IBM

IBM 8260 Nways ATM kit

GA33-0370-00

Technical Overview

First Edition (October 1995)

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Chapter 1. The ATM kit Development Program

Why an ATM kit Development Program?

In the process of evolving away from router- or host-based networks towards high-speed ATM switched networks, one concern for developers is how to integrate various applications or physical media types into a new or expanding ATM network. IBM's ATM kit Development Program offers a simple, reliable method for developing ATM applications for a proven ATM platform: the IBM 8260 Nways Multiprotocol Switching Hub.

The ATM Carrier Module

The key to the program is the ATM Carrier Module: a generic 8260 ATM module that can be used as the foundation for building a variety of new ATM applications:

The Carrier Module provides all standard ATM functions as well as access to 8260 management services.

Your ATM application resides on one or more daughter cards that communicate with the Carrier Module through a simple, standard ATM interface – UTOPIA.

What is UTOPIA?

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.

ATM Carrier Module Architecture

By using the UTOPIA interface in its ATM Carrier Module, IBM has succeeded in separating PHY-specific functions from the standard ATM functions that are common to all ATM applications:

Standard ATM functions are located in the Carrier Module

All PHY-specific functions are concentrated on custom-designed daughter cards that are mounted on the Carrier Module

The daughter cards access all necessary ATM functions via the UTOPIA interface, as shown in Figure 1.

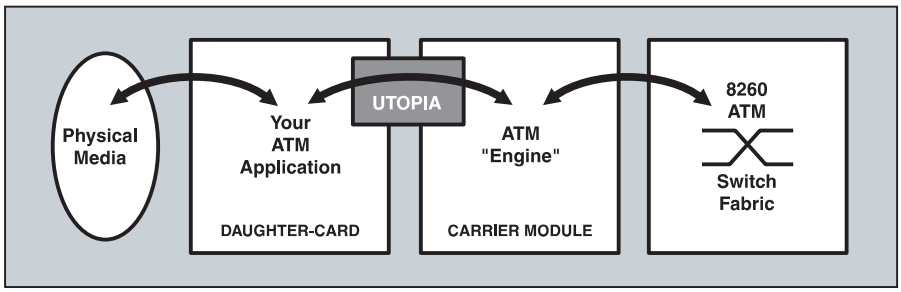


Figure 1. Data Flow in the ATM Carrier Module

Thus, the architecture of the ATM Carrier Module allows you to focus your creativity on the internal functioning of your ATM application and minimize your involvement with the details of ATM switching and module management.

ATM kit Development Program Description

The ATM kit Development Program consists of:

A set of introductory documentation consisting of this document, the flyer *We Carry Your Creativity to ATM* (GA33-0371), and the *ATM kit Application Form* (GA33-0372)

The *ATM kit Program Developer Package*, which includes:

- Technical specifications for the daughter card interface
- An 'ATM Class' for developers, covering overall system architecture of the IBM 8260 Hub and engineering/consulting time on daughter card development
- Conformance testing by IBM for compliance with ATM Carrier Module daughter card specifications.

Several optional extensions to the ATM kit Development Program that provide further assistance in developing your ATM Carrier Module application:

- Interoperability testing for ATM Forum protocols
- Testing for standards compliance
- Telecommunication homologation
- Additional network management functions
- Availability services.

Chapter 2. Overview of the IBM 8260 Nways Hub*

The ATM Carrier Module is designed for the IBM 8260 Nways Multiprotocol Switching Hub, Model A17 or A10, and works in conjunction with the IBM 8260 ATM Control Point/Switch module.

The sections that follow briefly describe the IBM 8260 Nways Multiprotocol Switching Hub* and the Control Point/Switch module. The ATM Carrier Module itself is described in Chapter 3, “The ATM Carrier Module” on page 5.

The IBM 8260 Nways Multiprotocol Switching Hub

The IBM 8260 Nways Multiprotocol Switching Hub Models A17 (17-slot) and A10 (10-slot) are both equipped with an ATM backplane.

Features of the 8260 Model A17/A10 Hub include:

Ability to run Ethernet, token-ring and FDDI traffic concurrently. If all LAN segments are using the same protocol, the maximum number of segments per hub is:

- 8 for Ethernet and FDDI
- 17 for Token-ring

Support for 8260 ATM modules via the ATM backplane. The current range of IBM ATM Media and Bridge modules includes:

- ATM 4-Port 100 Mbps Concentration module
- ATM 2-Port 155 Mbps Concentration module
- 8281 ATM/LAN Bridge module.

Other modules with different ATM rates are planned.

Intelligent power subsystem for easy access to load-sharing power supplies, high power availability, and controller-based power verification features designed to ensure optimal performance.

Intelligent cooling subsystem to help prevent damage to the hub or modules.

Distributed hub management architecture that consolidates media management in a single card, while distributing network monitoring across a series of network monitoring cards.

* For a full list of available documents on related IBM 8260 Nways networking products, see “Bibliography” on page 21.

The 8260 ATM Control Point/Switch Module

The ATM Control Point/Switch module is a dual-slot 8260 ATM module that performs two main functions:

ATM Switch: The Switch portion of the module provides an ATM switch fabric built around the IBM 'Switch-in-a-Chip' – a 16-by-16 times 256 Mbps 8-bit parallel switch with an aggregate throughput of 8 Gbps.

Control Point: The Control Point portion provides a fully distributed set of functions to control an ATM campus network and to interconnect ATM networks over a WAN. The Control Point dynamically 'learns' about machine resources, port speeds and network topology, and performs all route computations while automatically bypassing failed nodes and links.

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

Switched Virtual Circuit (SVC) and Permanent Virtual Circuit (PVC) signaling
Point-to-point mode
Point-to-multipoint mode
UNI 3.0 and 3.1
Interim InterSwitch Protocol (IISP)
Peer grouping of switches
PVP tunneling
Soft PVC
Link aggregation
In-band and out-of-band management.

Chapter 3. The ATM Carrier Module

Carrier Module Functionality

The ATM Carrier Module is designed to give your ATM application full access to 8260 ATM switching functions and hub control functions while minimizing the need to deal with those functions directly.

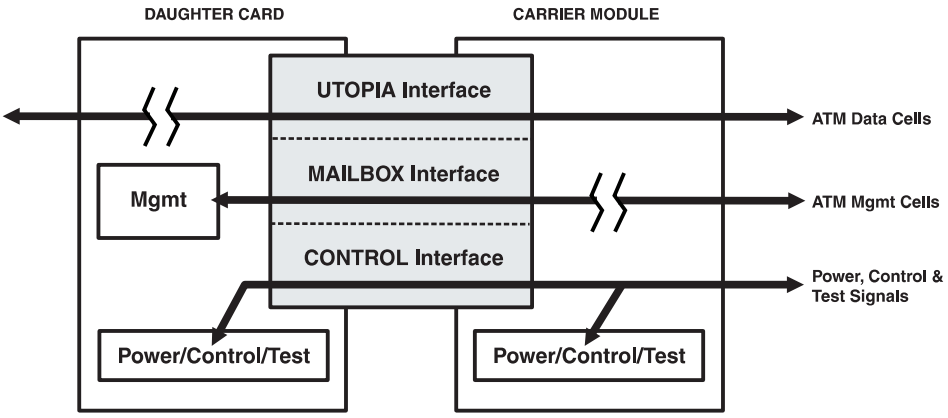


Figure 2. Carrier Module/Daughter Card Communication

As shown in Figure 2, all communication between the Carrier Module and the daughter card passes through the daughter card interface port connector using one of three logical interfaces:

UTOPIA Interface
ATM data cells are transferred via the public ATM/PHY-level interface, UTOPIA-1.

Mailbox Interface
ATM management cells are converted to Mailbox messages by the Carrier Module and exchanged with the daughter card via the Mailbox interface.

Control Interface
Power, control, module initialization and test signals are routed to the daughter card via the Control interface.

Carrier Module Physical Description

The ATM Carrier Module is an 8260 ATM module that is ready for you to add the daughter cards of your own custom ATM application. The Carrier Module consists of:

An 8260 ATM module frame (single- or dual-slot) with an empty front panel for your application's ports, connectors and LEDs
A generic, half-width ATM carrier card
Standard interface ports for mounting your daughter card application.

Module Versions

Two versions of the ATM Carrier Module, single-slot and dual-slot, accommodate larger or smaller daughter card applications, depending on:

Component height
Power requirements
Number and arrangement of daughter cards
Size of faceplate area.

The two versions are identical except for the width of the front panel and the power supply available for the daughter card.

Single-Slot: The single-slot Carrier Module has a narrow front panel (with two empty faceplate areas) and supplies up to 5.5 Amps of +5V power. Figure 3 shows a single-slot Carrier Module with one half-height daughter card.

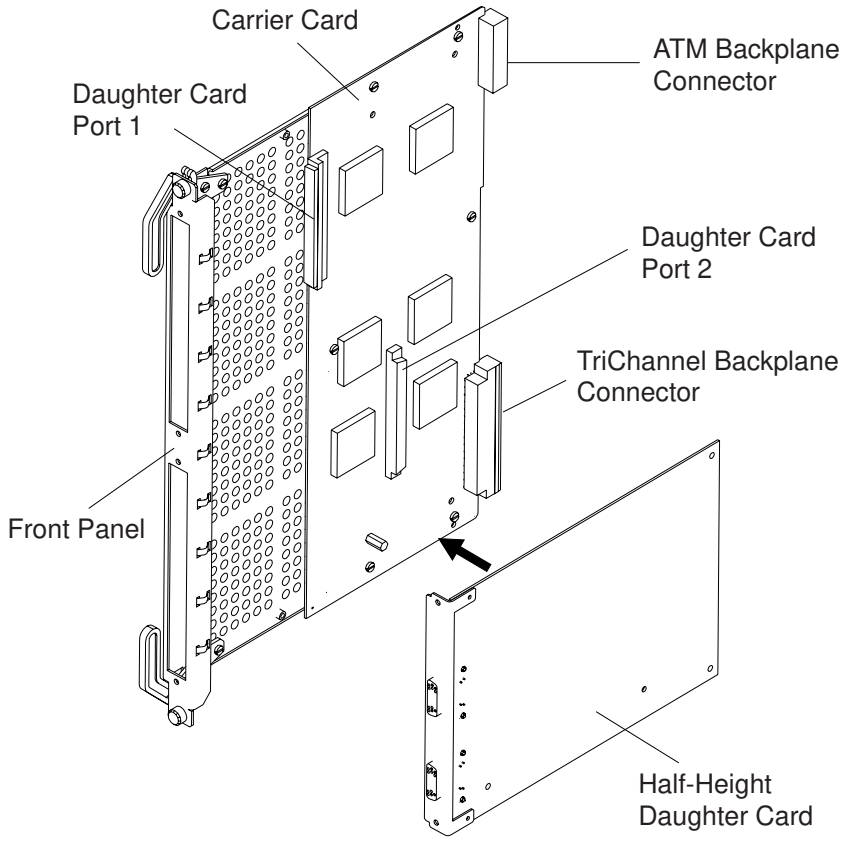


Figure 3. Single-slot ATM Carrier Module

Dual-Slot: The dual-slot Carrier Module has a wider front panel (with four empty faceplate areas) and supplies up to 10.5 Amps of +5V power. Figure 4 shows a dual-slot Carrier Module with two full-height daughter cards mounted on the module.

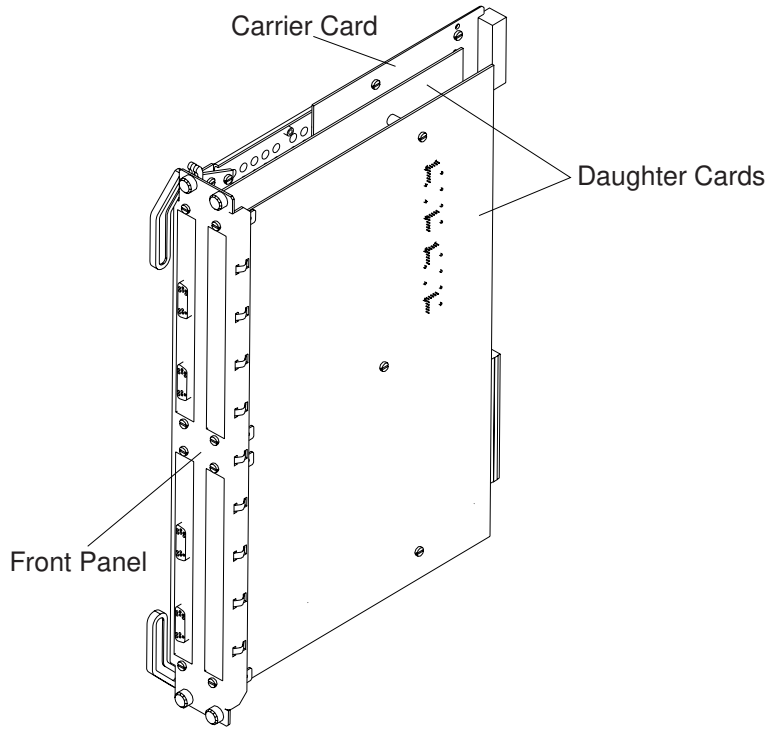


Figure 4. Dual-slot ATM Carrier Module

Connectors

The ATM Carrier Module has four standard connectors:

Two 8260 backplane connectors, for communication with the 8260 hub:

- 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 port connectors, for communication with the daughter card(s):

- Port 1, a right-angle connector
- Port 2, a vertical connector.

Front Panel

The front panel of the ATM Carrier Module provides two empty spaces (four in the dual-slot version) for the daughter card's customized faceplate.

Chapter 4. Daughter Card Characteristics

Daughter Card Functionality

Alongside the PHY-specific functions of your ATM application, the ATM Carrier Module requires that your application adhere to the requirements of the three logical Carrier Module interfaces:

UTOPIA Interface
All ATM data cells are transferred via the UTOPIA interface.

Mailbox Interface
A Mailbox Protocol must be implemented on the daughter card for the exchange of management messages with the Carrier Module via the Mailbox interface.

Control Interface
The daughter card must be able to respond to all power, control and test signals provided on the Control interface.

Physical Requirements: Additionally, the physical arrangement of daughter cards and faceplate must conform with IBM recommendations.

ATM Cell Transfer (UTOPIA Interface)

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. Throughput is 160 Mbps for each port. UTOPIA-1 supports a single PHY-layer.

Note: Future versions of the ATM Carrier Module will implement a 16-bit (UTOPIA-2) interface, which will effectively double the throughput (to 320 Mbps) and allow for multiple PHY-layer support.

Clocking may be provided internally by the Carrier Module (20 MHz), or externally by the daughter card (20 MHz maximum).

UTOPIA Receive Interface

Table 1 lists the signals of the UTOPIA Receive interface.

Name	Direction	Function
RxData (8)	Phy to ATM	Data bus receive
RxSOC	Phy to ATM	Start of cell
RxEnb	ATM to Phy	Enable
RxEmpty/RxClav	Phy to ATM	No data
RxClk	ATM to Phy	Synchro

Table 1. UTOPIA Receive Signals

UTOPIA Transmit Interface

Table 2 lists the signals of the UTOPIA Transmit interface.

Name	Direction	Function
TxData (8)	ATM to Phy	Data bus transmit
TxSOC	ATM to Phy	Start of cell
TxEnb	ATM to Phy	Enable (valid data)
TxFull/TxClav	Phy to ATM	Data available
TxClk	ATM to Phy	Synchro

Table 2. UTOPIA Transmit Signals

Management Messages (Mailbox Interface)

The 8260 ATM Control Point/Switch module manages its communication with the daughter card by means of a dual-port RAM 'Mailbox', which must be implemented on the daughter card itself.

The ATM Carrier Module provides a separate Mailbox interface for each of the two daughter card interface ports.

Messages (MPDUs)

The protocol between the daughter card and the Control Point is based on Mailbox Protocol Data Units (MPDUs) – messages written to the RAM Mailbox. Parameters passed across the Mailbox interface include static and dynamic information regarding:

Diagnostic testing of the interface
Personality information for module and port
Status information for module and port
Control parameters for module and port

More information on managing MPDUs is provided in the full specifications for the ATM Carrier Module.

Mailbox Interface

Table 3 lists the Mailbox interface signals for one UTOPIA interface port.

The address bus is 10 bits wide for addressing up to 1Kb of memory.

Name	Direction	Function
Mbus Data bus (8)	Out	Data path for mailbox
CE	Out	Chip Enable mailbox
Address (10)	Out	Guided cell address (from/to)
Output Enable	Out	Output Enable mailbox
Read/Write	Out	Read/Write signal
P_INT	In	Interrupt dual RAM

Table 3. Mailbox Interface Signals

Power, Control & Test Functions (Control Interface)

Power Management Memory Signals

Serial EPROM: A serial EPROM must be implemented on the daughter card to collect power management VPDs for the 8260's intelligent power control feature. The 8260 hub uses the VPDs to monitor the module's power budget and to automatically control the sequence of modules to be powered off in case of power fluctuation or failure.

The following are the power management memory signals that are connected to the serial EPROM:

DCID_0 (daughter card 1 ID)
DCID_1 (daughter card 2 ID)
DCID_2 (daughter card 3 ID)
E2+5V
E2Data ('SDA')
E2Clk

Control Signals

The following are the control signals for the daughter card:

Wrap: Carrier-to-Daughter
Wrap: Daughter-to-Carrier
Reset In
Reset Out
Daughter Card Clock Availability
Daughter Card Clock
Daughter Card Present
Daughter Card Operational

Wrap-Test: The application must provide a wrap test for FRU (Field Replace Unit) isolation (between Carrier Module and daughter card).

LED Signals

The following are the LED control signals for the daughter card:

Wrong Slot
Carrier Module Status
UTOPIA Port Status (optional)
UTOPIA Port Activity (optional)
Reset (optional)
Test LED (Force LED On for LED testing)

Power Signals

The following power signals are available from the daughter card interface port:

+12V
+5V
GND
-5V
-12V

Physical Requirements

The following are general guidelines for planning the design of your daughter card. Exact physical specifications for the daughter card are listed in Chapter 5, “Mechanical Specifications” on page 15.

Daughter Card Arrangement

Figure 5 shows the possible positions of daughter cards in single- and dual-slot Carrier Modules, as viewed from the top of the module.

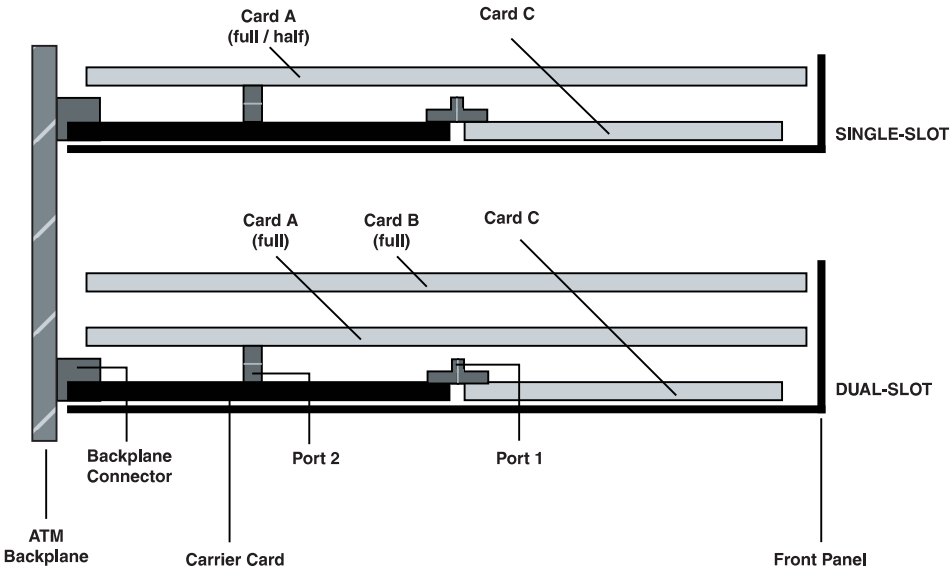


Figure 5. Possible daughter card positions (viewed from the top).

Note: The application faceplate may be supported by any of the daughter cards.

Faceplate

In addition to any ports, connectors or LEDs your own application may require, you must also provide several LEDs for the Carrier Module (see “LED Indicators” on page 17.)

Chapter 5. Mechanical Specifications

Carrier Module Specifications

Slot Dimensions

Carrier Modules can occupy either one or two slots. The dimensions of each slot are:

Height: 14.37" (365mm)
Depth: 10.25" (260mm)
Pitch: 1.00" (25.4mm)

Carrier Card Dimensions

The dimensions of the carrier card printed circuit are:

Height: 14.37" (365.00mm)
Depth: 5.85" (148.48mm)

Placement in the 8260 Hub

In the IBM 8260 Model A10 and A17 Hubs, some slots are reserved for specific ATM modules, depending on the configuration:

Slots 9 and 10 are always reserved for the dual-slot Control Point/Switch (CPSW) module.

In the Model A17, slots 11 and 12 are reserved for an optional backup CPSW module for fault-tolerant operation. (If no backup CPSW module is installed in slots 11/12, then only slot 11 is reserved, and an ATM module may be installed in slot 12.)

All remaining slot positions are available to accept ATM modules, including ATM Carrier Modules.

If a Carrier Module is inserted into one of the reserved slots, the Wrong Slot LED lights to indicate the error.

Figure 6 on page 16 shows a diagram of an IBM 8260 Hub (Model A17), with one single-slot ATM Carrier Module in slot 13.

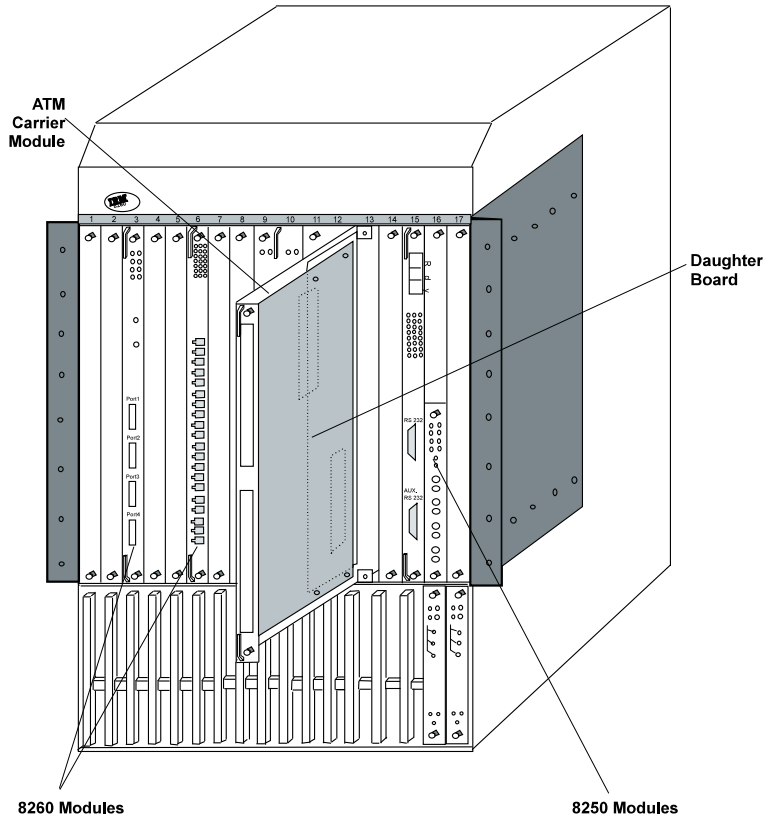


Figure 6. Sample configuration of the IBM 8260 Nways Multiprotocol Switching Hub

Daughter Card Specifications

Dimensions

The maximum dimensions of a daughter card depend on the location of the card in the carrier module, as shown in Figure 5 on page 13.

Card A (half-height):

Height: 6.59" (167.35mm)
Depth: 9.00" (228.60mm)

Card A (full-height) and Card B:

Height: 13.60" (365.52mm)
Depth: 9.00" (228.60mm)

Card C (narrow-width):

Height: 14.37" (365.00mm)
Depth: 2.52" (64.00mm)

Connectors

Table 4 lists the part numbers of the daughter card interface port connectors.

Connector	AMP P/N (120 pins)
Port 1 - carrier card side	AMP-176381-5
Port 1 - daughter card side	AMP-176379-5
Port 2 - carrier card side	AMP-176372-5
Port 2 - daughter card side	AMP-176380-5

Table 4. UTOPIA port connector part numbers

The connectors between the daughter card and carrier card are mounted vertically to preserve cooling air flow.

Component Height

The ATM Carrier Module and daughter cards are mounted with components facing. The maximum heights for daughter card components are:

Areas facing the ATM Carrier Module: 200 mils with some restricted areas.
Non-facing areas: 590 mils.
Solder side: 120 mils.

Faceplate

A mounting bracket must be incorporated into at least one of the daughter cards to support the application's own front panel components (connectors, LEDs, buttons, etc.) as well as the LEDs for the Carrier Module. The components must fit into the standard sized openings on the ATM Carrier Module faceplate.

Each of the openings on the Carrier Module faceplate are 5.84" x 0.59" (148.4mm x 15mm). Single-slot modules have two faceplate openings; dual-slot modules have four.

Maximum component height on the faceplate is 535 mils (13.6mm).

LED Indicators

All LEDs are mounted on the daughter card faceplate:

The Carrier Module provides driving signals for five LEDs, which must be routed from the daughter card connector:

- Wrong Slot LED, color Yellow.
- Carrier Module Status LED, color Green.
- UTOPIA Port Status LED, color Green (optional).
- UTOPIA Port Activity LED, color Yellow (optional).
- Reset LED

The daughter card may also have its own LEDs for operational indication.

Table 5 lists the part numbers of the Carrier Module LEDs.

LED	IBM P/N	Vendor/Part No.	Application
Single Yellow	8193284	Dialight TIRA551-0307	Wrong Slot
Single Green	99Z9999	Dialight TIRA551-0207	Module status / Blade status
Green and Yellow (dual in row)	8273334	Dialight TIRA553-0123	Port Status / Port Activity

Table 5. LED Part Numbers

Power

Power is a limited resource; in order to avoid configuration limitations, the power requirements for each module's daughter card application(s) should not exceed the following maxima.

Voltage	Max Power	Current (Amp)
+5V	27.5 W (single-slot) 52.5 W (dual-slot)	5.5 A (single-slot) 10.5 A (dual-slot)
+12V	7 W	0.58 A
–5V	2.5 W	0.5 A
–12V	3 W	0.25 A

Table 6. Power Voltage/Amp for Daughter Cards.

Note: These maxima apply when the 8260 Hub is configured with the maximum number of power supplies.

Radio Frequency Interference (RFI) Compliance

Class A digital device pursuant to part 15 of the Federal Communications Commissions (FCC) rules

VDE Class B

VCCI Class 1

EN 55022 requirement

CISPR22 Class A.

Environmental

Operating Temperature: 10° to 52° C (50° to 125.6° F)
Humidity: less than 95%, non-condensing
Wet bulb: 27°C (80.6° F)

Acoustic

A-Weighted sound power level less or equal to 6.7 Bels
A-Weighted sound pressure level less or equal to 53 dB.

Safety Standards

This product complies with the following safety standards:

Number	Date	Title
IEC 950	1986	International Standard (IBM C-B 3-0501-950)
C22.2 No. 950		Canadian deviation to IEC 950
UL 1950	1989	U.S.A. deviation to IEC 950
EN 60 950		CENELEC deviation to IEC 950
AS 3260	1988	Australian deviation to IEC 950
NZS 6661	1989	New Zealand deviation to IEC 950

Industry Standards

The IBM 8260 is designed according to the specifications of the following industry standards as understood and interpreted by IBM as of October 1992.

International Organization for Standardization (ISO)

ISO 8802/1
ISO 8802/3
ISO 8802/5

IEEE (Institute of Electrical and Electronic Engineers)

802.1 Local area network (LAN) management and Internet working
802.3 Carrier sense multiple access and collision detection
802.5 Token passing ring

ANSI (American National Standard Institute)

The IBM Fiber Distribution Data Interface (FDDI) network is an implementation of the American National Standards Institute (ANSI) X3T9.5 family of standards. The IBM base standards for the implementation of the FDDI are:

ANSI X3.166-1990, FDDI physical layer medium-dependent (PMD), ISO 93/4-3
ANSI X3.148-1988, FDDI token-ring physical layer protocol (PHY), ISO 93/4-1
ANSI X3.139-1987, FDDI token-ring media access control (MAC)
ANSI X3.T9, 5/84-49 RFC 1285 FDDI station management (SMI).

ITU-T (International Telecommunication Union - Telecommunication)

The IBM standards for the implementation of ATM are:

Q.2110 Service Specific Connection-Oriented Protocol (SSCOP)
Q.2130 Service Specific Coordination Function (SSCF)

ATM Forum

The ATM Forum has defined the ATM User-Network Interface (UNI) Specification.

Bibliography

The following documents are available from IBM to provide further information about the IBM 8260 Nways family of networking products.

IBM 8260 Nways Multiprotocol Switching Hub

IBM 8260 Multiprotocol Intelligent Switching Hub: Product Description, GA33-0315

IBM 8250 Multiprotocol Intelligent Hub, IBM 8260 Multiprotocol Intelligent Switching Hub: Planning and Site Preparation Guide, GA33-0285

IBM 8260 Multiprotocol Intelligent Switching Hub: Installation Guide, SA33-0251

ATM Modules

ATM 4-Port 100 Mbps Module: Installation and User's Guide, SA33-0324

ATM Control Point and Switch Module: Installation and User's Guide, SA33-0326

ATM 155 Mbps Flexible Concentration Module: Installation and User's Guide, SA33-0358

ATM LAN Bridge Module: Installation and Operation Guide, SA33-0361

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