI disabled  NOT IN SERVICE                      E3

Daughter Card Information:
--------------------------
DAUGHTER CARD TYPE  E3 (G.832)    Software version 0.1.1.66
 Connector                     : bnc
 Media                         : coax
 Failure integration time      : 2500 ms
 Failure decay time            : 20 s
 Timing source                 : PARM_INTERNAL_TMG
 Descramble_rcv_cells          : yes
 Discard_idle_cells            : yes
 Scramble_xmt_cells            : yes

DIAGNOSTICS:
 diag pattern                  : 00 00 00 00 00 00 00 00
 Internal wrap                 : disable
 Reply_mode wrap               : disable

EQUIPMENT TEST_RESULTS
 Test results                  : ok

FAILURE STATUS
 loss_of_signal                : inactive
 loss_of_frame                 : inactive
 equipment_failure             : inactive
 loss_of_synch                 : inactive
 loss_of_cell_delin            : inactive
 e3_rfi                        : inactive
 e3_ais                        : inactive
 payload_type_mismatch         : inactive
 trail_trace_mismatch          : inactive

 failure_summary :
ATMPROMPT>
```

DS3 Daughter Card:

```
     Type  Mode      Status                                Daughter Card Description
-------------------------------------------------------------------------------
 1.02:UNI disabled  NOT IN SERVICE                        DS3

Daughter Card Information:
--------------------------
DAUGHTER CARD TYPE  DS3    Software version 0.1.1.66
 Connector                      : bnc
 Media                          : coax
 Failure integration time       : 2500 ms
 Failure decay time             : 20 s
 Timing source                  : PARM_INTERNAL_TMG
 Descramble_rcv_cells           : yes
 Discard_idle_cells             : yes
 Scramble_xmt_cells             : yes

DIAGNOSTICS:
 diag pattern                   : 00 00 00 00 00 00 00 00
 Internal wrap                  : disable
 Reply_mode wrap                : disable
 Far_end_mode wrap              : disable

EQUIPMENT TEST_RESULTS
 Test results                   : ok

FAILURE STATUS
 loss_of_signal                 : inactive
 loss_of_frame                  : inactive
 equipment_failure              : inactive
 loss_of_synch                  : inactive
 loss_of_cell_delin             : inactive
 ds3_ais                        : inactive
 ds3_rai                        : inactive
 pclp_loss_of_frame             : inactive
 pclp_rai                       : inactive
 idle_signal                    : inactive

 failure_summary :
ATMPROMPT>
```

OC3 Daughter Card:

```
     Type  Mode      Status                              Daughter Card Description
-------------------------------------------------------------------------------
 1.02:UNI disabled  NOT IN SERVICE                      OC3

Daughter Card Information:
--------------------------
DAUGHTER CARD TYPE  OC3    Software version 0.1.1.66
 Connector                     : sc
 Media                         : mmf
 Failure integration time      : 2500 ms
 Failure decay time            : 20 s
 Timing source                 : PARM_INTERNAL_TMG
 Descramble_rcv_cells          : yes
 Discard_idle_cells            : yes
 Scramble_xmt_cells            : yes

DIAGNOSTICS:
 diag pattern                  : 00 00 00 00 00 00 00 00
 Internal wrap                 : disable
 Reply_mode wrap               : disable

EQUIPMENT TEST_RESULTS
 Test results                  : ok

FAILURE STATUS
 loss_of_signal                : inactive
 loss_of_frame                 : inactive
 sts_path_lop                  : inactive
 equipment_failure             : inactive
 loss_of_synch                 : inactive
 signal_label_mismatch         : inactive
 path_trace_mismatch           : inactive
 loss_of_cell_delin            : inactive
 line_ais                      : inactive
 sts_path_ais                  : inactive
 line_rfi                      : inactive
 sts_path_rfi                  : inactive
 failure_summary :
ATMPROMPT>
```

STM1 Daughter Card:

```
     Type  Mode      Status                                Daughter Card Description
-------------------------------------------------------------------------------
 1.02:UNI disabled  NOT IN SERVICE                        STM1

Daughter Card Information:
--------------------------
DAUGHTER CARD TYPE  STM1   Software version 0.1.1.66
 Connector                      : sc
 Media                          : smf
 Failure integration time       : 2500 ms
 Failure decay time             : 20 s
 Timing source                  : PARM_INTERNAL_TMG
 Descramble_rcv_cells           : yes
 Discard_idle_cells             : yes
 Scramble_xmt_cells             : yes

DIAGNOSTICS:
 diag pattern                   : 00 00 00 00 00 00 00 00
 Internal wrap                  : disable
 Reply_mode wrap                : disable

EQUIPMENT TEST_RESULTS
 Test results                   : ok

FAILURE STATUS
 loss_of_signal                 : inactive
 loss_of_frame                  : inactive
 au4_path_lop                   : inactive
 equipment_failure              : inactive
 loss_of_synch                  : inactive
 signal_label_mismatch          : inactive
 path_trace_mismatch            : inactive
 loss_of_cell_delin             : inactive
 ms_ais                         : inactive
 au4_path_ais                   : inactive
 ms_rfi                         : inactive
 vc4_path_rfi                   : inactive
 failure_summary :
ATMPROMPT>
```

Logical Link Information

To display status information about the logical links, enter the SHOW LOGICAL_LINK command. The following example displays logical link information for port 2 of the A2-WAN module in slot 1:

```
ATMPROMPT>> show logical_link 1.2        [ENTER]

 Port Vpi Acn Side Mode Sig Traf  Bwidth Status         Index
-------------------------------------------------------------------------------
 1.02   0  01 netw enab 3.0 RB       400     UP         1

ATMPROMPT>
```

For more information on the SHOW LOGICAL_LINK command, see the Command Reference Guide.

Changing Default Configuration Parameters

The A2-WAN module is supplied with default settings for the ATM ports. These settings, and how to display or change them, are described in Appendix C, “Default Configuration Settings” on page 89.

Saving Configuration Settings

After configuring A2-WAN module and port settings, save your configuration settings by entering the SAVE MODULE_PORT command.

Connecting the Module to the Network

When you install an A2-WAN module, it is by default set to Isolated mode and all of its ports are disabled. When an A2-WAN module is isolated, no network activity takes place on it and it cannot be accessed by the network. This is a security measure that protects your ATM network from unauthorized access and module disfunction.

To establish the A2-WAN module's connection to the network, enter the following command at the ATM console prompt:

```
SET MODULE slot CONNECTED
```

where `slot` specifies the slot number of the A2-WAN module. The Module Status LED should light ON.

The module's ports will not be enabled. This allows you to configure the individual ports before enabling them. If you wish to enable both ports using the current values (either the default values if the module has not been used, or the previous values entered), enter the following command:

```
SET MODULE slot CONNECTED ENABLE
```

Verifying Module Operation

After configuring and saving ATM WAN module port and module settings, you can verify that the module is operating correctly by viewing the LEDs on the front panel:

- The Module Status LED should be ON.
- The Port Status LED should be ON.
- The Port Activity LED should be ON when traffic is present.

Table 14 on page 57 provides a full description of all the front panel LEDs.

A2-WAN Module Front Panel

ATM connections are made through the A2-WAN module by means of the ports on its front panel and its backplane interfaces. The A2-WAN module front panel is shown in Figure 12 on page 56. The meaning of each ATM WAN module LED is shown in Table 14 on page 57.

By pressing the Module Reset button, you interrupt and reset the operation of the A2-WAN module. All ATM data traffic and connections that are being transmitted are stopped. The change in status of the A2-WAN module (from normal operation to reset status) is reported to the A-CPSW.

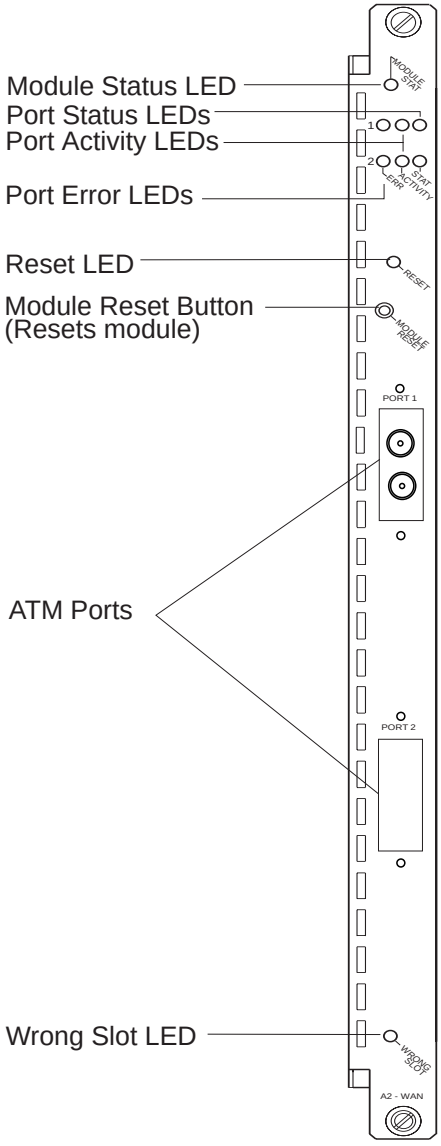

Figure 12. Front Panel

Table 14. Meaning of the ATM WAN module LEDs

LED Name	Color	State	Meaning
Module Status (MODULE STAT)	Green	OFF	Either no power is reaching the A2-WAN module or the module is inoperable (isolated).
		ON	Normal operation (connected).
Port Error (ERR)	Yellow	OFF	Normal operation.
		ON	Either no signal is detected or an error condition is detected on the port.
Port Activity (ACTIVITY)	Yellow	OFF	No ATM data traffic is being transmitted.
		ON	ATM cells are being transmitted.
Port Status (STAT)	Green	OFF	Port is disabled.
		ON	Port is enabled.
Reset	Yellow	OFF	Normal operation. Module is not being reset.
		ON	Module is being reset; data traffic is interrupted.
		Blinking (8260 only)	Internal clock failure.
Wrong Slot	Yellow	OFF	Normal operation.
		ON	A2-WAN module is installed in an incorrect slot and no power is reaching the module.

If you find any of the following operating conditions, see Chapter 6, “Troubleshooting” on page 61:

- The Module Status LED is not ON.
- A Port Status LED is not ON.
- A Port Activity LED is not ON during traffic.
- A Port Error LED is ON.
- The Reset LED is ON or is blinking.
- The Wrong Slot LED is ON.

Resetting a Port

Individual A2-WAN ports can be reset via the ATM control point console. When a reset is performed, the on-board microprocessor will be reset, the on-board FPGA devices reprogrammed, and power on diagnostics will be run (unless they have been deactivated). Resetting the port interrupts the transmission/reception of ATM cells.

To reset a single port on the A2-WAN module, enter the following command:

```
SET PORT slot.port PARM PORT_SOFT_RESET        [ENTER]
```

slot Slot number of the A2-WAN module.

port ATM port number.

PARM Required keyword

PORT_SOFT_RESET Parameter for resetting the port.

Example:

```
ATMPROMPT> set port 4.2 parm port_soft_reset        [ENTER]

ATMPROMPT>
```

Upgrading Port Microcode

Microcode updates for the A2-WAN module daughter cards 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
- 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

Upgrading the Microcode

To upgrade ATM port microcode, ATM network administrators, using the ATM console, perform inband operations from a server connected to an 8260 hub or workgroup switch.

After locating the directory where the microcode updates are stored, log on using the administrator password, and enter the following ATM 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 PORT
4. SET TFTP TARGET_PORT slot.port (where slot identifies the location of the module, and port identifies the port to be updated)
5. DOWNLOAD (to load the microcode).

Chapter 6. Troubleshooting

This chapter describes how to diagnose and solve problems that may arise with the operation of an A2-WAN module. These problems are signaled by the following conditions:

- The Module Status LED is not ON.
- The Port Status LED is not ON.
- The Port Activity LED is not ON during data transmission.
- A Port Error LED is ON.
- The Module Reset LED is either ON or blinking.
- The Wrong Slot LED is ON.

Before you start troubleshooting, be sure to carry out the procedure described in “Verifying LED Operation.”

When instructed to replace an A2-WAN module, proceed as described in “Replacing Modules” on page 69.

USA and Canada: If the problem is not resolved after following the troubleshooting procedures outlined in this chapter, call toll-free 800-IBM-SERV for IBM support.

Verifying LED Operation

Before troubleshooting an A2-WAN module, verify that all LEDs on the module are functioning properly:

8260 Press the LED Test button on the Fault-Tolerant Controller module in the 8260 hub.

8285 Press the RESET button on the base unit. Note that this action wil interrupt all traffic and reset the 8285.

All LEDs should light ON. If not, replace the module (see page “Replacing Modules” on page 69).

Module Status LED Is Not ON

During normal operation, the Module Status LED of an A2-WAN module should be ON. If not, the module is inoperable. Refer to Table 15 to diagnose and solve the problem.

Table 15. Problem Determination Using Module Status LED

Module Status LED	Module Status	Possible Cause	Corrective Action
OFF	Disabled or Isolated	Module is not receiving power.	1) Enter the `SET MODULE slot CONNECTED` command at the ATM console. 2) Check the Power Supply LEDs by following the instructions in "Verifying LED Operation" on page 61. 3) **(8260 only)** Check the power budget by entering the `SHOW POWER` command from the A-CPSW console, or Distributed Management Module (DMM) console if a DMM module is installed. For more information, refer to the Command Reference Guide. 4) Re-insert the A2-WAN module.
		Power budget has been exceeded. **(8260 only)**	Check the power budget by entering the `SHOW POWER` command from the A-CPSW console, or DMM console if a DMM module is installed.
		Status LED is burned out.	1) Check the Status LED by following the instructions in "Verifying LED Operation" on page 61. 2) If necessary, replace the module.
		Module is faulty.	Replace the module.

Port Status LED Is Not ON

When the Status LED of an ATM WAN module port is not ON, the port has detected a possible problem. Refer to Table 16 to diagnose and solve the problem.

Table 16. Problem Determination Using Port Status LED

Status LED	Port Status	Possible Cause	Corrective Action
OFF	Disabled	Port is disabled.	Enable port.
		Module is not receiving power.	1) Check the Module Status LED by following the instructions in “Verifying LED Operation” on page 61. 2) Re-insert the A2-WAN module.
		Status LED is burned out.	1) Check the Port Status LED by following the instructions in “Verifying LED Operation” on page 61. 2) If necessary, replace the module.
		Module is faulty.	Perform the wrap tests described in “Determining the Failing Component Using a Wrap Test” on page 67.

Port Activity LED Is Not ON During Traffic

If during continuous traffic the Activity LED of an ATM WAN module port is not ON, refer to Table 17 to diagnose and solve the problem.

Table 17. Problem Determination Using Port Activity LED

Activity LED	Possible Cause	Corrective Action
OFF	Port is disabled.	Enter the `SHOW PORT` command at the ATM console to see if port is enabled.
	Module is not receiving power.	1) Check the Module Status and Power Supply LEDs by following the instructions in “Verifying LED Operation” on page 61. 2) Re-insert the A2-WAN module.
	Activity LED is burned out.	1) Check the Activity LED by following the instructions in “Verifying LED Operation” on page 61. 2) If necessary, replace the module.
	Port is faulty.	Perform the wrap tests described in “Determining the Failing Component Using a Wrap Test” on page 67.
	There is a bad connection on the ATM backplane.	1) Remove the A2-WAN module and re-insert it in the same slot. 2) If the problem persists, insert the module in another slot.
	UNI port is enabled but not in service.	From the ATM host, make sure that the station attached to the port has been assigned an ATM address and that the address is unique within the network.

Port Error LED Is ON

When an Error LED of an ATM WAN module port is ON, the port has entered into an error condition. Table 18 describes the possible problems that may occur and the corrective action to take for each problem.

Table 18. Problem Determination Using the Port Error LED

Error LED	Meaning	Possible Cause	Corrective Action
ON	Error condition on the port	Module is faulty.	Perform the wrap tests described in "Determining the Failing Component Using a Wrap Test" on page 67.
		Cable attached to the A2-WAN port is faulty.	1) Change the cable. 2) Perform the wrap tests to determine the failing component. 3) Check the cable type.
		Remote station attached to the A2-WAN port is either turned OFF or inoperable.	Check the remote station. If the station is turned OFF, turn ON the station. If the station is inoperable, restart the application running on it.

Reset LED Is ON or Starts Blinking

When the Reset LED of an A2-WAN module is ON or starts blinking, the module has entered into an error condition. Table 19 describes the possible problems that may occur and the corrective action to take for each problem.

Table 19. Problem Determination Using the Module Reset LED

Reset LED	Meaning	Possible Cause	Corrective Action
ON	Error condition	Module is faulty.	Perform the wrap tests described in "Determining the Failing Component Using a Wrap Test" on page 67.
		There is a bad connection on the ATM backplane.	1) Remove the A2-WAN module and re-insert it in the same slot. 2) If the problem persists, insert the module in another slot.
Blinking **(8260 only)**	Error condition	Internal clock failure.	Replace the module.
		Module is either faulty or not securely plugged into the ATM backplane.	1) Remove the A2-WAN module and re-insert it. 2) If the problem persists, replace the module.
		There is a bad connection on the ATM backplane.	1) Remove the A2-WAN module and re-insert it in the same slot. 2) If the problem persists, insert the module in another slot.

Wrong Slot LED Is ON (8260 only)

When the Wrong Slot LED of an A2-WAN module is ON, the module is not installed in the correct slot. Remove the module from the hub and re-insert it into any blank slot in positions 1 to 8 (or 12 to 17 in A17 models). (Slots 9-10, and 11 in A17 models are reserved for the A-CPSW module). Slot 12 in 17-slot models cannot be used if an A-CPSW module is installed in slot 11.

Determining the Failing Component Using a Wrap Test

In the troubleshooting procedures in this chapter, you are sometimes instructed to perform a wrap test in order to determine the failing component (for example, daughter card or motherboard) that caused the problem in an ATM WAN module connection.

There are four types of wrap tests:

Internal The ATM cell interface on the daughter card is looped back onto itself internally.

External The ATM cell interface on the daughter card is looped back onto itself via an external cable.

Reply-mode A wrap is set up on the port of a local 8260 hub or workgroup switch, and a loop is established from the port on the remote hub or workgroup switch.

Far-end-mode (DS3 only) The local 8260 hub or workgroup switch establishes a loop from the local port to a port connected to a remote 8260 hub or workgroup switch. The reply-mode request is sent via the channel 1 FEAC. This wrap test is only available when C-bit parity framing format is used. (see "DS3 Framing Format" on page 97.) The far-end wrap test is a two step process:

1. The far-end mode is enabled, and the loop established.
2. The far-end test is executed, and the loop is released.

   Note: If the connection is broken before the test has completed, the loop can be released manually.

Note: Before running a wrap test, the module must be connected and the port disabled.

1. Enter the SHOW MODULE command to display the status of the module and its ports.
2. If the module is `isolated`, enter the SET MODULE slot CONNECTED command, where slot indicates the location of the module. Then press Enter.
3. If the port is enabled, enter the `SET PORT slot.port DISABLE` command, where `slot` is the slot number of the A2-WAN module to be tested, and `port` is the number of the port (1 or 2). Then press Enter.

Internal Wrap Test

To perform an internal wrap test:

1. Enter the `WRAP slot.port INTERNAL` command, where `slot` is the slot number of the A2-WAN module and `port` is the number of the port. Then press Enter.
2. If you receive the message `KO Test Failed`, the motherboard is faulty and should be replaced.

External Wrap Test

To perform an external wrap test:

1. Insert a wrap plug in the port.

2. Enter the `WRAP slot.port EXTERNAL` command, where `slot` is the slot number of the module and `port` is the number of the port. Then press Enter.

If you receive a return code of `KO Test Failed`, the daughter card is faulty and should be replaced.

If you receive a return code of `OK Test Successful`, and if another 8260 hub or workgroup switch is attached to the port, perform a Reply-mode wrap test or far_end_mode wrap test (DS3 only).

If you receive a return code of `OK Test Successful` and if another device besides an 8260 hub or workgroup switch (for example, a workstation adapter over a UNI connection) is attached to the port, return to the troubleshooting procedure and follow the next step.

Reply-mode Wrap Test

To perform a reply-mode wrap test:

1. Enable the wrap procedure on the remote ATM WAN module port by entering the `WRAP slot.port REPLY_MODE ENABLE` command. Then press Enter.
2. From the console attached to the local hub, enter `WRAP slot.port EXTERNAL`. This command sends a signal across the connection to the remote (wrapped) port on the attached 8260 hub or workgroup switch. The test result appears on the console of the local hub or workgroup switch.

   If you receive a return code of `KO Test Failed`, either the cable is faulty and should be replaced, or the fault lies with the transceiver of the remote 8260 hub or workgroup switch. If you receive a return code of `OK Test Successful`, the cause of the problem is on the remote 8260 hub or workgroup switch.
3. Disable the wrap procedure on the remote ATM WAN module port by entering `WRAP slot.port REPLY_MODE DISABLE` from the console attached to the remote hub or workgroup switch. Then press Enter.
4. Perform an internal and external wrap test on the ATM WAN module port on the remote 8260 hub or workgroup switch in order to determine the failing component.

Far-end-mode Wrap Test

To perform an far-end-mode wrap test:

1. Enter the `WRAP slot.port far_end_mode enable` command. Then press Enter.
2. Enter the `WRAP slot.port far_end_test` command. Then press Enter.

If the connection is broken before the test has completed, the loop will not be automatically released. To release the loop, enter the `WRAP slot.port far_end_mode disable` command.

Replacing Daughter Cards

After running a wrap test, you may find that the daughter card is faulty and you need to replace it. Or, while troubleshooting a problem from the condition of the ATM WAN module LEDs, you may be instructed to replace a daughter card.

To replace a daughter card follow these steps:

1. Enter `SET MODULE slot ISOLATED` where `slot` is the slot number of the 8260 Nways ATM WAN module containing the daughter card. Then press Enter.
2. Remove the module from the hub or workgroup switch expansion unit.
3. Unscrew and remove the screws that secure the daughter cards to the faceplate (two for each daughter card installed). See Figure 5 on page 31 for details.

   CAUTION:
   If two daughter cards are installed, all four screws must be removed.
4. Unscrew and remove the ten screws that secure the motherboard to its frame.
5. Slide the motherboard out of its frame.
6. Unscrew and remove the three screws that secure the failed daughter card to the motherboard.
7. Remove the VPD PROM chip for the daughter card being replaced.
8. Install a new daughter card and VPD PROM chip on the motherboard as described in “Installing Daughter Cards” on page 30.
9. Re-insert the motherboard into its frame, and insert the 10 screws that secure it.
10. Re-insert the screws that secure the daughter card(s) to the faceplate.
11. Re-insert the module into the hub or workgroup switch expansion unit.
12. Enter `SET MODULE slot CONNECTED` where `slot` is the slot number of the module. Then press Enter.

Replacing Modules

The troubleshooting procedures in this chapter sometimes instruct you to replace a failing A2-WAN module. To do so, follow these steps:

1. Enter `SET MODULE slot ISOLATED` where `slot` is the slot number of the failed module. Then press Enter.
2. Remove the failed module and insert another A2-WAN module in its slot.
3. Enter `SET MODULE slot CONNECTED` where `slot` is the slot number of the failed module. Then press Enter.

The new A2-WAN module is automatically configured with the last settings configured for the slot number you entered.

Running Diagnostics

There are three types of diagnostics:

Power On Diagnostics: run automatically after the module is reset

Audit Diagnostics run continuously when the module is operational

On Demand Diagnostics run on request, by entering the `SET PORT DIAG_PATTERN` command.

Power On Diagnostics

The diagnostics are run each time the module is initialized, unless deactivated by the SET PORT command (`SET PORT slot.port parm address 100 1`).

To enable power on diagnostics, if they are disabled, enter the `SET PORT slot.port parm address 100 0` command.

The diagnostics test memory access, register access, data path continuity, and basic device functionality on the ports.

The results of the power on diagnostics are displayed in the EQUIPMENT_TEST_RESULT field displayed after entering the following command from the ATM console:

```
SHOW PORT slot.port verbose        [ENTER]
```

slot.port Slot number where the A2-WAN module is installed and port for which results are to be displayed.

Example: The following examples shows the Equipment Test Results fields displayed from the `SHOW MODULE slot.port VERBOSE` command.

```
ATMPROMPT> show port 2.2 verbose       [ENTER]

EQUIPMENT_TEST_RESULTS
 Test results                  : failed
 Test number                   : 64
 Test address                  : 0
 Expected data                 : 0
 Received data                 : 0
 Suspected part                : FLASH
 Interface error               : no

ATMPROMPT>
```

The following table describes the fields displayed:

Table 20. Power On Diagnostics

Field	Description
Test results	This field shows whether the diagnostics have completed successfully, failed, or are currently active.
Test number	Number of the failed test (1-200)
Test address	Address where test failed (412 = most significant, 415 = least significant)
Expected data	Data pattern expected by the test when the diagnostics failed.
Received data	Data pattern received by the test
Suspected part	This field indicates the part suspected of causing the diagnostics to fail: • processor • flash memory • static RAM • dual port RAM • S/UNI device • one FPGA • FPGA 1 • FPGA 2 • write address FIFO
Interface error	This field indicates whether an interface error has caused the diagnostics to fail.

Audit Diagnostics

Audit diagnostics run continuously and verify that telecom devices are accessible and properly configured. If an error is found, the error information is stored at address offset 420-421.

To display the Audit Diagnostics results, enter the SHOW PORT command as follows:

```
SHOW PORT slot.port ADDRESS 420        [ENTER]
```

16 consecutive addresses from 420 are displayed. The results of the Audit diagnostics are shown in the first two bytes. Table 21 shows the possible values of the first two bytes and their meanings.

Table 21 (Page 1 of 2). Audit Diagnostics

First two bytes (in HEX)	Description
00 00	no error
00 01	integration time failure
00 02	decay time failure
00 03	timing source failure
00 04	unscramble received cell failure
00 05	receive errors failure
00 06	discard error cells failure
00 07	discard idle cells failure
00 08	scramble transmit cells failure
00 09	generate transmit HEC failure
00 0A	monitor signal label failure
00 0B	monitor path trace failure
00 0C	transmit path trace failure
00 0D	expected receive path trace failure
00 0E	coset polynomial failure
10 01	terminal loopback

Table 21 (Page 2 of 2). Audit Diagnostics

First two bytes (in HEX)	Description
10 02	facility loopback

Example: The following example shows the value 00 01 in the first two bytes, indicating that the Audit diagnostics detected an integration time failure.

```
ATMPROMPT> show port 2.2 parm address 420       [ENTER]
Actual value : 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00

ATMPROMPT>
```

On Demand Diagnostics

On Demand diagnostics can be run from terminal dialog. The diagnostic selections are not stored in flash memory, so, if the module is reset, the diagnostics settings will revert to the defaults.

A pattern of 8 bytes can be set to test the control interface between the ATM control point and the A2-WAN ATM port. ATM control point software can read the diagnostic pattern and write it back again in order to test the data path without affecting the operation of the port. The pattern is stored at address offset 070 through 077.

Displaying the Diagnostics Pattern: To display the current diagnostics pattern, enter the following command:

```
SHOW PORT slot.port verbose        [ENTER]
```

slot Slot number of the A2-WAN module.

port ATM port number.

verbose Required keyword.

The diagnostics pattern is displayed under the heading 'Diagnostics' in the output from the command (see page 48 for an example).

Setting a Diagnostics Pattern: A value of 00 to 0F can be set for each of the 8 bytes (set to 00 for each byte by default).

To set a pattern, enter the following command:

```
SET PORT slot.port PARM ADDRESS xxx value        [ENTER]
```

slot Slot number of the A2-WAN module.

port ATM port number.

PARM Required keyword.

ADDRESS Required keyword.

xxx Address of the byte to be set (070 through 077). Only one byte may be set at a time. Repeat the command, changing the address to complete a pattern.

value The value to be applied to the setting. If no value is entered, the setting is displayed and may be altered if required.

Example

```
ATMPROMPT> set port 2.2 parm address 070       [ENTER]
Actual value : 01
Enter required value: 22        [ENTER]

ATMPROMPT>
```

Clearing Diagnostic Results: To clear the results of the diagnostics, address 081 must be set to a value of 1. To do this, enter the following command:

```
SET PORT slot.port PARM ADDRESS 081 1        [ENTER]
```

Failure Status

The A2-WAN module software continually monitors the ports for failure.

The Failure Status for individual ports can be displayed via the SHOW PORT command (SHOW PORT slot.port VERBOSE, where slot.port indicates the slot where the A2-WAN module is installed and the port to be displayed).

DS3 Ports: The following table lists the possible failures displayed.

Table 22. Failure Status Fields

Field	Description
loss_of_signal	A value of 1 in this field indicates that a Loss of Signal defect was detected.
loss_of_frame	A value of 1 in this field indicates that a Loss of Frame defect was detected, and a Loss of Signal failure is not present.
equipment_failure	A value of 1 in this field indicates that an equipment failure was detected.
loss_of_synch	A value of 1 in this field indicates that a synchronization error was detected.
loss_of_cell_delin	A value of 1 in this field indicates that a loss of cell delineation was detected.
ds3_ais	A value of 1 in this field indicates that a DS3 Alarm Indication Signal was detected.
ds3_rai	A value of 1 in this field indicates that a DS3 Remote Alarm Indication defect was detected. C-bit: a Loss of Signal, Loss of Frame, Alarm Indication Signal, or equipment failure is indicated in the FEAC channel.
pclp_loss_of_frame	A value of 1 in this field indicates that a PCLP loss of frame was detected.
pclp_rai	A value of 1 in this field indicates that a PCLP Remote Alarm Indication was detected.
idle_signal	A value of 1 in this field indicates that an idle signal was detected.

E3 Ports: The following table lists the possible failures displayed.

Table 23. Failure Status Fields

Field	Description
loss_of_signal	A value of 1 in this field indicates that a Loss of Signal defect was detected.
loss_of_frame	A value of 1 in this field indicates that a Loss of Frame defect was detected, and a Loss of Signal failure is not present.
equipment_failure	A value of 1 in this field indicates that an equipment failure was detected.
loss_of_synch	A value of 1 in this field indicates that a synchronization error was detected.
loss_of_cell_delin	A value of 1 in this field indicates that a loss of cell delineation was detected.
e3_rfi	A value of 1 in this field indicates that an E3 Remote Failure Indication defect was detected.
e3_ais	A value of 1 in this field indicates that an E3 Alarm Indication Signal was detected.
payload_type_mismatch	A value of 1 in this field indicates that a payload type mismatch was detected.
trail_trace_mismatch	A value of 1 in this field indicates that a trail trace mismatch was detected.

OC3 Ports The following table lists the possible failures displayed.

Table 24. On Demand Diagnostics

Field	Description
loss_of_signal	A value of 1 in this field indicates that a Loss of Signal defect was detected.
loss_of_frame	A value of 1 in this field indicates that a Loss of Frame defect was detected, and a Loss of Signal failure is not present.
sts_path_lop	A value of 1 in this field indicates that a loss of pointer was detected.
equipment_failure	A value of 1 in this field indicates that an equipment failure was detected.
loss_of_synch	A value of 1 in this field indicates that a synchronization error was detected.
signal_label_mismatch	A value of 1 in this field indicates that a signal label mismatch was detected.
path_trace_mismatch	A value of 1 in this field indicates that a path trace mismatch was detected.
loss_of_cell_delineation	A value of 1 in this field indicates that a loss of cell delineation was detected.
line_ais	A value of 1 in this field indicates that a Line Alarm Indication Signal was detected.
sts_path_ais	A value of 1 in this field indicates that an STS path Alarm Indication Signal was detected.
line_rfi	A value of 1 in this field indicates that a Line Remote Failure Indication was detected.
sts_path_rfi	A value of 1 in this field indicates that an STS-3C Remote Failure Indication was detected.

STM-1 Ports The following table lists the possible failures displayed.

Table 25. On Demand Diagnostics

Field	Description
loss_of_signal	A value of 1 in this field indicates that a Loss of Signal defect was detected.
loss_of_frame	A value of 1 in this field indicates that a Loss of Frame defect was detected, and a Loss of Signal failure is not present.
au4_path_lop	A value of 1 in this field indicates that a loss of pointer was detected.
equipment_failure	A value of 1 in this field indicates that an equipment failure was detected.
loss_of_synch	A value of 1 in this field indicates that a synchronization error was detected.
signal_label_mismatch	A value of 1 in this field indicates that a signal label mismatch was detected.
path_trace_mismatch	A value of 1 in this field indicates that a path trace mismatch was detected.
loss_of_cell_delineation	A value of 1 in this field indicates that a loss of cell delineation was detected.
ms_ais	A value of 1 in this field indicates that a Line Alarm Indication Signal was detected.
au4_path_ais	A value of 1 in this field indicates that an AU4 path Alarm Indication Signal was detected.
ms_rfi	A value of 1 in this field indicates that a Multiplex Section (MS) Remote Failure Indication was detected.
vc4_path_rfi	A value of 1 in this field indicates that a VC4 Remote Failure Indication was detected.

Appendix A. Technical Specifications

General

Feature Codes	5302 (Motherboard) 8501 (E3 I/O card) 8502 (DS3 I/O card) 8503 (OC3 Sonet Singlemode Fiber I/O card) 8504 (OC3 Sonet Multimode Fiber I/O card) 8505 (STM-1 SDH Singlemode Fiber I/O card) 8506 (STM-1 SDH Multimode Fiber I/O card)
Faceplate Marking	A2-WAN (Feature Code 5302) E3 (Feature Code 8501) DS3 (Feature Code 8502) O-SF (Feature Code 8503) O-MF (Feature Code 8504) S-SF (Feature Code 8505) S-MF (Feature Code 8506)
Number of Ports	2
Connectors	BNC (Feature Codes 8501/8502) SC fiber (Feature Codes 8503/8504/8505/8506)

Electrical

Power Requirement	34.2 Watts for +5.25V (18.4 Watts for the motherboard plus 7.9 Watts for each I/O card)
Power Consumption	6.5 Amps for +5.25V
Fuses	7 Amps for +5.25V

Environmental

Operating Temperature	10°C to 50°C (50°F to 122°F)
Storage Temperature	–10°C to +60°C (14°F to 140°F)
Humidity	0 to 95 % RH

Mechanical

Dimensions	2.5 cm. (1.0 in) Width 10.27 cm. (10.7 in) Length 38.5 cm. (15.2 in) Height
Weight	1.5 kg (3.3 lbs)

Optical Specifications

This section describes the optical specifications for A2-WAN module transmitters and receivers with SC singlemode and SC multimode connectors.

Additional information on A2-WAN module transmitter and receiver parameters is given in the notes at the end of each section. The note relevant for a parameter is shown by the superscript number following the parameter name in each table.

SC Singlemode Transmitters

- Light Source: LASER at 1300 ± 20 nm wavelength.
- Power coupled into fiber cable includes SC connector loss.

Table 26. SC Singlemode Transmitters: Optical Specifications

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
Optical Power Output (P_O):				
9/125 micron cable[1]	-15	—	-8	dBm avg
Center Wavelength (λ_c)	1261	1300	1360	nm

Notes:

1. These optical power values are measured with the following conditions:
   - At the Beginning Of Life (BOL).
   - Over the specified operating voltage and temperature ranges.
   - With HALT Line State (12.5 MHz square-wave) input signal.
   - At the end of one meter of noted optical fiber with cladding modes removed.

   The average power value can be converted to a peak power value by adding 3 dB.

SC Singlemode Receivers

Table 27. SC Singlemode Receivers: Optical Specifications

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
Optical Power Input: Minimum at Window Edge[1] ($P_{IN\ Min}$ W)	—	—	-29	dBm avg
Maximum ($P_{IN\ Max}$)	-8	—	—	dBm avg
Operating Wavelength (λ)	1261	—	1360	nm

Notes:

1. This specification is intended to indicate the performance of the receiver section of the transceiver when Input Optical Power signal characteristics are present according to the following conditions, the Input Optical Power dynamic range from the minimum level (with a window time-width) to the maximum level is the range over which the receiver is guaranteed to provide output data with a Bit Error Ratio (BER) better than or equal to 2.5×10^{-10}.

SC Multimode Transmitters

- Light Source: GaA1As LED at 1300 ± 20 nm wavelength.
- Power coupled into fiber cable includes SC connector loss.

Table 28. SC Multimode Transmitters: Optical Specifications

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
Optical Power Output (P_O):				
50/125 micron cable[1,2] NA 0.20 fiber	-22.5	-18	-14	dBm avg
62.5/125 micron cable[1] NA 0.275 fiber	-19	-16	-14	dBm avg
Center Wavelength[3] (λ_c)	1270	1300	1380	nm

Notes:

1. These optical power values are measured with the following conditions:
   - At the Beginning Of Life (BOL).
   - Over the specified operating voltage and temperature ranges.
   - With HALT Line State (12.5 MHz square-wave) input signal.
   - At the end of one meter of noted optical fiber with cladding modes removed.

   The average power value can be converted to a peak power value by adding 3 dB.
2. This transmitter is available on special request with coupled optical power guaranteed into 50/125 micron fiber cables. The value will depend on the specific NA of the 50/125 micron fiber used.
3. This parameter complies with the FDDI PMD requirements for the tradeoffs between center wavelength, spectral width, and rise/fall times. The temperature coefficient of the center wavelength is typically +0.37 nm/°C.

SC Multimode Receivers

Table 29. SC Multimode Receivers: Optical Specifications

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
Optical Power Input: Minimum at Window Edge[1] ($P_{IN\ Min}$ W)	—	-34	-30	dBm avg
Maximum ($P_{IN\ Max}$)	-14	-13	—	dBm avg
Operating Wavelength (λ)	1270	—	1380	nm

Notes:

1. This specification is intended to indicate the performance of the receiver section of the transceiver when Input Optical Power signal characteristics are present according to the following conditions, the Input Optical Power dynamic range from the minimum level (with a window time-width) to the maximum level is the range over which the receiver is guaranteed to provide output data with a Bit Error Ratio (BER) better than or equal to 2.5×10^{-10}.

Appendix B. ATM Components

Table 30 lists the part numbers of ATM components (wrap plugs, adapters, cables, and so on) that can be ordered for use with the A2-WAN module.

Table 30. Part Numbers of ATM Components

ATM Component	IBM Part Number
SC wrap plug	19G5609
SC-to-SC Coupler	33G2744
MIC-to-SC 62.5/125 micron ATM jumper cable, 2 m (6.5 ft)	19G6707
MIC-to-SC 62.5/125 micron ATM jumper cable, 4 m (13 ft)	19G4797
MIC-to-SC 62.5/125 micron ATM jumper cable, 6 m (20 ft)	19G4798
MIC-to-SC 62.5/125 micron ATM jumper cable, 10 m (33 ft)	19G4799
MIC-to-SC 62.5/125 micron ATM jumper cable, 20 m (66 ft)	19G4800
MIC-to-SC 62.5/125 micron ATM jumper cable, 40 m (135 ft)	19G4801
MIC-to-SC 62.5/125 micron ATM jumper cable, custom lengths	19G4796
SC-to-SC 62.5/125 micron ATM jumper cable, 2 m (6.5 ft)	19G6706
SC-to-SC 62.5/125 micron ATM jumper cable, 4 m (13 ft)	19G4864
SC-to-SC 62.5/125 micron ATM jumper cable, 6 m (20 ft)	19G4865
SC-to-SC 62.5/125 micron ATM jumper cable, 10 m (33 ft)	19G4866
SC-to-SC 62.5/125 micron ATM jumper cable, 20 m (66 ft)	19G4867
SC-to-SC 62.5/125 micron ATM jumper cable, 40 m (135 ft)	19G4868
SC-to-SC 62.5/125 micron ATM jumper cable, custom lengths	19G4863
Optical fiber cleaning kit	5453521

Appendix C. Default Configuration Settings

The A2-WAN module is supplied with default settings for the ATM ports. These settings can be changed with the SET PORT command from the ATM Control Point console. This appendix describes the default settings, the possible alternate settings, and how to change them.

- Parameters common to all daughter cards are detailed in “Common Parameters” on page 91.
- Additional parameters specific to E3 daughter cards are detailed in “E3 Parameters” on page 95.
- Additional parameters specific to DS3 daughter cards are detailed in “DS3 Parameters” on page 97.

Displaying Current Settings

The current setting of a parameter is displayed via the `SHOW PORT` command. Frequently used parameters are displayed when the `SHOW PORT slot.port VERBOSE` command is issued, and all other settings are displayed individually when the `SET PORT` command is issued along with the address of the parameter to be displayed. 16 bytes are displayed, starting from the address specified.

Table 31 summarizes which method should be used.

Table 31. Displaying Parameters

Parameter	To Display:
Failure_integration_time Failure_decay_time Timing_source Descramble_rcv_cells Discard_idle_cells Scramble_xmt_cells	`SHOW PORT slot.port VERBOSE`
All other parameters	`SHOW PORT slot.port ADDRESS address`

Examples: For an example of how to display parameters using the `SHOW PORT VERBOSE` command, see “Port Information” on page 47.

This example shows how to display the setting of the power on diagnostics.

```
ATMPROMPT> show port 4.2 address 100        [ENTER]

Actual value: 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
ATMPROMPT>
```

Note that 16 bytes are displayed, starting with address 100. The value `01` in the first byte (address 100), shows that the diagnostics are enabled (see “Power On Diagnostics” on page 93).

Changing Current Settings

The current setting of a parameter is changed via the `SET PORT` command. Frequently used parameters can be changed when the `SET PORT slot.port PARM name` command is issued, where `name` defines the name of the parameter to be changed, and `value` signifies the new value to be applied. All other settings are changed when the `SET PORT slot.port PARM ADDRESS address value` command is issued, `address` specifying the address of the parameter to be changed, `value` specifying the new value (in hex). If no value is entered, the current setting is displayed, and you are given the option of entering a new setting.

Table 32 summarizes which method should be used.

Table 32. Changing Parameters

Parameter	To Change:
Failure_integration_time Failure_decay_time Timing_source Descramble_rcv_cells Discard_idle_cells Scramble_xmt_cells	`SET PORT slot.port PARM name value`
All other parameters	`SET PORT slot.port PARM ADDRESS address value`

Examples: This example shows how to change the timing source to external timing:

```
ATMPROMPT> set port 4.2 parm timing_source 1        [ENTER]

ATMPROMPT>
```

This example shows how to change the setting of the power on diagnostics to disabled:

```
ATMPROMPT> set port 4.2 parm address 100 0      [ENTER]

ATMPROMPT>
```

Common Parameters

The parameters detailed in this section are common to all types of daughter card. For additional card-specific parameters, see also:

- “E3 Parameters” on page 95
- “DS3 Parameters” on page 97
- “OC3/STM-1 Parameters” on page 99.

Failure Integration Time

The amount of time that a defect must be continually present before being deemed a failure is set by default to 2.5 seconds.

parameter `failure_int_time`

values See the table below for possible values.

Table 33. Failure Integration Time Parameter Values

Value	Seconds	Value	Seconds	Value	Seconds	Value	Seconds	Value	Seconds
00	0.0	05	2.5	0A	5.0	0F	7.5	14	10.0
01	0.5	06	3.0	0B	5.5	10	8.0		
02	1.0	07	3.5	0C	6.0	11	8.5		
03	1.5	08	4.0	0D	6.5	12	9.0		
04	2.0	09	4.5	0E	7.0	13	9.5		

Failure Decay Time

The amount of time that a defect must be continually absent before being the failure is cleared is set by default to 10.0 seconds.

parameter `failure_decay_time`

values See the table below for possible values.

Table 34. Failure Decay Time Parameter Values

Value	Seconds	Value	Seconds	Value	Seconds	Value	Seconds	Value	Seconds
00	0.0	09	4.5	12	9.0	1B	13.5	24	18.0
01	0.5	0A	5.0	13	9.5	1C	14.0	25	18.5
02	1.0	0B	5.5	14	10.0	1D	14.5	26	19.0
03	1.5	0C	6.0	15	10.5	1E	15.0	27	19.5
04	2.0	0D	6.5	16	11.0	1F	15.5	28	20.0
05	2.5	0E	7.0	17	11.5	20	16.0		
06	3.0	0F	7.5	18	12.0	21	16.5		
07	3.5	10	8.0	19	12.5	22	17.0		
08	4.0	11	8.5	1A	13.0	23	17.5		

Timing Source

The timing source used for transmission signal timing can be set to be derived from the receive signal (Facility timing), the external interface (External timing), or the daughter card (Internal timing).

parameter `timing_source`

values
`0` = Facility timing (default)
`1` = External timing
`2` = Internal timing

Unscrambling of ATM Cells

The ATM cells received by the port are unscrambled by default.

parameter `descramble_rcv_cells`

values `0` = unscrambling disabled
`1` = unscrambling enabled (default)

Discarding of Idle ATM Cells

Idle ATM cells (cells with VPI and VCI fields of zeroes) received by the port are discarded by default.

parameter `discard_idle_cells`

values `0` = discard disabled
`1` = discard enabled (default)

Scrambling of Transmitted Cells

The scrambling of ATM cells transmitted by the port is performed by default.

parameter `scramble_xmt_cells`

values `0` = scrambling disabled
`1` = scrambling enabled (default)

Power On Diagnostics

Power On diagnostics test memory access, register access, data path continuity and basic device functionality on the port, after each reset of the port. These diagnostics are enabled by default. Disabling the diagnostics will minimize the time required for the port to be initialized.

address `100`

values `0` = disabled
`1` = enabled (default)

Correction of Header Errors

The correction of single bit errors in the header of ATM cells received by the port is enabled by default.

address `105`

values `0` = error correction disabled
`1` = error correction enabled (default)

Discarding of ATM Cells with Uncorrectable Headers

ATM cells with uncorrectable header errors received by the port are discarded by default. They are not passed to the ATM Control Point.

address 106

values 0 = discard disabled
1 = discard enabled (default)

Generation of Header Error Control (HEC) Field

The generation of the HEC field in ATM cells that are to be transmitted over the ATM port is performed by default. The port generates the HEC field and inserts it into the transmitted cells. Applications that require the ATM Control Point to generate the field should disable this function.

address 109

values 0 = generation disabled
1 = generation enabled (default)

E3 Parameters

The parameters detailed in this section apply to E3 daughter cards only.

For information on DS3 parameters, see “DS3 Parameters” on page 97.

Addition of Coset Polynomial in ATM Cell Headers

The addition of the coset polynomial to the HEC byte in ATM cell headers is performed by default.

address `10A`

values `0` = coset polynomial not added
`1` = coset polynomial added (default)

E3 Framing Format

The E3 transmit framing format is by default set to G.832. When other framing formats are supported in future releases, the format may be changed.

address `10B`

values `0` = G.832 format used for transmit

E3 Transmit Timing Marker

When external timing is used (see “Timing Source” on page 92), transmit timing can be deemed traceable to a primary reference clock.

address `10C`

values `0` = external clock is a primary reference clock
`1` = external clock is not a primary reference clock (default)

Monitoring of Payload Type

The monitoring of payload type mismatch failures can be enabled or disabled. When enabled, failures are declared when the payload field of the E3 overhead does not contain the proper value.

address `10D`

values `0` = monitoring disabled
`1` = monitoring enabled (default)

Monitoring of Trail Mismatch Failures

The monitoring of trail mismatch failures can be enabled or disabled. When enabled, failures are declared when the 16-byte trail trace received does not match the expected receive trail trace (see “Expected Trail Trace”).

address 10E

values 0 = monitoring disabled (default)
1 = monitoring enabled

Trail Trace Format

The trail trace format applies to both the transmit and receive trail traces. The 16-byte trail trace format can be specified to include a CRC7 in the first byte.

address 10F

values 0 = 16-byte format
1 = 16-byte format with CRC7 in first byte (default)

Transmit Trail Trace

A trail access point identifier (16 bytes in length) is usually transmitted so that the trail receiving terminator can verify that it is connected to the correct transmitter. If the trail trace format is set to include a CRC7 in the first byte, only bytes 1-15 of the 16 byte field are significant.

address 110 to 11F

values 00-FF for each byte. Default is 89 for the first byte, all remaining bytes 00.

Expected Trail Trace

The trail trace that is expected to be received can be specified so that when the monitoring of trace mismatch failures is active (see “Monitoring of Trail Mismatch Failures”), a failure can be signalled if the received trail trace differs. If the trail trace format is set to include a CRC7 in the first byte, only bytes 1-15 of the 16 byte field are significant.

address 120 to 12F

values 00-FF for each byte. Default is 89 for the first byte, all remaining bytes 00.

Generation of RDI Signal

An E3 RDI signal can be generated when of loss of cell delineation occurs.

address 130

values 0 = transmission of RDI signal disabled
1 = transmission of RDI signal enabled (default)

DS3 Parameters

The parameters detailed in this section apply to DS3 daughter cards only.

For information on E3 parameters, see “E3 Parameters” on page 95.

Addition of Coset Polynomial in ATM Cell Headers

The addition of the coset polynomial to the HEC byte in the ATM cell headers is performed by default.

address 10A

values 0 = coset polynomial not added
1 = coset polynomial added (default)

DS3 Framing Format

The DS3 transmit framing format can be set to either C-bit parity or M23 format. Enforced C-bit parity is set by default. The format can also be set so that C-bit parity automatically reverts to M23 format if the received DS3 signal is in M23 format.

address 10B

values 0 = M23 format forced
1 = C-bit parity format preferred
2 = C-bit parity format forced (default)

DS3 Line Buildout

The trasmnit DS3 line buildout is determined by the length of the cable connected to the ATM port. If the cable is between 0 and 225 feet (0 and 68.5 m), the default setting should be used. If the length of cable is between 225 and 450 feet (68.5 and 137.1 m), the setting should be changed to 1.

address 10C

values 0 = 0 to 225 feet (default)
1 = 225 to 450 feet

PLCP Framing

A PLCP (Physical Layer Convergence Protocol) can be used in the transmit and receive DS3 signals. When used (default), 41.1 Mbps of bandwidth is allocated to ATM cell traffic, while direct mapping of ATM cells provides up to 44.21 Mbps of bandwidth for ATM traffic. If not used, ATM cells are mapped directly into the DS3 payload and cell delineation is based on the HEC field.

address 10D

values 0 = PLCP disabled
1 = PLCP enabled (default)

PLCP Timing Source

The timing source for the transmit PLCP can be independent of transmit DS3 timing. By default, the timing is derived from the receive PLCP signal, and may be changed to derive timing from the transmit DS3 signal or from the external interface.

address 10E

values 1 = external 8kHz timing
3 = receive PLCP (default)
4 = transmit DS3

Transmitting Z Bytes

Transmit Z bytes can either be derived from an external source or be filled with zeroes (default). When an external source is used, the bytes are derived from the XPOHDATA (Transmit PLCP Overhead Data) signal.

address 10F

values 0 = all zeroes (default)
1 = external source

OC3/STM-1 Parameters

The following parameters are common for OC3 and STM-1 daughter cards.

Monitoring of Signal Label Mismatch Failures

Signal label mismatch failures are monitored by the port by default. The port indicates label mismatch failures when the C2 byte in the SDH path overhead received does not contain the proper value. The use of this monitoring is optional.

address `10A`

values `0` = monitoring disabled
`1` = monitoring enabled (default)

Path Trace Format (STM-1 only)

The path trace format applies to both receive and transmit path traces. By default, it is set to a repeating 64-byte message. The trace can also be set to a repeating 16-byte message, with the first byte optionally containing a CRC7 calculated over the message.

address `18D`

values `00` to `FF` for each byte (max. 64 bytes)
`00` for each byte (default)

Monitoring of Path Trace Mismatch Failures

Path trace mismatch failures are not monitored by default. When enabled, the ATM port indicates path trace mismatch failures when the 64-byte path trace received in the J1 byte in the SDH path overhead received does not match the expected received path trace. The expected path trace should be configured before monitoring is activated.

address 10B

values 0 = monitoring disabled (default)
1 = monitoring enabled

Transmitted Path Trace

The path trace transmitted by the ATM port in the J1 byte of the SDH overhead, typically a string describing the location of the transmitter, is sent in the path trace field so that the far end VC4 path terminator can verify that is is connected to the correct transmitter. If the path trace format has been set at 16 bytes, (see page 99), only the first 16 bytes (all set to 0 by default) of this field are significant. If the path trace format contains a CRC7, only bytes 1-15 are significant (a CRC7 is generated for byte 0).

address 10C

values 00 to FF for each byte (max. 64 bytes)
00 for each byte (default)

Expected Received Path Trace

If the monitoring of path trace mismatches is enabled, the value assigned to the expected path trace is compared with the received path trace to determine if a mismatch is present. If the path trace format contains a CRC7, only bytes 1-15 are significant (a CRC7 is generated for byte 0). By default, the expected received path trace has all bytes set to zeroes.

address 14C to 18B

values 00 to FF for each byte (max. 64 bytes)
00 for each byte (default)

Addition of Coset Polynomial in ATM Cell Headers (STM-1 only)

The addition of the coset polynomial to the HEC byte in the ATM cell headers is performed by default.

address 18C

values 0 = coset polynomial not added
1 = coset polynomial added (default)

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).

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)

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 in the 8260 hub across a UNI interface.

ATM subnetwork. A set of ATM subsystems interconnected by ATM interfaces (UNI, SSI, NNI).

ATM subsystem. The ATM components in an ATM hub or switch.

attach. To logically make a device a part of a network. Contrast with *connect*, which implies physically connecting a device to a network.

attenuation. Level of optical power loss expressed in units of dB.

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 another. 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*.

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. (I) (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)

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.

CBR. Constant bit rate.

CCITT. Comité Consultatif International Télégraphique et Téléphonique. The International Telegraph and Telephone Consultative Committee.

CLP. Cell loss priority.

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 TCP/IP, the path between two protocol applications that provides reliable data stream delivery service. In Internet, a connection that extends from a TCP application on one system to a TCP application on another system. (4) The path between two protocol functions, usually located in different machines, that provides reliable data delivery service. (5) A logical association between a call participant (party) and a switch. A party's connection represents that party's participation in a telephone call.

D

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 to another for reception 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.

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*.

F

F. Fahrenheit.

FCC. Federal Communications Commission (USA).

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)

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*.

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. 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; frequence 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.

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.

ITU. International Telecommunication Union.

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.

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, meters.

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.

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.

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).

O

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

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.

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.

PLCP. Physical Layer Convergence Protocol.

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-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.

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

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.

remote. (1) Pertaining to a system, program, or device that is accessed through a telecommunication line. (2) Contrast with *local*.

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.

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.

signaling. Establishment of an ATM connection from a call set up by an end device.

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.

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*.

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.

TRS. Topology Routing Service.

TX. Transmit.

U

UNI. User-network interface.

unshielded twisted pair (UTP). One or more twisted pairs of copper wire in the unshielded voice-grade cable commonly used to connect a telephone to its wall jack. Synonym for *telephone twisted pair*.

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.

X

XPOHDATA. Transmit PLCP overhead data.

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.

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Installation and User's Guide

Publication No. SA33-0396-00

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