IBM 8260/8265 Nways ATM kit



Technical Overview

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Chapter 1. The 8260/8265 ATM kit Development Program

Why an ATM kit Development Program?

In the process of evolving away from traditional data-only networks towards high-speed multimedia ATM networks, one concern for developers is how to integrate various applications and physical media types into the ever expanding deployment of ATM technology. IBM's ATM kit Development Program offers a simple, reliable method for developing ATM applications for world class ATM platforms:

- The IBM 8260 Multiprotocol Switching Hub, which combines Ethernet, Token Ring, and ATM switching.
- The IBM 8265 ATM backbone switch, which has a higher ATM switching capacity than the 8260.

The purpose of this document is to provide new potential developers enough technical information to quickly assess the technical feasibility of their proposed ATM kit application. This overview also should help in rapidly determining whether or not an application fits into the ATM kit model.

The ATM Carrier Module

The ATM kit Development Program addresses two types of applications:

- Applications targeted to both the IBM 8260 and IBM 8265 products.
- Applications devoted to the IBM 8265.

The key to the ATM kit program is a series of generic ATM **Carrier Modules**.

A Carrier Module is a half-board ATM module that plugs into the 826x switch and provides an open interface for a customized ATM application. Carrier Modules are the foundation for building a variety of new ATM applications:

- The Carrier Module provides standard ATM functions as well as access to 826x 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.

Three Carrier Modules are available to permit the two types of applications:

- The ATM Carrier Module level 1.5 hosts a Daughter Card developed for 8260 Applications
- The ATM Carrier Module level 2.5 for the 8265, hosts the same Daughter Card as the one developed for the 8260.
- The ATM Carrier Module level 2.0 hosts a Daughter Card developed for 8265 Applications.

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 is 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. The ATM Forum defined two levels of UTOPIA:

- UTOPIA level 1, which may be either 8 or 16 bits wide and is **single-user** (only one PHY can be connected)
- UTOPIA level 2, which also may be either 8 or 16 bits wide, but which is **multi-user** (several PHYs can be multiplexed over the UTOPIA level 2).

The ATM Carrier Modules level 1.5 and 2.5 implement the 8 bit wide UTOPIA level 2 interface. The ATM Carrier Module level 2.0 implements the 16 bit wide UTOPIA level 2 interface.

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ATM Carrier Module Architecture

By using the UTOPIA interface in its ATM Carrier Modules, 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.

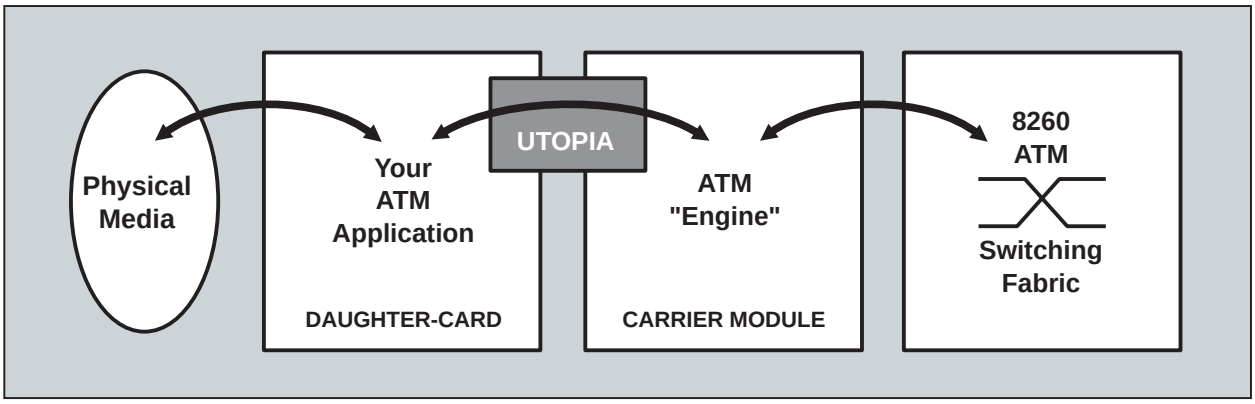


Figure 1. Data Flow in the ATM Carrier Module

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. This architecture makes the Daughter Card transparent to evolving ATM functionality and permits the Daughter Card to be ported from 8260 to 8265 by simply adding it to the appropriate Carrier Module.

How to Apply for the ATM kit Development Program

A detailed description of the ATM kit Development Program procedures is provided in the ATM kit Development Program Introduction, which explains how to join the ATM kit Development Program and the rules for interoperation with IBM.

Chapter 2. Overview of the IBM 8260 and 8265

ATM Hardware Architecture

IBM 826x switches are based on a central switching fabric. Each media module plugged into a user slot gets access to one fabric port via the chassis backplane. A **media module** in our terminology is any payload module that connects to the ATM backplane. A **Control Point** card, mounted on the Control Point/Switch (CPSW) module, is also connected to a port of the fabric, and houses the microprocessor over which the ATM operating system runs. The general IBM 826x architecture is shown in Figure 2.

- The switch fabric
- The ATM protocol engines on the media module
- The Control Point
- The ATM backplane

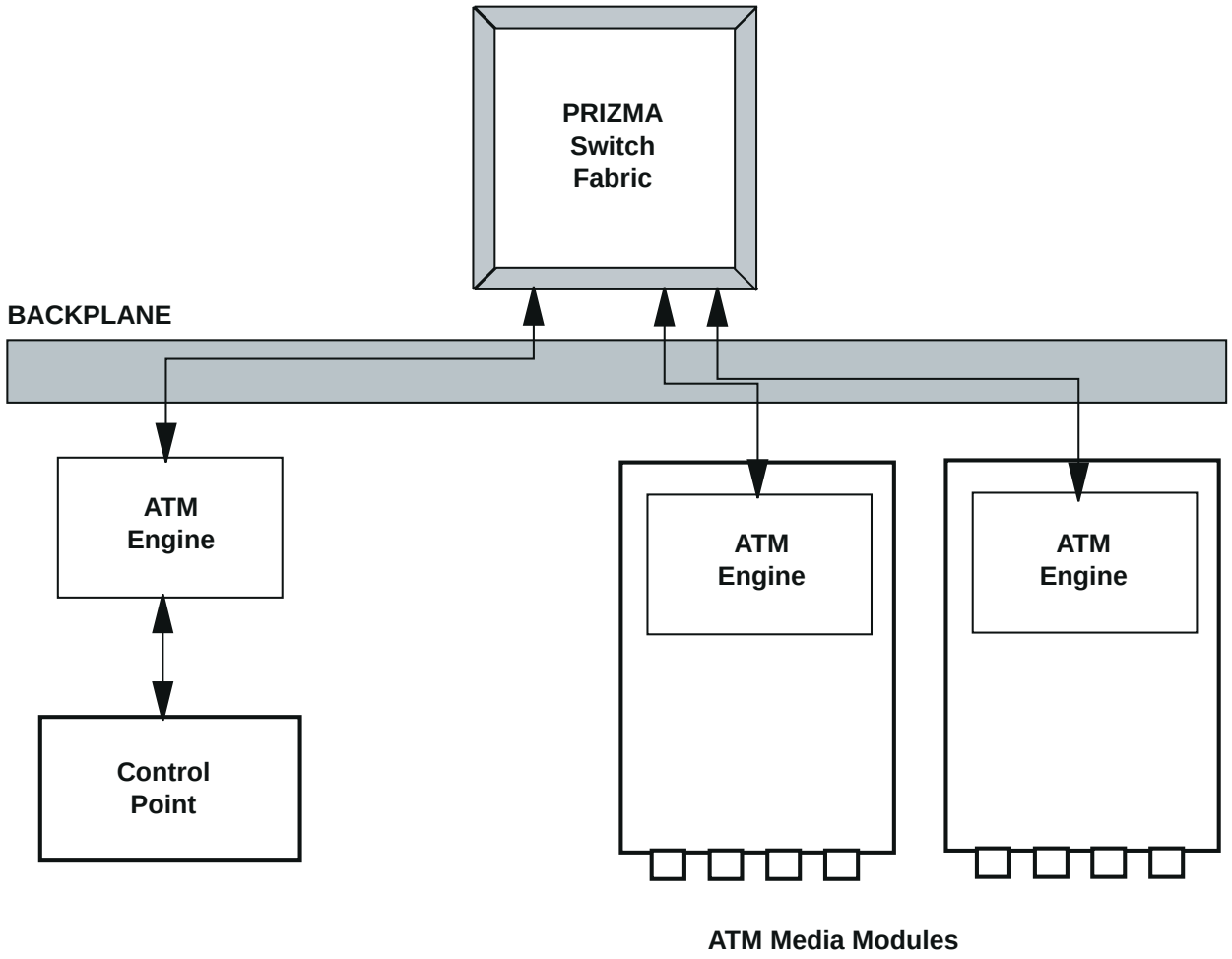


Figure 2. Switching Architecture

The Switch Fabric

The switch fabric is based on PRIZMA switch elements; one PRIZMA is used for the 8260, while on the 8265 two PRIZMAs are mounted in speed expansion mode delivering 16 times 768 Mbps full-duplex, corresponding to an aggregate throughput of 12.3 Gbps full-duplex. The PRIZMA fabric switches cells of

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fixed size and is equipped with a 128-packet pool of shared output buffers to absorb contentions on output ports. This single stage architecture is superior to multi-stage switches which suffer from higher jitter and cell delay variation. By having a central switching fabric, every ATM module has a dedicated connection to a port of the switching fabric. Each module relies on the fabric to do the switching, allowing a lower cost per module and a simplified back plane design.

Port 0 of the Switch is dedicated to the Control Point operations; an ATM protocol engine is also present on the Control Point/Switch module for Control Point (inband) communications with the external world. This inband communication checks the integrity of the communication links within the switch fabric and the modules, as the inband control packets follow the same path as the normal user cells.

The ATM Engines

The ATM engines reside on each ATM module where the cell buffer pools are located. The ATM engine on an ATM module is a combination of an ASIC and Field Programmable Gate Arrays (FPGAs). This approach is taken to have optimum performance (ASIC) while still maintaining openness (FPGA). The ATM engines perform the following functions:

- Cell routing for point-to-point and point-to-multipoint connections
- Traffic management
- Flow control
- Statistics and counters
- Label swapping
- Multicasting

The ATM traffic management functions are distributed over every module as well as the buffer pools; therefore each new module that is added to the switch comes with its own processing horsepower to perform ATM functions, plus its own buffer pool to absorb bursts of traffic. This architecture is superior to existing ATM switches in the industry which utilize centralized traffic management and a central buffer pool. The distributed architecture in 826x switches offers consistent performance and system behavior, regardless of the number of modules or ports, whereas the centralized architecture in other switches suffers from system performance degradation when the number of ports increases (that is, more ports share the same buffer pool and the same traffic management hardware processor).

The ATM operating system

The ATM operating system processor resides on the Control Point/Switch module. It has flash memory from which it loads the bootstrap code. The flash memory also holds the operational code that is run from DRAM. The ATM operating system performs all the essential central functions, such as:

- PNNI topology and routing
- Address mapping
- Resource management
- Signaling tasks
- Network management
- Setup of all hardware control elements (VP/VC values, shaping parameter values, etc.)

The ATM operating system manages the ATM subsystem by sending **guided cells**, a patented technique used to control the rest of the 826x via an internal port connected to the switch (port 0).

The ATM Backplane

ATM media modules are linked to the switching fabric via a passive backplane, in the form of a star, where the PRIZMA chips sit in the center and the ATM media modules at the points of the star. For redundancy reasons, the backplane is actually made of two stars, with room for two switching fabrics; every ATM media module connects therefore to the two stars.

The 826x backplane is made of one physical board with the following busses:

- A power and environment management backplane. All modules draw power and send environment information (power budget, vital product data) via this backplane.
- A dual full duplex ATM backplane, star shaped, with room for two switching fabrics and Control Points.
- A serial bus for communication between the two Control Points.

All data transmitted between modules in the 826x pass through the ATM backplane. No local switching is provided on the ATM modules.

Each media module has a dedicated set of wire connections to the Control Point/Switch module.

The main characteristics of the 826x backplane are as follows:

- The backplane is totally passive. No active components reside on the backplane, so that extremely high reliability is achieved.
- The ATM media modules have full-floating capabilities. The ATM media modules can be inserted into any of the slots 1 to 8 and 11 to 17.
- All ATM modules are hot-swappable. Any module can be removed or inserted without having to power-down the 826x.
- The 826x supports two ATM Control Point/Switch modules for reliability and redundancy.

When two Control Point/Switch modules are installed for redundancy, the serial on the 826x backplane links the two modules together. This interface is used by the two Control Points (primary and secondary) to automatically update any configuration changes and to monitor the health of the primary module.

The 826x ATM modules

The IBM 826x provides a rich set of ATM interfaces as well as value-added modules, centered around an ATM core switch, as shown in Figure 3 on page 6. The entire architecture remains based on the core ATM cell switching, regardless of the type of access traffic; in other words, any traffic that crosses the backplane has already been converted to standard ATM cells.

The following 826x ATM media modules are available:

ATM Media Modules

- OC12-c SONET/SDH media modules; options for multimedia fiber as well as short-reach and long-reach single mode fiber are available.
- OC3-c SONET/SDH media modules; options for shielded and unshielded twisted pair, multimode fiber as well as short-reach and long-reach single mode fiber are available.
- 25.6 Mbps media module
- 100 Mbps TAXI media module
- ATM WAN Carrier Module. This is a modular module that can accept up to two Daughter Cards of the following types:
  - E1/T1/J1
  - E1/T1/J1 with ATM Inverse Multiplexing

– E3/T3

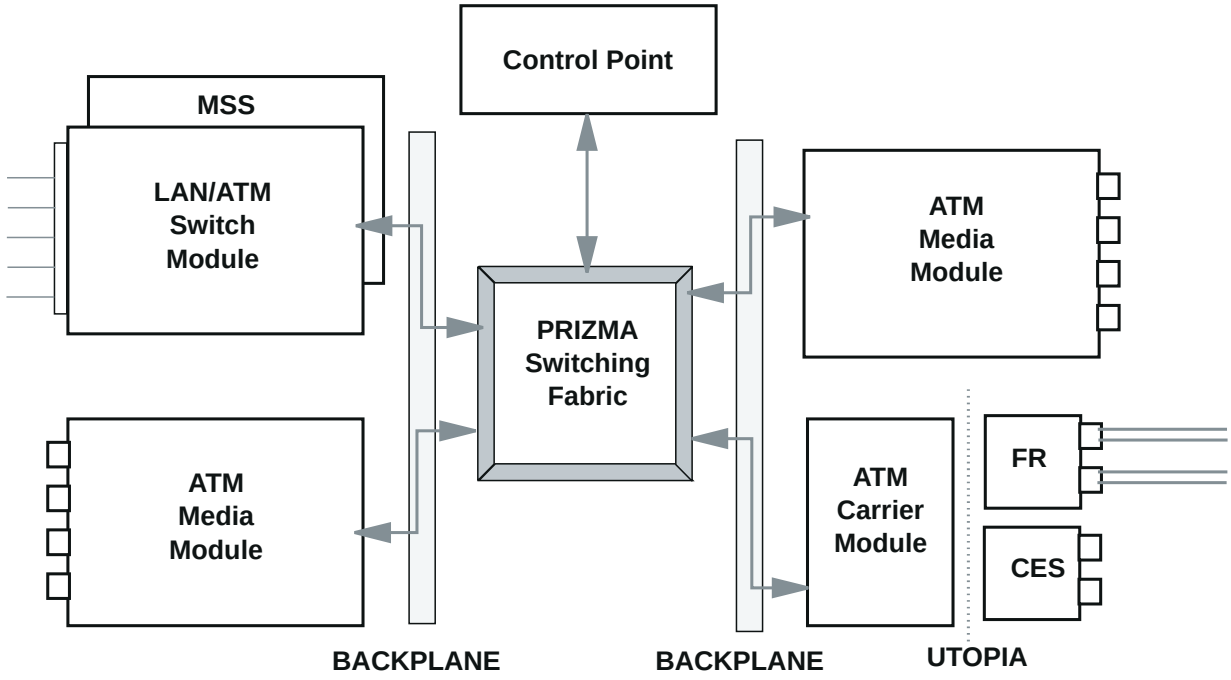


Figure 3. Unified Architecture

Multiprotocol Switched Services (MSS) Server

The Multiprotocol Switched Services (MSS) Server module is the integrated version of the IBM 8210 Nways MSS Server stand-alone box, without for the ATM uplink. (There is no need for an ATM uplink because the MSS module attaches to the 826x ATM backplane.)

The MSS Server module provides a multiprotocol networking solution for the ATM environment and allows a smooth migration from shared LANs to high speed ATM backbones. The MSS Server module provides LAN Emulation and Classical IP network functions, as well as various bridging and routing functions through the following features:

- ATM Forum compliant LAN emulation:
  - Ethernet and Token-Ring emulated LANs
  - LAN Emulation Client (LEC)
  - LAN Emulation Server (LES)
  - LAN Emulation Configuration Server (LECS)
  - Broadcast and Unknown Server (BUS)
- MPOA server
- Virtual LAN support: logical groups of end stations
- Enhanced availability of LAN emulation: an IBM extension to LAN emulation that supports multiple LAN Emulation Servers for backup purposes.
- Enhanced LAN emulation broadcast management: an IBM extension to the BUS that reduces broadcast traffic to improve network performance.
- NHRP Server/Client
- Standard bridging and routing support:
  - Source route (SR) bridging

- Transparent bridging (TB)
- SR and TB
- Source route transparent bridging (SRT)
- Source route to transparent bridging (SR-TB)
- Adaptive source route transparent bridging (ASRT).
- IP routing over ATM
- APPN/HPR routing
- Novell IPX routing on emulated LANs
- Bayan Vines

827x LAN/ATM Switch Modules

The following LAN switching modules can be added onto an 826x:

- 8271 ATM/Ethernet LAN Switch module. This is an Ethernet Switch with ATM backplane attachment; it provides options for attachment of 10BaseTX, 10BaseFL, 100BaseTX, and 100BaseFX ports. It runs ATM Forum LAN Emulation protocols. An option for routing IP and IPX is also available.
- 8272 ATM/Token-Ring LAN Switch module. This is a Token-Ring Switch that connects to the ATM backplane. It provides options for frontal copper and fiber Token-Ring, as well as routing for IP and IPX protocols. It runs LAN Emulation protocols over ATM.

ATM kit Applications

These are applications developed by companies that joined the IBM ATM kit Development program. The following Daughter Cards are available:

1. 4-port and 8-port ATM Circuit Emulation cards (from Litton-Fibercom). These cards provide Circuit Emulation over ATM based on ATM Forum specifications, and support both structured and unstructured channels.
2. 6-port Frame Relay / ATM Interworking card (from Odetics Telecom). This card provides Frame Relay to ATM interworking based on Frame Relay Forum standards FRF.8 and FRF.5 for transport of Frame Relay traffic over AT M, as well as for interworking between Frame Relay devices and ATM devices.

Chapter 3. The ATM Carrier Module

As the 8260 and 8265 are based on the same architecture, all the ATM Carrier Modules present the same generic interfaces to the Daughter Card, differing only at the backplane interface (user transparent) and by the form factor of the Carrier Card.

Carrier Module Functionality

The ATM Carrier Module is designed to give your ATM application full access to 826x ATM switching and machine control functions while minimizing the need to deal with those functions directly.

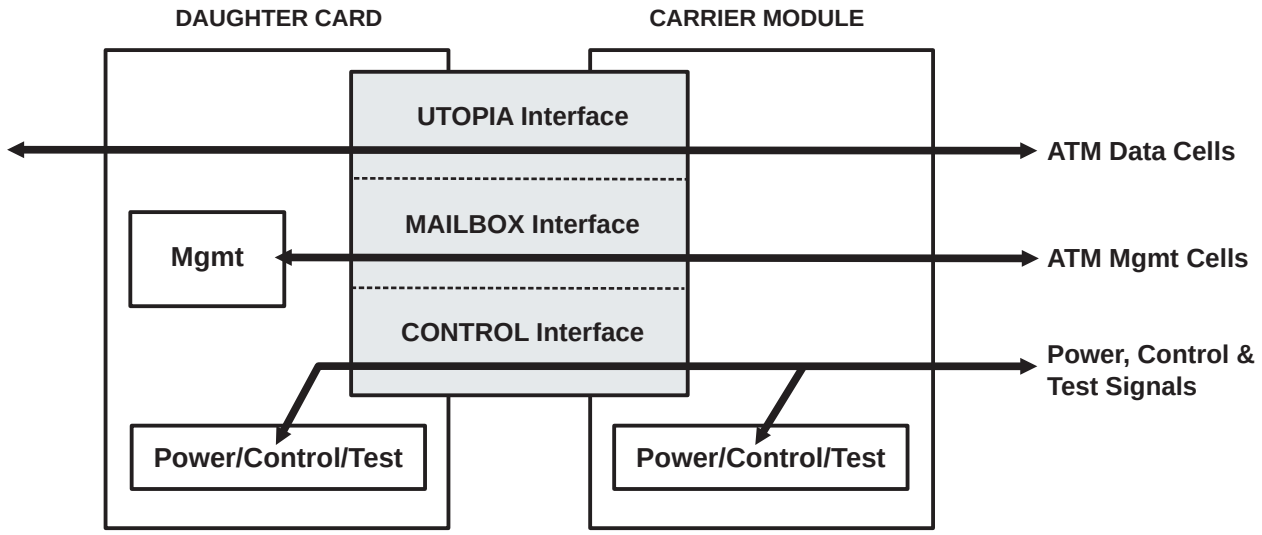


Figure 4. Carrier Module/Daughter Card Communication

As shown in Figure 4, 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-2 (8 bits in case of ATM Carrier Module levels 1.5 and 2.5, or 16 bits in case of ATM Carrier Module level 2.0).

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

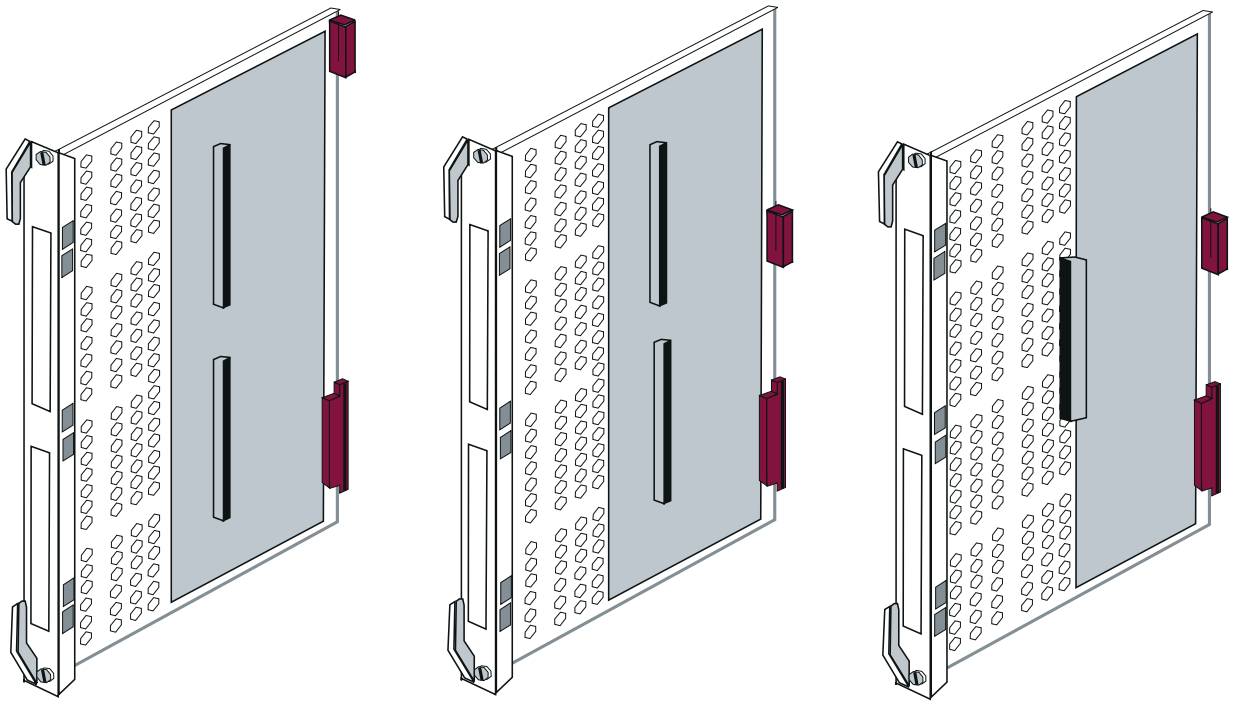
Control Interface
Power, control, module initialization and test signals are routed to the Daughter Card via the Control interface.

Carrier Module Physical Description

The ATM Carrier Module is an 8260 or 8265 ATM module that is ready to add the Daughter Cards of the custom ATM application. The Carrier Module consists of:

- An 826x ATM module frame (single-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.

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8260 Generic Carrier 1.5 **8265 Generic Carrier 2.5** **8265 Generic Carrier 2.0**

Figure 5. ATM Carrier Cards level 1.5, 2.5, 2.0

Figure 5 shows views of the three levels of ATM Carrier Modules.

Front Panel

The front panel of the ATM Carrier Module provides two empty spaces for the Daughter Card's customized faceplate.

Connectors

The ATM Carrier Modules have two kinds of connectors:

- The **ATM backplane connectors** for communication with the 826x switch. These comprise:
- The Management bus connector, which provides power and control signals
- The ATM backplane connector to the 826x ATM backplane.
- The **Daughter Card port connectors** for communication with the Daughter Card, which comprise:
- Two Daughter Card interface port connectors (vertical 120 I/Os) for Carrier levels 1.5 and 2.5
- One Daughter Card interface port connector (vertical 160 I/Os) for Carrier level 2.0.

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 Carrier Module logical interfaces:

UTOPIA Interface
All ATM data cells are transferred across 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 across 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-2 is an 8-bit (Carrier level 1.5 and 2.5) or an 16 bit (Carrier level 2.0) interface with no parity management and a cell level handshake.

Throughput is 160 Mbps for each port of the Carrier modules level 1.5 and 2.5 and 800 Mbps for the port of Carrier level 2.0.

UTOPIA-2 is a Multi-PHY interface and its implementation in the 826x provides the Daughter Card with the following capabilities:

- 6 PHY ports for each of the interface ports of Carrier Module level 1.5 and 2.5
- 12 PHY ports for the Carrier Module level 2.0 port.

Clocking

UTOPIA is a master/slave interface between the ATM layer (master) and the PHY layer (slave). So, the ATM layer (ATM Carrier module) provides both ″transmit″ and ″receive″ clocks to the PHY layer (Daughter Card). ATM Carrier levels 1.5 and 2.5 provide a 20 MHz transmit and receive clocks. ATM Carrier level 2.0 provides a 50 MHz transmit and receive clock. The Daughter Card must comply with the UTOPIA slave timings.

UTOPIA Receive Interface

Table 1 lists the signals of the UTOPIA Receive interface.

Table 1. UTOPIA Receive Signals

Name	Direction	Function
RxData (8 or 16)	PHY to ATM	Data bus receive

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Table 1. UTOPIA Receive Signals (continued)

RxSOC	PHY to ATM	Start of cell
RxEnb	ATM to PHY	Enable
RxEmpty/RxClav	PHY to ATM	No data
RxClk	ATM to PHY	Synchro

UTOPIA Transmit Interface

Table 2 lists the signals of the UTOPIA Transmit interface.

Table 2. UTOPIA Transmit Signals

Name	**Direction**	**Function**
TxData (8 or 16)	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

Management Messages (Mailbox Interface)

The 826x 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. The 8260 and 8265 both implement the same logical Mailbox. However, the physical Mailbox mechanism differs in some control signals (level 1.5/2.5 vs level 2.0).

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.

Table 3. Mailbox Interface Signals

Name	**Direction**	**Function**
Mbus Data bus (8)	Out	Data path for mailbox
CE	Out	Chip Enable mailbox
Address (10/12)	Out	Guided cell address (from/to)

Table 3. Mailbox Interface Signals (continued)

Output Enable	Out	Output Enable mailbox
Read/Write	Out	Read/Write signal
P_INT	In	Interrupt dual RAM

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 826x's intelligent power control feature. The 826x 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 17.

Daughter Card Arrangement

Figure 6 shows the possible positions of Daughter Cards, as viewed from the top of the module. Card A represents the main card of the application; if more room is necessary, a second card (Card B) can be placed on the same plane as the carrier board, which would be connected to Card A. Note that depending on the application, the size of Card A can vary.

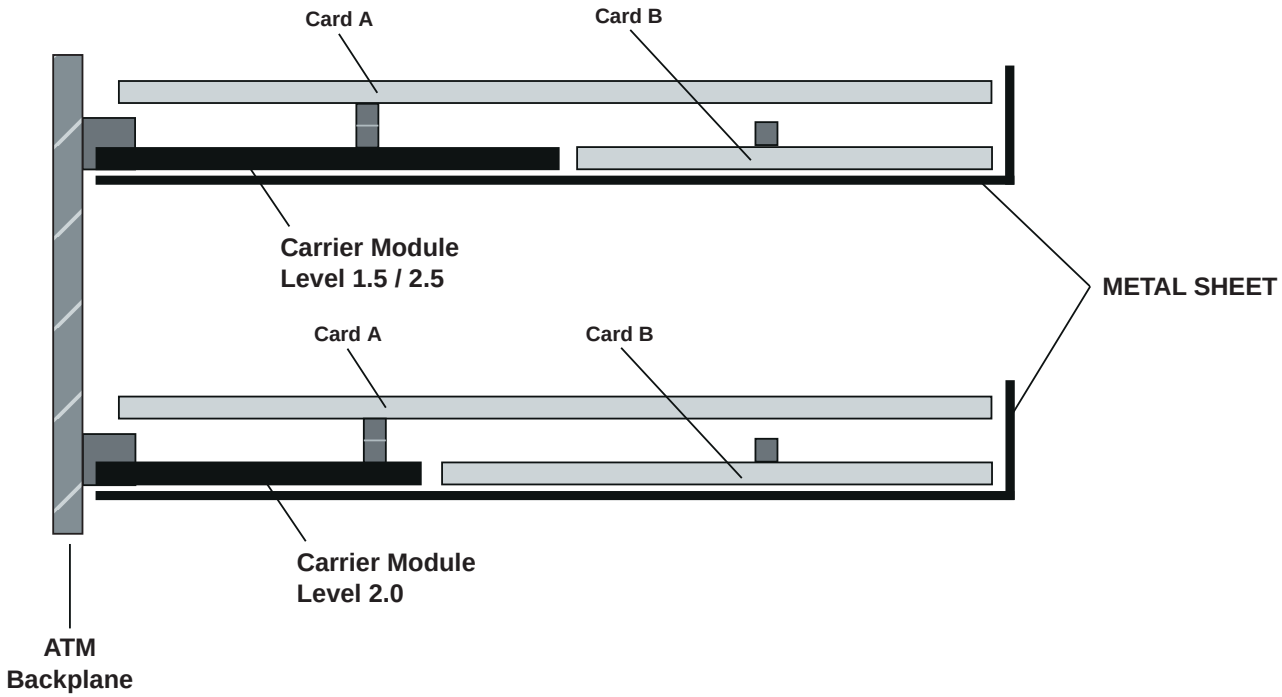


Figure 6. Possible Daughter Card positions (viewed from the top)

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 18.)

End User Interface Guidelines

The application usually requires some specific setup before operations. Some applications can be quite sophisticated, requiring a rich user interface, and others are quite simple. The ATM kit Development Program includes a set of guidelines for designing the end user interface, to ensure consistency in terms of serviceability and setup across the entire ATM switch, knowing that within the same machine, several applications from different sources can coexist or even interwork. These guidelines follow the model of the current end user interface on the IBM 826x CPSW module with some additional guidelines for code updates.

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:

Carrier Module levels 1.5/2.5

- Height: 14.37″ (365.00mm)
- Depth: 5.85″ (148.48mm)

Carrier Module level 2.0

- Height: 14.37″ (360mm)
- Depth : 4.40″ (112mm)

Placement in the IBM 826x

In the IBM 8260 Model A10 and A17 and 8265 Model S17, some slots are reserved for specific ATM modules, depending on the configuration:

- Slots 9 and 10 are always reserved for the dual-slot CPSW module.
- In the Model A17 or Model S17, 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. 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 6 on page 14.

Table 4. Daughter Card Dimensions

Card	Carrier 1.5/2.5	Carrier 2.0
Card A	H: 13.60″ D: 9.00″	H: 13.60″ D: 9.00″
Card B	H: 14.37″ D: 2.52″	H: 13.60″ D: 3.97″

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Connectors

Table 5 lists the part numbers of the Daughter Card interface port connectors.

Table 5. UTOPIA Port Connector Part Numbers

Carrier level	Carrier 1.5/2.5	Carrier 2.0
Connector	AMP P/N (120 pins)	AMP P/N (160 pins)
Port 1 - Carrier Card side	AMP-176372-5	AMP-536254-5
Port 1 - Daughter Card side	AMP-176380-5	AMP-536254-5
Port 2 - Carrier Card side	AMP-176372-5	N/A
Port 2 - Daughter Card side	AMP-176380-5	N/A

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. The Carrier Module has two openings on the faceplate; the dimension of each opening is 5.84″ x 0.59″ (148.4mm x 15mm). 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 6 lists the part numbers of the Carrier Module LEDs.

Table 6. LED Part Numbers

LED	IBM P/N	Vendor/Part No.	Application
Single Yellow	8193284	Dialight TIRA551-0307	Wrong Slot
Single Green	99Z9999	Dialight TIRA551-0207	Module status

Table 6. LED Part Numbers (continued)

Green and Yellow (dual in row)	8273334	Dialight TIRA553-0123	Port Status / Port Activity

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.

Table 7. Power Voltage/Amp for Carrier 1.5/2.5 Daughter Cards

Voltage	Max Power	Current (Amp)
+5V	27.5 W	5.5 A
+12V	7 W	0.58 A
-5V	2.5 W	0.5 A
-12V	3 W	0.25 A

Table 8. Power Voltage/Amp for Daughter Cards

Voltage	Max Power	Current (Amp)
+5.2V	32 W	6 A
+3.3V	26 W	7.7 A

Note: These maxima apply when the 826x switch 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 Commission's (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



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