297-8103-903

Nortel Networks
BroadBand STP

Centillion 1200N ATM Switch User Manual

SSR3.0 Standard 1.01 September 2000

Published in Canada

REGULATORY INFORMATION

Network Equiipment Building Systems (NEBS)

This product has been tested and found to comply with the criteria of NEBS level 1, 2, and 3.

FCC Part 15 Requirements

In compliance with FCC Part 15 Rules, the following statement is provided:

WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at their expense will be required to take whatever measures may be required to correct the interference.

FCC Part 68 Registration

Company Notification

If this product is provided with either a CE-DS1 or an ATM-DS1 interface then the following applies:

Before installing the Centillion 1200N ATM Switch to the telephone network, the telephone company must be provided with the following:

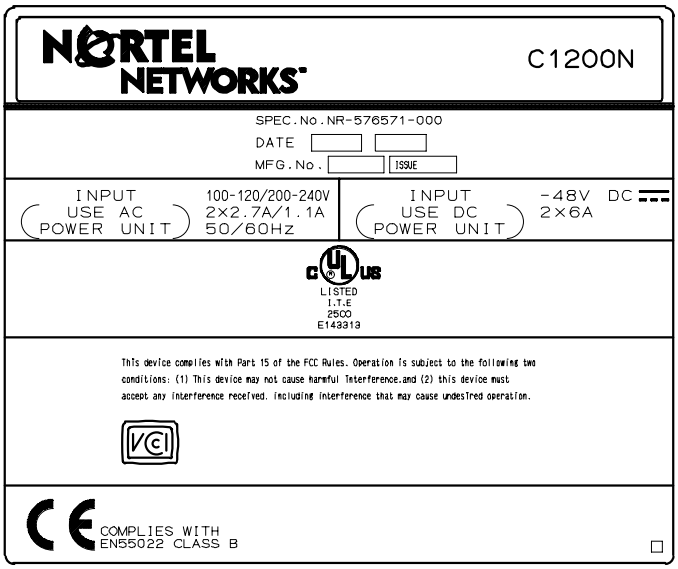
- Your telephone number
- The FCC registration number: AY5JPN-32775-XD-N
- The required USOC jack is RJ45

Service Requirements

In the event of equipment malfunction, Nortel Networks or an authorized distributor of Nortel Networks will perform all repairs. It is the responsibility of users requiring service to report the need for service to Nortel Networks or to one of their authorized distributors.

Location of FCC Compliance Labels

Labels stating the Centillion 1200N ATM Switch FCC registration number and compliance with FCC Part 15 and 68 are attached to the Base Chassis. The appearance of the labels is as shown below:



Regulatory Information for Analog Telephone

The equipment uses the following USOC jacks: RJ45.

If the equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. If advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations, or procedures that affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications in order to maintain uninterrupted service.

If trouble is experienced with this equipment, please contact NEC America, Inc.'s National Technical And Support Center (NTAC) at 800-538-8166 for repair and/or warranty information. If the trouble is causing harm to the telephone network, the

telephone company may request that you remove the equipment form the network until the problem is resolved.

NO REPAIRS CAN BE DONE BY THE CUSTOMER.

IC CS03 Certification (Canada)

Certification number: 140 8642

Load Number of the equipment: N/A

NOTICE: The Industry Canada label identifies certified equipment. The certification means that the equipment meets certain telecommunications network protective operational and safety requirements. The department does not guarantee the equipment will operate to the user's satisfaction.

Before installing the equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the companies inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situation.

Repairs to certified equipment should b made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or installations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request that the user disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This protection may be particularly important in rural areas.

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

CAUTION: The act of monitoring or recording telephone conversations under certain circumstances may violate federal or state statutes. Consultation with your legal counsel prior to engaging in such practices would be advisable.

Safety Certifications

This equipment has been listed by Underwriters Laboratories and found to comply with all the applicable requirements of the standard for Information Technology equipment UL 1950 3rd edition. This equipment complies with CSA standard C22.2 No 950 3rd edition.

Table of Contents

Table of Contents i

Precautions on Handling the Product 1-1
Precautionary Messages 1-1
Safety Measures 1-2
Power Supply 1-2
Installation 1-2
Operating the Equipment 1-3
User Responsibilities 1-3
Equipment Environment 1-3
Handling of Main Unit and Cables 1-4
PCMCIA Cards 1-4

What is the Centillion 1200N Switch? 2-1
Features 2-1
Outside View of the ATM Switch 2-3
Centillion 1200NSample System Configuration 2-4
What is ATM? 2-5
What is a Server Card? 2-7
LAN Emulation 2-8
ARP 2-10

Nomenclature and Functions 3-1
Nomenclature of the ATM Switch 3-1
Front View 3-1
Back View 3-4
Description and Function of Components 3-5
Switch/CPU Card 3-5
Line Cards 3-7
155 Mbps UTP5 Line Card 3-8
6.3 Mbps-J2 Line Card 3-9
DS3 Line Card and E3 Line Card 3-10
Power Unit 3-11
Fan Unit 3-12
Slot Numbers 3-13
Line Numbers 3-14

Hardware Specifications 4-1
Principal Functions of the ATM Switch 4-1
Flow of ATM Cells 4-2
Hardware Configuration and Overview of Functions 4-3
Line Cards 4-5
Interworking Cards 4-8
Server Cards 4-9

Software Specifications 5-1
Connection Management 5-1
Signaling Control 5-3
Routing 5-4
ILMI Functions 5-4
PNNI Functions 5-5
Traffic Management 5-6
Call Admission Control (CAC) 5-6
Usage Parameter Control (UPC) 5-6
Congestion Control 5-7
Priority Control 5-7
Shaping 5-7
Monitoring 5-8
Hardware Management 5-8

Hardware Interface 6-1
UNI and NNI 6-1
Line Interface 6-2

Installation 7-1
Installation Conditions 7-2
Environmental Conditions 7-2
Installation Space 7-3
Areas Suitable for Installation 7-5
Checking the Package Contents and Preparation for Setting 7-6
Packages 7-6
Packing List 7-6
Tools and Equipment Necessary for Installation 7-7
Transfer 7-8
Mounting of Switch on Chassis 7-9
Recommended Chassis 7-9
Installing the Chassis Brackets 7-10
Installing the Shelf 7-10
ATM Switch Installation 7-11
Connecting Communication Cables 7-12
Types of Communication Cables 7-12
Connection 7-13
MAT Connection 7-14

Inserting PCMCIA Cards 7-14
Turning Power On and Off 7-15
Connecting the Power Cable. 7-15
Turning the Power On. 7-16
Turning the Power Off 7-17
Power Source and Power Consumption 7-17
Setting System Configuration Data 7-18
Operation Check 7-18
Line Interface Test 7-19

Basic Configuration and Setup 8-1
Hardware Installation and Connection 8-1
Setting Configuration Data 8-2
Software Upgrading 8-4
Ongoing Configuration 8-5
Interface, ILMI, and SVC Signaling. 8-5
PVC Setup and Installation. 8-8
Setting up LAN Emulation 8-10
SVC Tunneling 8-14

Maintenance and Operations. 9-1
Overview. 9-1
MAT and NMS 9-2
MAT 9-2
Physical Connection of MAT 9-3
Connection 9-5
Communications Software 9-6
NMS 9-7
NMS Interface (via ATM) 9-8
NMS Interface (via Ethernet) 9-8
Periodic Maintenance 9-9
Backing up Configuration Data 9-10
Cosmetic Check 9-11
Checking Cables and Connectors 9-11
Checking with MAT 9-11
Cleaning 9-12

Modifications. 10-1
Moving the Equipment 10-1
General Precautions on Handling Packages 10-3
Power Unit Installation 10-4
Inserting the Power Unit 10-4
Removing the Power Unit. 10-6
Switch/CPU Card Installation. 10-7
Inserting the Switch/CPU Card. 10-7
Removing the Switch/CPU Card 10-8

Line Card Installation 10-9
Inserting a Line Card 10-9
Removing a Line Card 10-11
Installing the Front Plate 10-12
Removing the Front Plate 10-12
Installing the Fan Unit 10-13
Inserting the Fan Unit 10-13
Removing the Fan Unit 10-14
Installing the Front Cover 10-15
Installing the Front Cover 10-15
Removing the Front Cover 10-15
Upgrading Software 10-16
Inserting PCMCIA Cards 10-16
Upgrading 10-18
Adding Line Cards 10-25
Preparation 10-25
Hardware Work 10-25
Setting the ATM Switch and MAT 10-25
Hardware Check of the Additional Line Card 10-25
Setting System Configuration Data 10-25
Adding Hardware 10-26
Preparation 10-26
Setting the New ATM Switch 10-26
Hardware Work 10-27

Troubleshooting 11-1
Error Detection 11-1
Detection by LED 11-2
Detection by Diagnosis 11-4
Troubleshooting Procedures 11-5
When ALARM LED is Lighted (Hardware Error) 11-5
Alarm Error Numbers 11-6
When RCV/INS is Lighted (Line Error) 11-10
Error Messages 11-11
Line Error Definition 11-12

Specifications and Standards A-1

Glossary B-1

Worksheets 1

This page is for your notes.

1 Precautions on Handling the Product

Precautionary Messages

This document uses the following symbols to alert you to safety issues that you should observe to protect yourself and others from physical injury or property damage.

The precautionary messages used in this manual have the following meanings. Be sure to understand them before using the product.

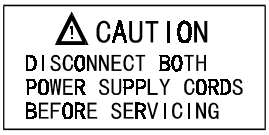
⚠ DANGER — ***When this sign is ignored and the product is used incorrectly, there is an imminent danger that the user will suffer either death or serious injury.***

⚠ WARNING — ***When this sign is ignored and the product is used incorrectly, there is a possibility that the user will suffer either death or a serious injury.***

⚠ PRECAUTION — ***When this sign is ignored and the product is used incorrectly, there is a possibility that the user will suffer an injury or cause property damage.***

The symbols and signals used on the labels supplied with the product have the following meanings. Be sure to understand them before using the product.

Class 1: Uses (safe) laser.



Keep the power cable disconnected when equipment is not in use.

Safety Measures

Power Supply

- For safety, be sure to use a three-pin outlet for power supply with a grounding receptacle. Lack of grounding may cause electric shock.
- To prevent electric shock, do not touch the equipment with wet hands when it is connected to a power supply.
- Do not plug the power cable of this equipment into an outlet with excess load. Putting excess load on one outlet may cause the outlet to overheat and start a fire.
- Do not place a heater near the power cable, place a heavy object on the power cable, or forcefully pull the power cable. Doing so may cause damage to the power cable and cause electric shock or fire.

Installation

- Place the equipment indoors.
- Place the equipment where the temperature is 41 to 104°F (5 to 40°C) and humidity is 10 to 80% (without condensation).
  - Condensation happens when moisture in the air attaches to the surface of metallic panels, etc., and turn into water drops. Condensation may occur inside the equipment when the temperature inside the equipment is low and the room temperature is high. Note that condensation may cause the equipment to fail.
- To prevent electric shock or a failure, do not place the equipment where it is susceptible to such liquids as water and oil, steam, or where the humidity is high.
- Place the equipment where the floor is flat and has adequate strength.
- To prevent a failure or deformation, do not place the equipment where it is exposed to direct sunlight or near fire or such heaters as stoves.
- To prevent a failure, do not place the equipment in a dusty area.
- Do not block the vents in the bottom, back, or top (rack mount) of the equipment. Blocking the vents will cause the temperature in the equipment to rise and may cause a failure or fire.

Operating the Equipment

- It is dangerous to use the equipment when it is malfunctioning. If you detect an irregular condition (irregular noise, irregular odor, or smoke), immediately turn off the main power, remove the power plug from the outlet, and call for service.
- To prevent electric shock or a failure, do not pour liquid such as water inside the equipment or touch the equipment with a wet hand. If liquid is accidentally spilled inside the equipment, turn off the main power, remove the power plug from the outlet, and call for service. Even if the equipment appears to be dry, if there is liquid left inside the equipment, electric shock or a failure may result.
- Do not touch any internal part of the equipment, or modify or disassemble the equipment. Electric shock, fire, or a failure may result.
- The ATM Switch is precision equipment. Keep it away from vibration.
- Do not install the equipment where it is susceptible to vibration. Vibration may cause the equipment to fail.
- To prevent a failure, do not place any foreign objects inside the equipment.
- Static electricity may cause the equipment to fail. To prevent damage from static electricity, be sure the equipment is adequately grounded.
- When touching a connector of the equipment, be careful of electrostatic damage. Be sure to use an electrostatic prevention kit and wear gloves when handling the equipment.
- This equipment is normally used with its power on. No one other than the person in charge of the system should touch the power switch. When power is turned off, communications will be severed. In addition, all unsaved data settings will be lost.

User Responsibilities

Once operation begins, the user need not control the equipment. The user merely needs to carefully read the handling precautions in this chapter and provide an environment around the equipment so the switch can function properly.

When an error occurs to the equipment during operation, the ALARM LED on the front of the equipment will light. In this case, promptly call the system manager.

Equipment Environment

- Protect the equipment from excessive heat or cold. (Do not expose the equipment to direct sunlight or place heat-radiating equipment near the switch.)
- Ensure adequate ventilation.
- Do not install the equipment where it is constantly humid or it is dusty.
- Do not place a radio, television, or any other equipment that produces strong magnetism near the ATM Switch.

Handling of Main Unit and Cables

- Do not open the equipment or disassemble it.
- Do not block ventilation holes or air-cooling fans.
- Do not expose the equipment to strong shock or vibration.
- Do not place heavy objects on the equipment.
- Keep water, chemicals, etc., from coming in contact the equipment.
- Keep foreign objects from entering the inside of the equipment.
- Do not touch the reset switch or cable connections during operation.
- Keep the cables from being at sharp angles.

PCMCIA Cards

The following precautions apply to PCMIA cards (if supplied):

- Do not touch the card's terminal. Poor contact or failure may result.
- Do not bend the card or subject it to external shock. Destruction of saved data or a failure may result.
- Store the card away from heat, moisture, or direct sunlight. These elements may cause the card to deform or fail.

What is the Centillion 1200N Switch? 2

The Centillion 1200N is a compact desktop 2.5 Gbps ATM Switch.

At the core is an input/output buffer switch that realizes a 2.5 Gbps nonblocking throughput. The ATM Switch can accommodate up to four lines of 622 Mbps interface conforming to the ATM Forum and ITU-T recommendations and up to 16 lines of 155 Mbps interface.

XATOM (eXpandable ATM Output Modular Switch), the core of the ATM Switch, is equipped with a large-capacity buffer to ensure the smooth flow of multimedia traffic and provide a powerful support to multimedia communications.

The ATM Switch supports both fixed path, or permanent virtual connections (PVC), and variable path, or switched virtual connections (SVC), and features such functions as ATM cell priority control, congestion control, and traffic monitoring. In addition, by using the SNMP protocol, the ATM Switch can interface with a network management system (NMS).

Features

The ATM Switch is a desktop ATM switch used for such applications as LAN-to-LAN connection. The ATM Switch serves as the core of an ATM users' network.

The features of the ATM Switch are described below.

- Realizes 2.5 Gbps throughput

  As the ATM Switch employs an output buffer type ATM switch with a random access input-output buffer, it realizes high-capacity switching at a high-speed total throughput of 2.5 Gbps of maximum switching capacity (at 155 Mbps × 16 lines maximum). Consequently, the ATM Switch can be used to build a high-speed multimedia network.

- Has redundant configuration

  Redundant configuration of power unit ensures high reliability.

- Accommodates various ATM lines

  The ATM Switch can interface various ATM lines by accommodating both optical lines and metallic lines, different throughputs, and different protocols. Because the ATM Switch is equipped with interfaces for various ATM lines, it can be used for a wide range of multimedia applications depending on the need.

- Structure of the ATM Switch

  With its compact dimensions, the ATM Switch can be placed on a desktop or on a standard 19-inch rack. To facilitate on-site maintenance after the operation begins, the ATM Switch is designed to allow service access from the front of each unit.

- Supports various connection functions

  As the ATM Switch supports both fixed connections (PVCs) and switch connections (SVCs), it provides various connection formats.

- Connections may be set to one of five levels of control priority
  - Total management of network

    Because the ATM Switch is equipped with a network management agent function based on SNMP, it can be managed along with such LAN products as routers and hubs.

- Traffic control

  When competition occurs in sending out cells, this traffic control function prevents the cell with a higher priority from being delayed or discarded.

  Each connection may be set to one of five levels of control priority.

- Supports PNNI Ver.1.0

  The ATM Switch is the world's first ATM switch to support PNNI Ver.1.0 that conforms to the ATM Forum. This ensures that network construction is made simple.

- Provides server function

  By installing a server card (option) in the line card slot, the ATM Switch can be used as a LAN emulation server or an ARP server.

- Total management of network

  As the ATM Switch is equipped with a network management agent function based on SNMP, it can be managed along with such LAN products as routers and hubs.

- Interworking with other types of networks

  Interworking between ATM network and other types of networks can be realized by installing an interworking line card (Frame Relay card FR-DS1) and a Circuit Emulation card (CE-DS1) in the ATM Switch.

Outside View of the ATM Switch

Figure 2-1 and Figure 2-2 show the external structure of the ATM Switch. The ATM Switch has the following dimensions:

- 440 mm (17.3 in.) wide
- 410 mm (16.1 in.) deep
- 154 mm (6.1 in.) high (including rubber footing)

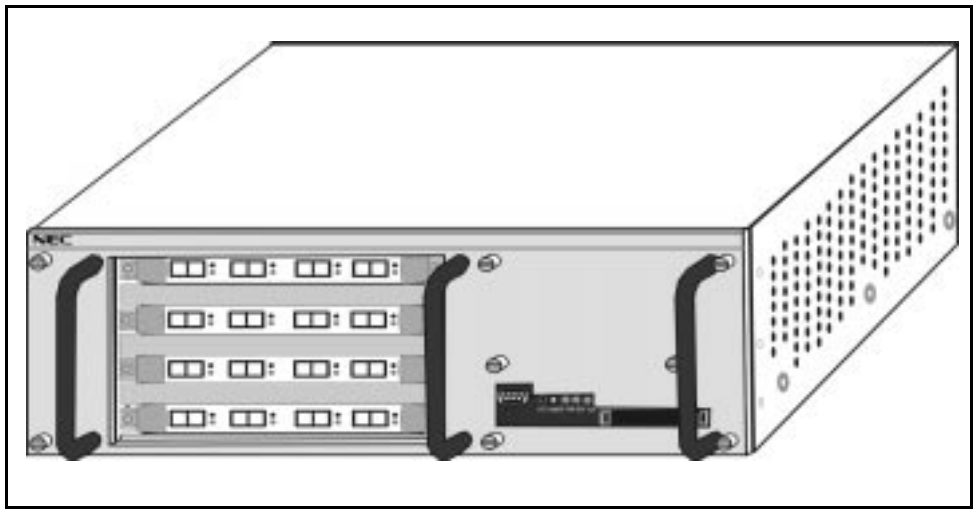


Figure 2-1: Front View

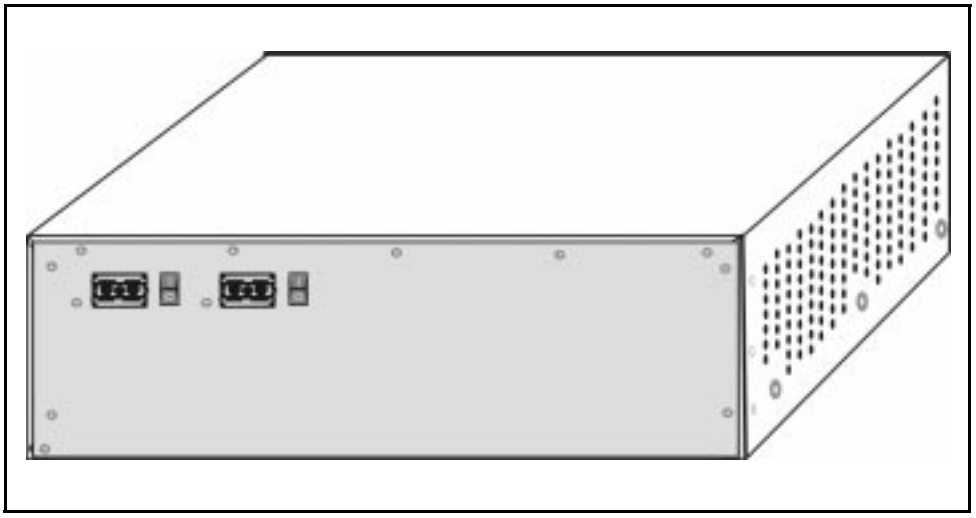


Figure 2-2: Back View (DC Power)

Centillion 1200NSample System Configuration

Explained in Figure 2-3 are LAN-to-LAN connection and ATM-LAN, which are principal systems using the ATM Switch.

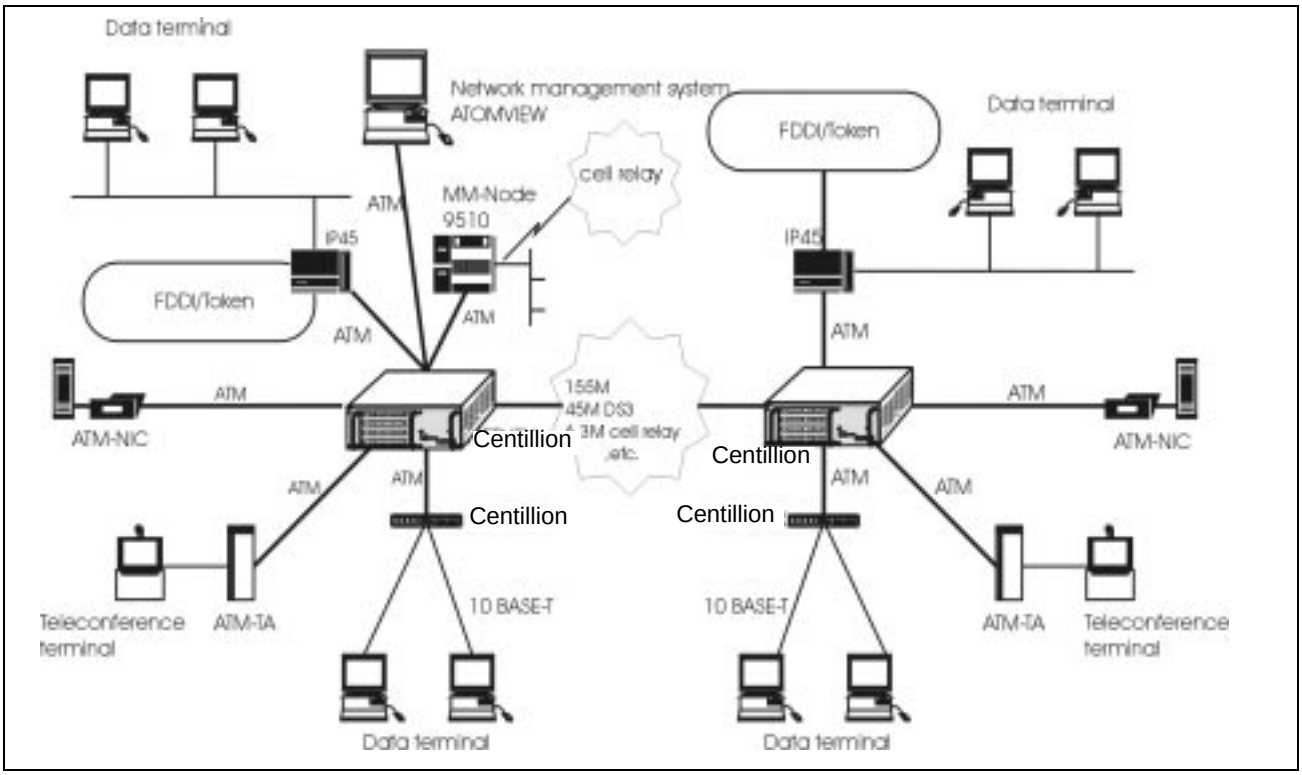


Figure 2-3: Sample System Configuration

LAN-to-LAN Connection

ATM Switch is used as the backbone network of a router (IP45) or a switching hub (ATM Switch 3) for interworking such LANs as Ethernet, Token Ring, and FDDI. In this case, the throughout is 2.5 Gbps.

A router or a switching hub with an ATM interface may be connected directly to ATM Switch. Those without an ATM interface may be connected to the ATM Switch via DSU.

ATM-LAN

By installing ATM-NIC on a PC (Personal Computer)/WS (Work Station) and using ATM Switch, the LAN built with Ethernet, etc., can be used as an ATM-LAN with maximum throughput of 2.5 Gbps.

Method of Expansion

The number of lines accommodated can be increased by connecting a number of ATM Switch units. Line interface can be used to connect the ATM Switch units. An interface dedicated to connections between units is not necessary. When a number of the ATM Switch units are connected to increase the number of lines, the actual number of lines accommodated is the total number of lines less the number of lines between the units.

What is ATM?

ATM, or Asynchronous Transfer Mode, is a communication method that will serve as the basis for tomorrow's communication network, B-ISDN.

In ATM, all data in the network are exchanged in fixed-length, 53-byte blocks called "cells." This allows much faster and broader communications compared to the conventional STM or packet switching method.

The communication channels for cells are such virtual connections as VP (Virtual Path) and VC (Virtual Channel). These are identified by the VPI (Virtual Path Identifier) and VCI (Virtual Channel Identifier) stored in the 5-byte header of each cell.

Figure 2-4 is a conceptual diagram of VP and VC in an ATM network, and the format of ATM cells.

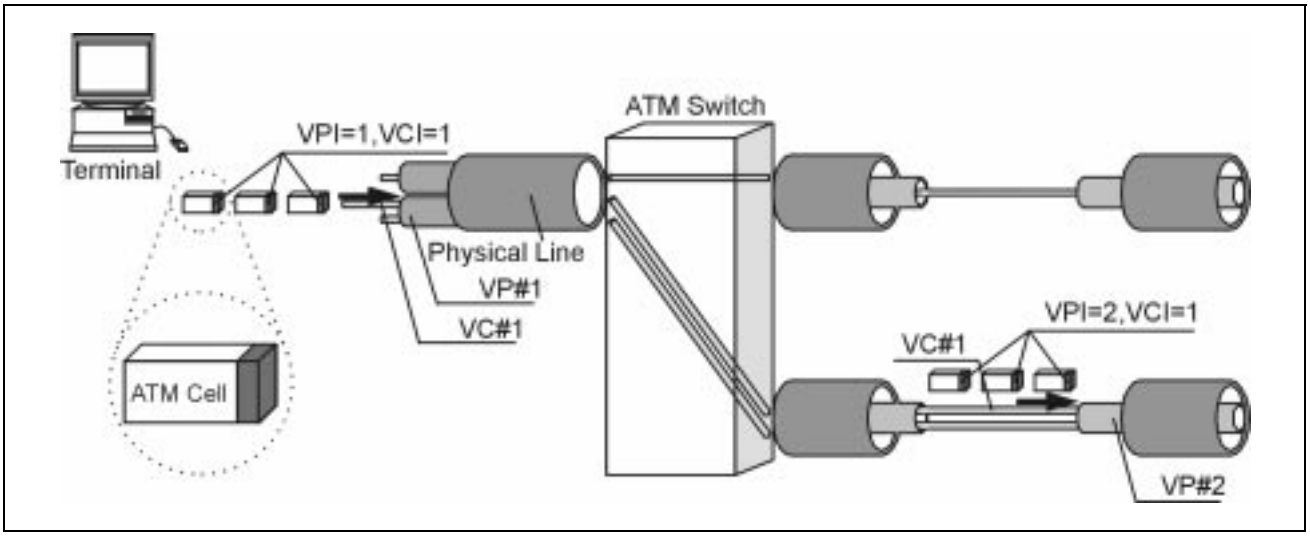
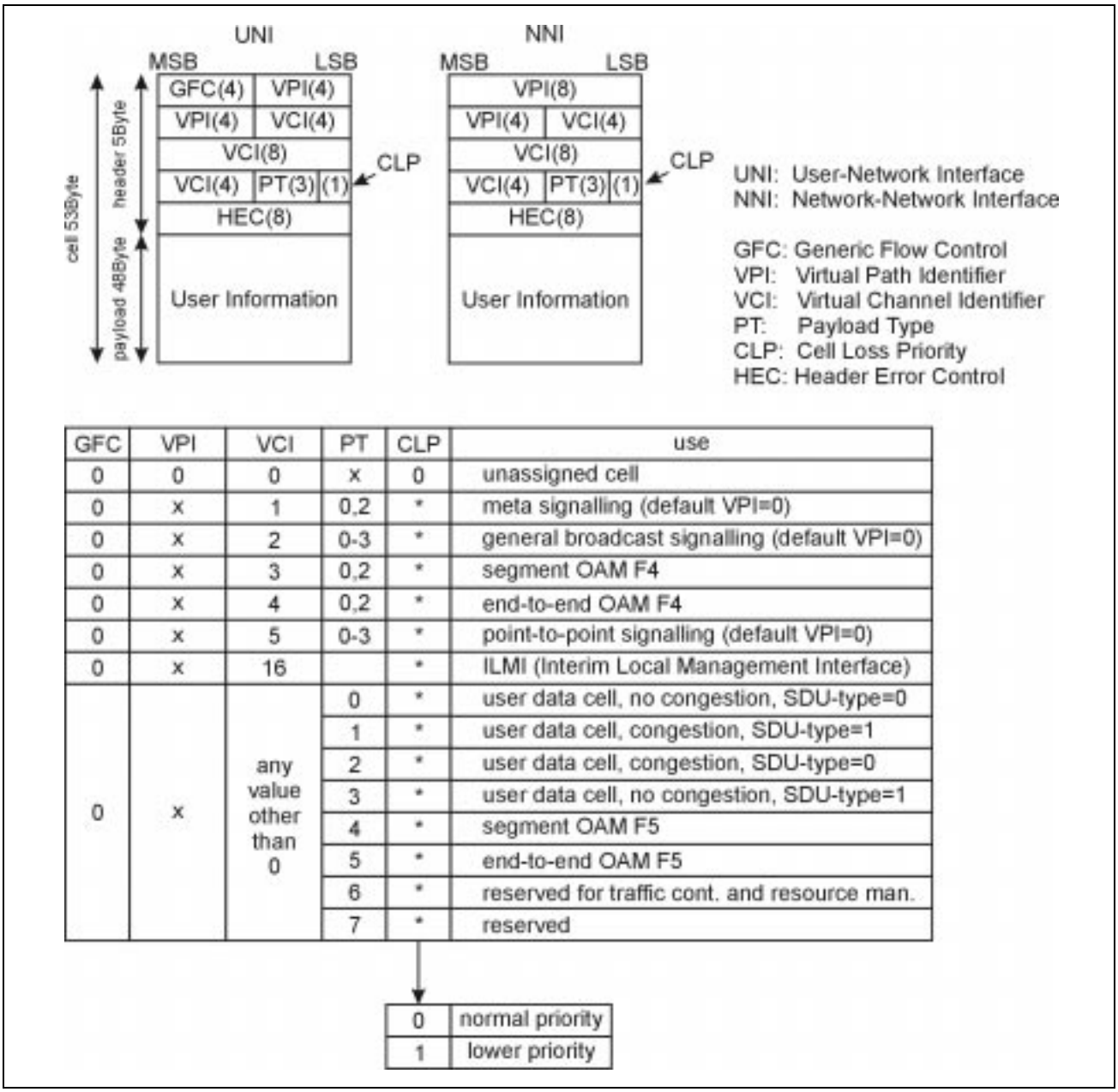


Figure 2-4: Virtual Path (VP) and Virtual Channel (VC)

Figure 2-5 illustrates the ATM cell format.



GFC	VPI	VCI	PT	CLP	use
0	0	0	x	0	unassigned cell
0	x	1	0,2	*	meta signalling (default VPI=0)
0	x	2	0-3	*	general broadcast signalling (default VPI=0)
0	x	3	0,2	*	segment OAM F4
0	x	4	0,2	*	end-to-end OAM F4
0	x	5	0-3	*	point-to-point signalling (default VPI=0)
0	x	16		*	ILMI (Interim Local Management Interface)
0	x	any value other than 0	0	*	user data cell, no congestion, SDU-type=0
			1	*	user data cell, congestion, SDU-type=1
			2	*	user data cell, congestion, SDU-type=0
			3	*	user data cell, no congestion, SDU-type=1
			4	*	segment OAM F5
			5	*	end-to-end OAM F5
			6	*	reserved for traffic cont. and resource man.
			7	*	reserved

0	normal priority
1	lower priority

Figure 2-5: ATM Cell Format

What is a Server Card?

The Server Card is a CPU built-in card for realizing seamless connection with existing LAN in an ATM network environment.

The card is mounted on ATM Switches, which serves as the core of an ATM network, to provide LANE server, ARP server, and NHRP server functions.

Following are features of the server card:

- Provides server functions conforming to various specifications

  The software that provides the LAN emulation server functions is installed in the card with a built-in CPU to facilitate the construction of LAN emulation. By installing software with ARP server and NHRP server functions, it is possible to eliminate bandwidth waste caused by conventional broadcast address solution and improve the capacity of the network as a whole.

- Hot-Swappable

  The server card can be inserted into or removed from the ATM switching system without affecting its switching functions.

- Processor-to-processor communication function

  Reciprocal communication is realized between the CPU in the server card and the CPU in the switching system. This function allows the switching system to control the server card and also to control in an integrated fashion the switching system, along with other network equipment, with an NMS (Network Management System).

- Allows the installation of several server cards

  A number of server cards can be installed on a single ATM Switch. Consequently, this facilitates the scalable expansion of the server according to network size and enables the server to be operated in a redundant configuration. In addition, this feature makes it possible to distribute the traffic that had concentrated in the server with conventional networks.

LAN Emulation

LAN emulation refers to the technology of using the existing infrastructure of a LAN and connecting the LAN to an ATM network on a bridge level to emulate the connection. The specification of LAN emulation has been standardized by the ATM Forum in its “LAN Emulation Over ATM Specification Version 1.0.”

LAN emulation allows existing LAN terminals to reciprocally communicate with ATM terminals and make it possible to construct a virtual LAN that is free of physical restraints.

Figure 2-6 and Figure 2-7 show the LAN emulation protocol stack between an ATM terminal and an existing LAN terminal and its frame format when IP protocol is used as the network layer.

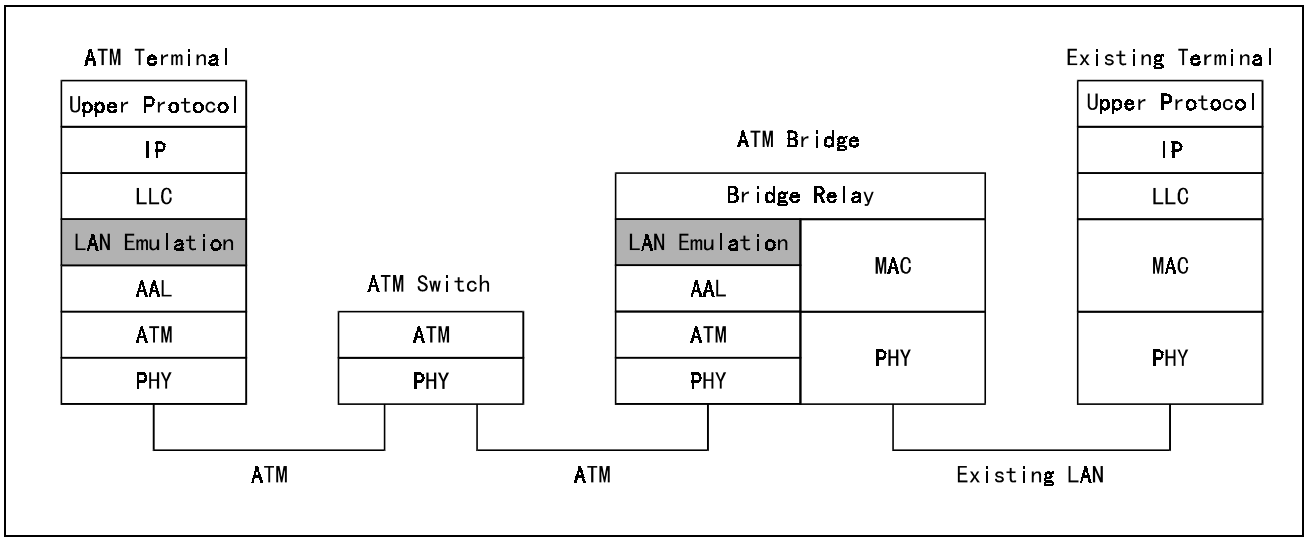


Figure 2-6: LAN Emulation Protocol Stack

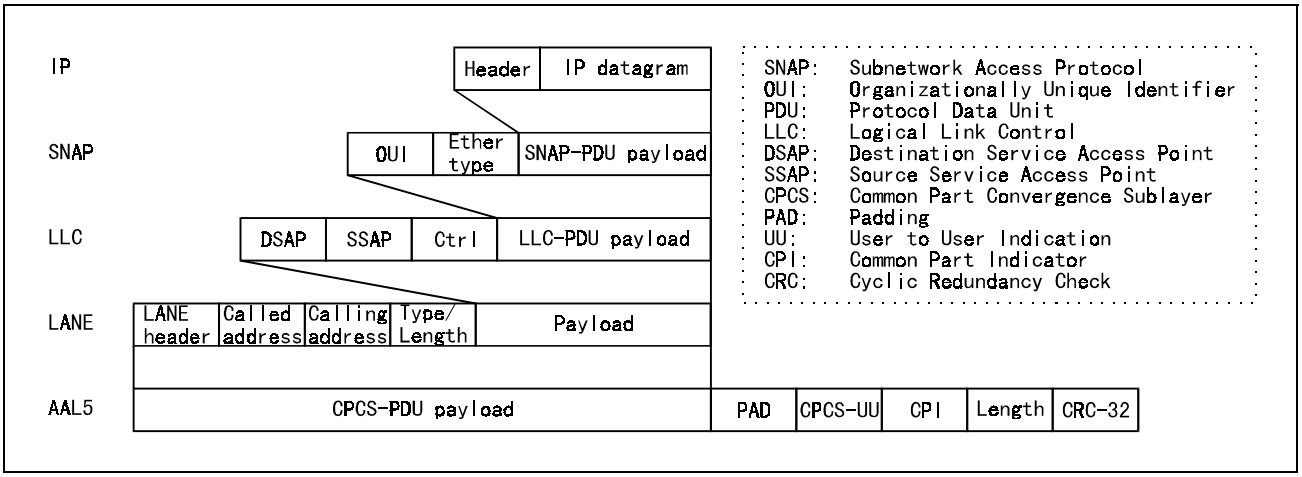


Figure 2-7: LAN Emulation Frame Format

The server card provides the three server functions below to realize LAN emulation.

- LES (LAN Emulation Server)

  LES provides the ARP (Address Resolution Protocol) function for solving an ATM address from a MAC address. There is one LES for each ELAN (Emulated LAN).

- LECS (LAN Emulation Configuration Server)

  LECS manages LAN emulation configuration and provides LES addresses. It assigns a LEC (LAN Emulation Client; client that is a member of LAN emulation) to a certain ELAN. There is one LECS for each management domain.

- BUS (Broadcast and Unknown Server)

  BUS provides broadcast and multicast functions and solves unknown destination addresses. There is one BUS for each ELAN (Emulated LAN).

Figure 2-8 is a sample system configuration using the ATM Switch series switching system and the server card (LAN Emulation Server).

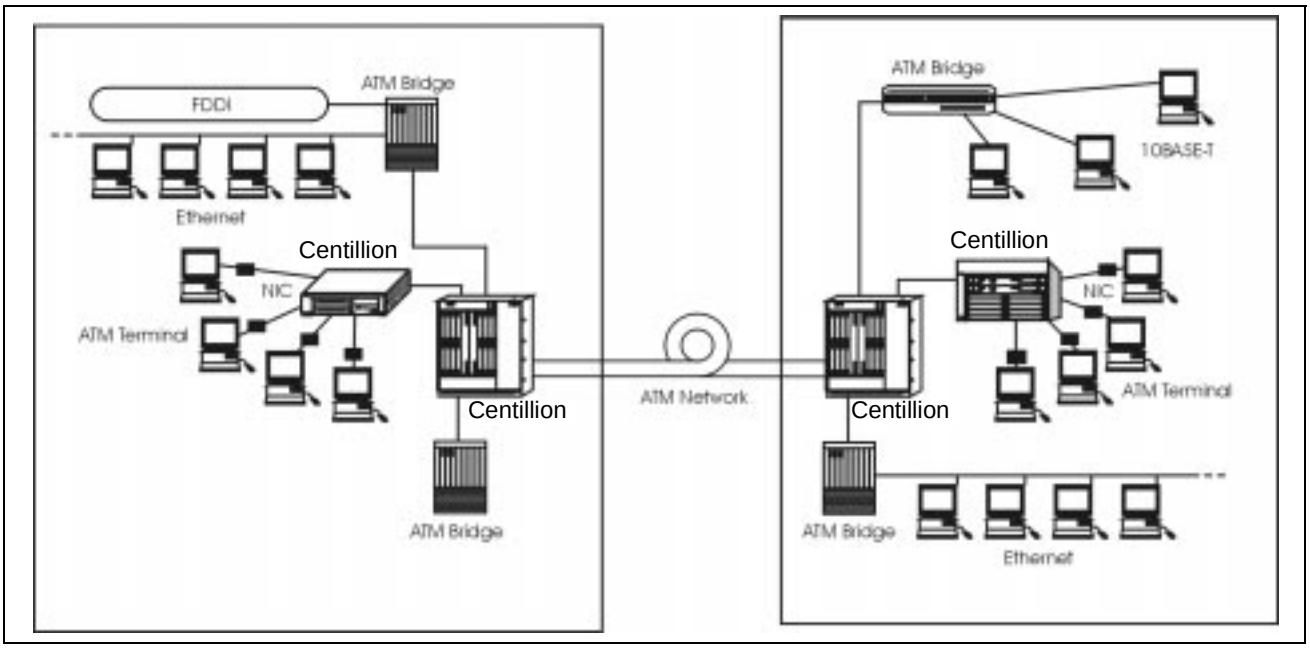


Figure 2-8: Sample System Configuration

In the sample system configuration (Figure 2-8), such existing LANs as Ethernet, and FDDI are connected to the ATM network by an ATM bridge. Here, the ATM bridge and ATM terminal are equivalent to the LAN emulation client.

The server card is installed on one of the ATM switches in the illustration. A number of server cards can be installed on a single ATM Switch.

ARP

Address Resolution Protocol (ARP) is an address conversion protocol used to resolve the MAC address (or ATM address) of a terminal from its IP address in a subnet. ARP provides IPOA function which conforms to RFC 1577.

The ARP function provided by the Server Card is to resolve the ATM addresses of terminals in ATM-LAN. This function, in particular, is referred to as ATM ARP.

At least one ARP server is placed in a logical IP subnet (LIS). Having an ARP table (IP address-ATM address chart) that is periodically updated, the ARP server resolves addresses of terminals in that LIS.

Shown in Figure 2-9 is the address resolution procedure using an ARP server. (The numbers correspond with the procedures that follow.)

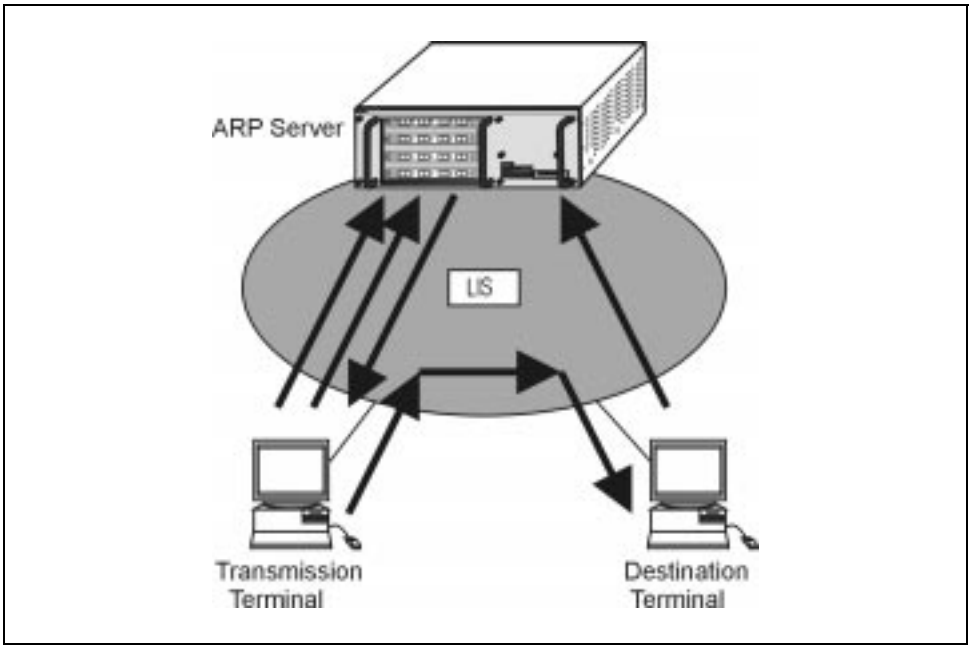


Figure 2-9: Address Resolution Procedure Using an ARP Server

1. Each terminal, when connected to ATM-LAN, registers its own IP address and ATM address with the ARP server. The ARP server uses the registered addresses to prepare an ARP table.
2. When the transmission terminal has no connection with the destination terminal and has not cached the ATM address of the destination terminal, it sends to the ARP server an address resolution request with the destination terminal's IP address.
3. The ARP server, after receiving the address resolution request, checks the ARP table to see if there is an entry corresponding to the IP address. If there is, the ARP server notifies the terminal of the ATM address corresponding to the received IP address.

4. The transmission terminal, after receiving the ATM address of the destination terminal from the ARP server, uses the ATM address to establish a direct SVC connection to the destination terminal. This SVC connection is used until the data communication to the destination terminal is completed. When the communication is completed, this SVC is released. (The ATM address of the destination terminal obtained from the ARP server is cached in the transmission terminal and retained for a certain duration.)

This page is for your notes.

3 Nomenclature and Functions

This chapter describes the names and functions of each part of the ATM Switch.

- Nomenclature
- Description and function of components
- Slot number of each package
- Line number

Nomenclature of the ATM Switch

Front View

Power Unit

The power unit supplies power to the components of the ATM Switch. It draws DC -40 to -58V as the power input. The power unit is installed on the top right-hand side of the front of the ATM Switch. The power unit may be redundant.

Switch/CPU Card

This is the basic component of the ATM Switch. It is capable of switching ATM cells at a maximum speed of 2.5 Gbps. It also controls the entire switch. The switch/CPU card is installed on the bottom right-hand side of the front of the ATM Switch.

Front Plate

The Front Plate is installed in empty line card slots.

Fan Unit

The fan units force internal heat outside. The air flows from the right to left.

RS-232C Port

This is a 9-pin D-SUB connector used by service personnel to connect a Maintenance and Administration Terminal (MAT).

Line Cards

Depending on the type of lines accommodated, line cards are available in variations such as:

- OC-12c
- OC-3c/STM-4 (single mode)
- OC-3c/STM1 (single mode/ multi-mode/UTP-5/COAX)
- TAXI
- 6.3M-J2
- 45M-DS3
- 34M-E3
- 1.5M-DS1
- 2M-E1
- FR-DS1
- CE-DS1
- CE-E1

The line cards provide line interfaces conforming to the ITU-T/ATM Forum. The line cards terminate physical and ATM layers. The line cards are installed in the line card slots in the front of the ATM Switch.

LANE server and IPOA ARP server functions can be used by installing a server card in the line slot. LANE conforms to ATM Forum and IPOA to RFC1577.

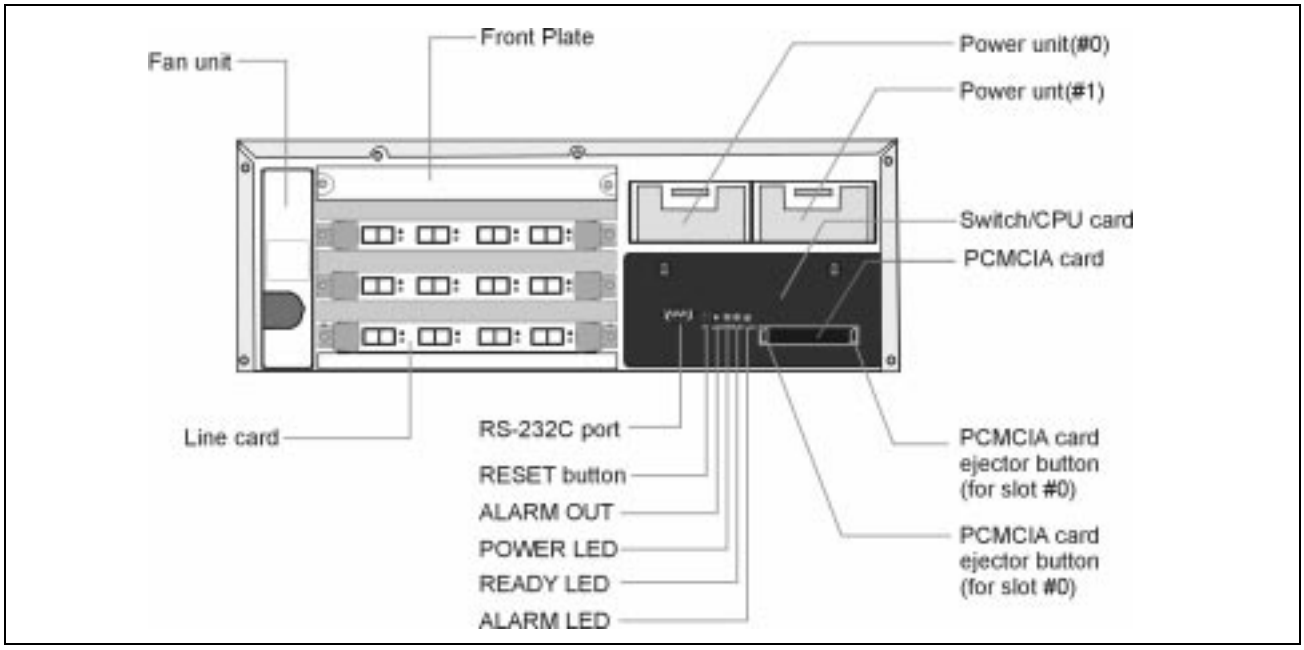


Figure 3-1: Front View of the ATM Switch (front mask removed)

RESET Button

This is used to reset the switch/CPU card.

ALARM OUT

An external device for notifying the user of a problem with the ATM Switch (e.g., speaker or alarm lamp) is connected to this connector.

Power LED

The POWER LED lights green when power is on and turns off when power is off.

Ready LED

The READY LED turns on when the equipment is operating properly and turns off when an error occurs. It also flashes during diagnosis.

Alarm LED

The ALARM LED lights red when an error occurs in the equipment.

PCMCIA Card Slot

This slot is used to install an ATA (flash disk) card for storing software or system configuration data or a LAN card (optional) for connecting the hardware to Ethernet.

Back View

Power Switch

This switch is used to turn the ATM Switch on and off.

DC Power Connector

This connector is used to connect the power cable.

Power Unit Fastening Screw

This screw is used to fasten the power unit to the main unit and ground the ground wire inside the main unit for safety.

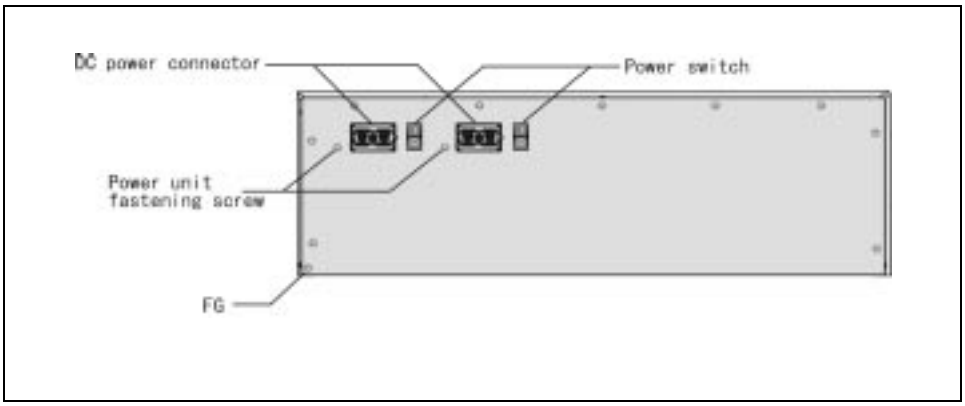


Figure 3-2: Back View of the ATM Switch

Description and Function of Components

Switch/CPU Card

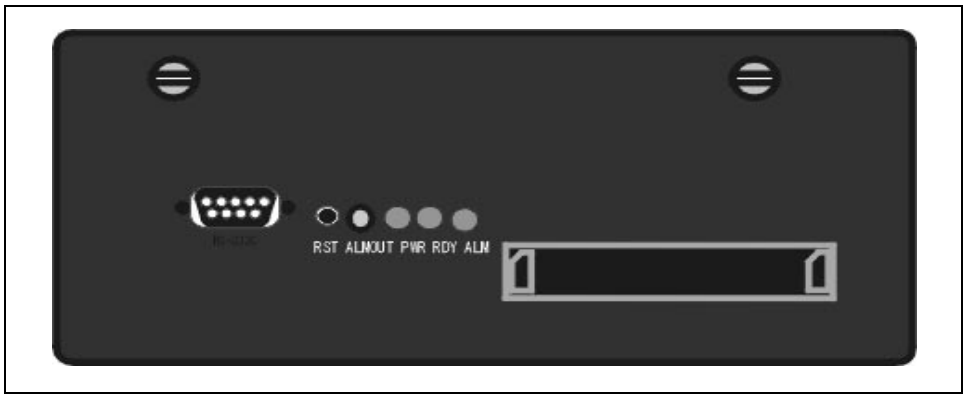


Figure 3-3: Front View of the Switch/CPU Card

Power/Ready/Alarm Indicator Lights

These lamps indicate the status of the switch/CPU card.

POWER	Lighted	Power on
	Off	Power off
READY	Lighted	Operating properly
	Flashing	Undergoing diagnosis
	Off	Error occurred
ALARM	Lighted	Error occurred
	Off	Operating properly

RESET Button

This button is used to reset the switch/CPU card.

RS-232C Connector

This is a 9-pin D-SUB connector used by service personnel to connect a Maintenance Administration Terminal (MAT).

ALARM Out

This connector is used to connect an external device for notifying the occurrence of an irregular condition in the hardware (e.g., speaker or alarm notification lamp).

PCMCIA Card Slot

This slot is used to install a PCMCIA (ATA, LAN) card.

- 622 Mbps single mode line card
- 155 Mbps single mode (long) line card

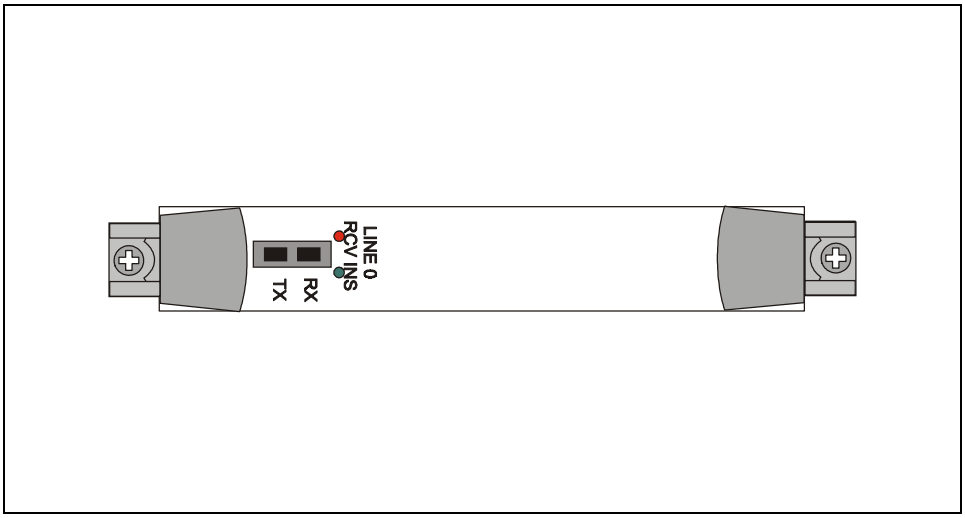


Figure 3-4: Front View of 622 Mbps Single Mode and 155 Mbps Single Mode (Long) Line Card

RCV/INS

Available for each line, these lamps indicate the status of that particular line.

RCV (red)	INS (green)	Status
Off	Lighted	Line status normal
Lighted	Off	Line error (reception error)
Off	Flashing	Line error (transmission error)
Off	Off	Hardware error

Rx/Tx

These codes indicate the reception side and transmission side of the SC connectors.

Rx	Reception side connector
Tx	Transmission side connector

Line Cards

- 155 Mbps Multi-mode Line Card
- 155 Mbps Single Mode (short) Line Card
- 100 Mbps TAXI Line Card

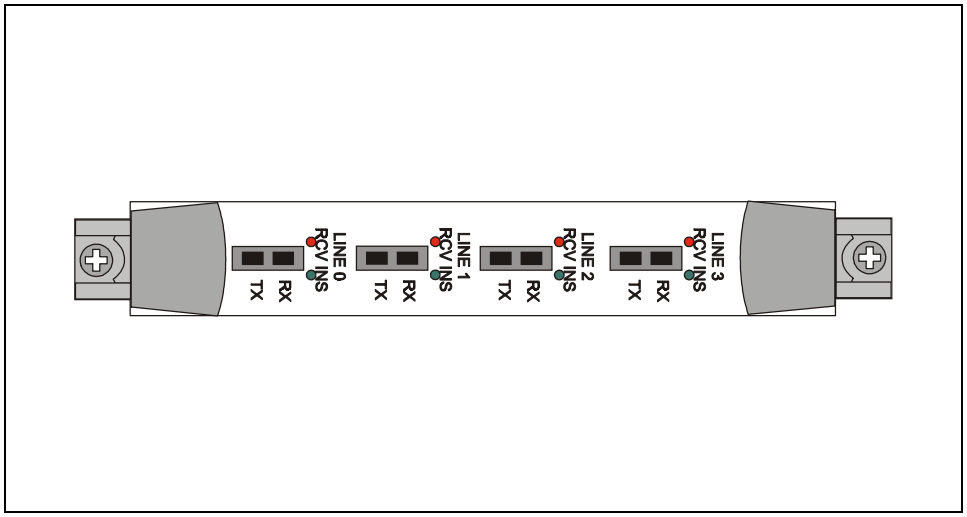


Figure 3-5: Front View of 155 Mbps Multi-Mode, 155 Mbps Single Mode (Short), and 100 Mbps TAXI Line Card

RCV/INS

Available for each line, these lamps indicate the status of that particular line.

RCV (red)	INS (green)	Status
Off	Lighted	Line status normal
Lighted	Off	Line error (reception error)
Off	Flashing	Line error (transmission error)
Off	Off	Hardware error

Rx/Tx

These codes indicate the reception side and transmission side of the SC connectors.

Rx	Reception side connector
Tx	Transmission side connector

155 Mbps UTP5 Line Card

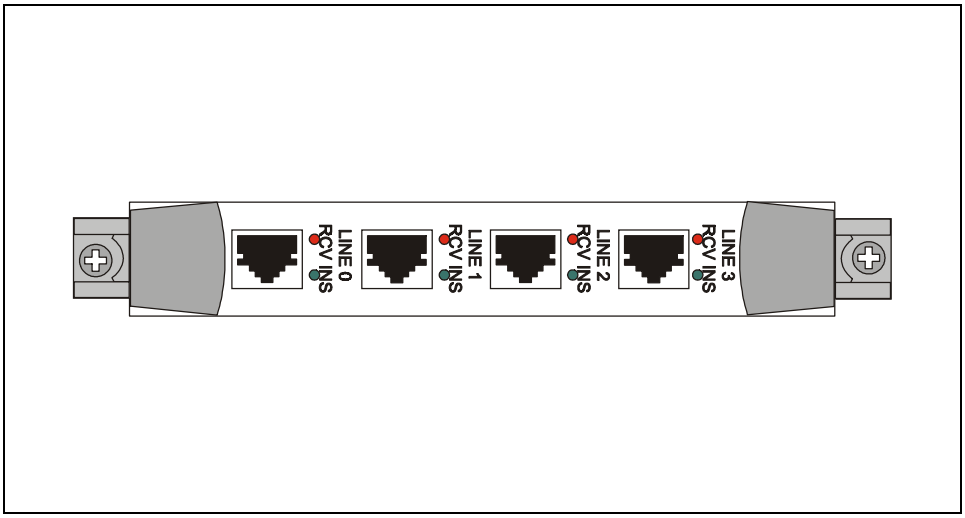


Figure 3-6: Front View of 155 Mbps UTP5 Line Card

RCV/INS

Available for each line, these lamps indicate the status of that particular line.

RCV (red)	INS (green)	Status
Off	Lighted	Line status normal
Lighted	Off	Line error (reception error)
Off	Flashing	Line error (transmission error)
Off	Off	Hardware error

6.3 Mbps-J2 Line Card

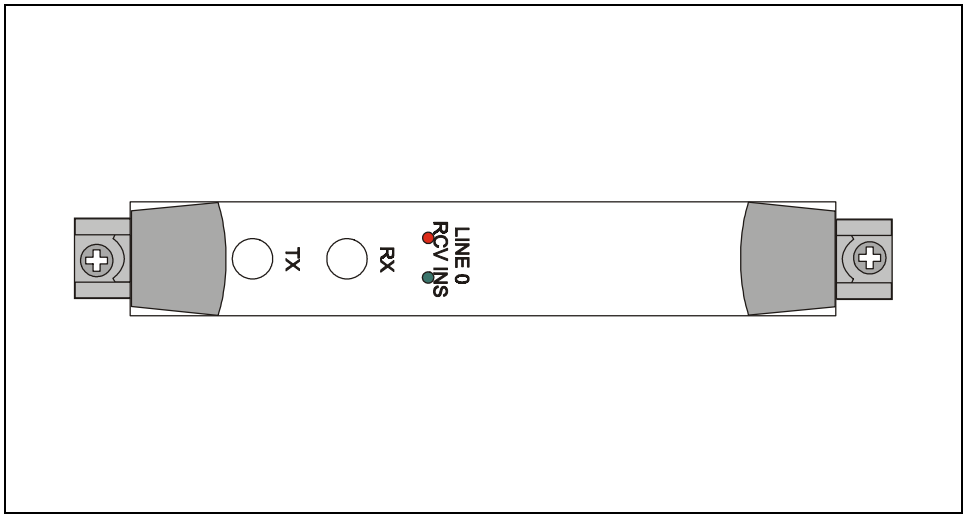


Figure 3-7: Front View of 6.3 Mbps-J2 Line Card

RCV/INS

Available for each line, these lamps indicate the status of that particular line.

RCV (red)	INS (green)	Status
Off	Lighted	Line status normal
Lighted	Off	Line error (reception error)
Off	Flashing	Line error (transmission error)
Off	Off	Hardware error

Rx/Tx

These codes indicate the reception side and transmission side of the BNC connectors.

Rx	Reception side connector
Tx	Transmission side connector

DS3 Line Card and E3 Line Card

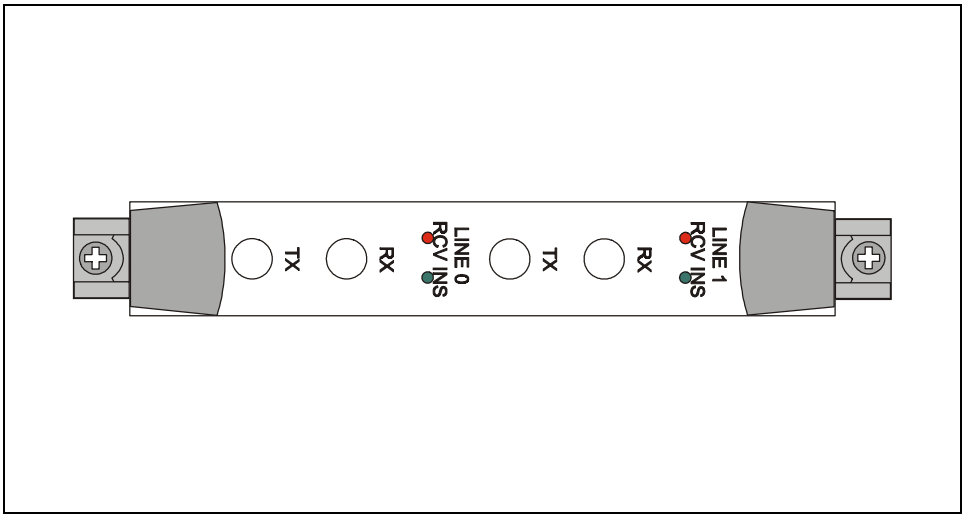


Figure 3-8: Front View of DS3 and E3 Line Card

RCV/INS

Available for each line, these lamps indicate the status of that particular line.

RCV (red)	INS (green)	Status
Off	Lighted	Line status normal
Lighted	Off	Line error (reception error)
Off	Flashing	Line error (transmission error)
Off	Off	Hardware error

Rx/Tx

These codes indicate the reception side and transmission side of the BNC connectors.

Rx	Reception side connector
Tx	Transmission side connector

Power Unit

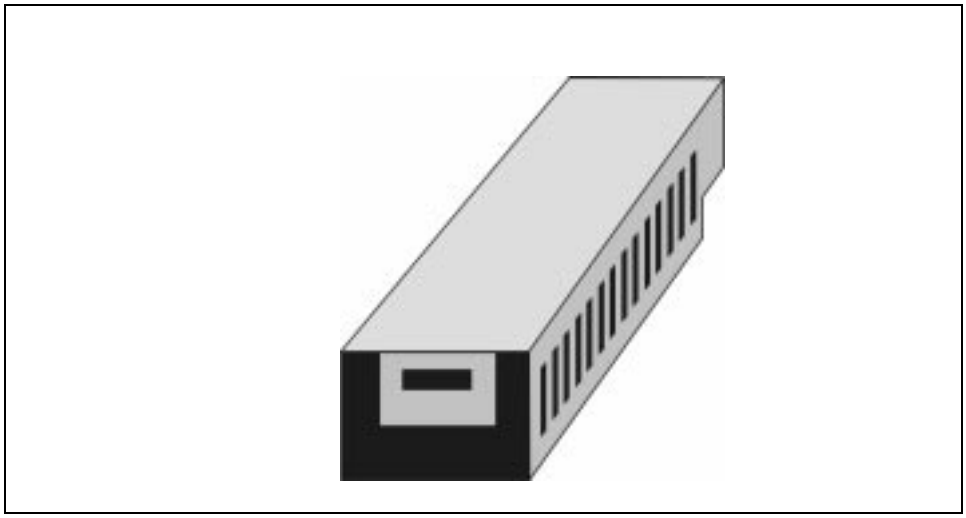


Figure 3-9: Outside View of Power Unit

The power unit indicates an alarm and stops output under the following conditions:

- When excessive load is imposed on the output side and the protective function of the power unit lowers the voltage.
- When voltage of higher than the rating is output due to an error in the power unit.
- When the temperature rises abnormally inside the power unit.

Fan Unit

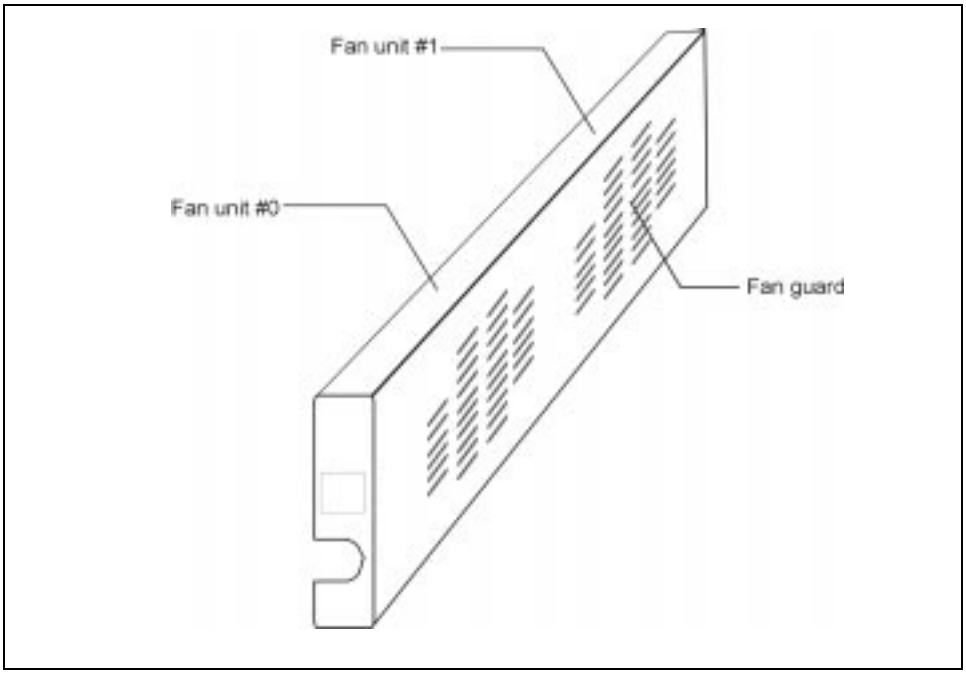


Figure 3-10: Outside View of Fan Unit

Finger Guard

Protects users from injury.

Fastening Screws

These screws are used to fasten the fan unit to the shell.

Slot Numbers

Slot numbers for each package of the ATM Switch are shown in Figure 3-11:

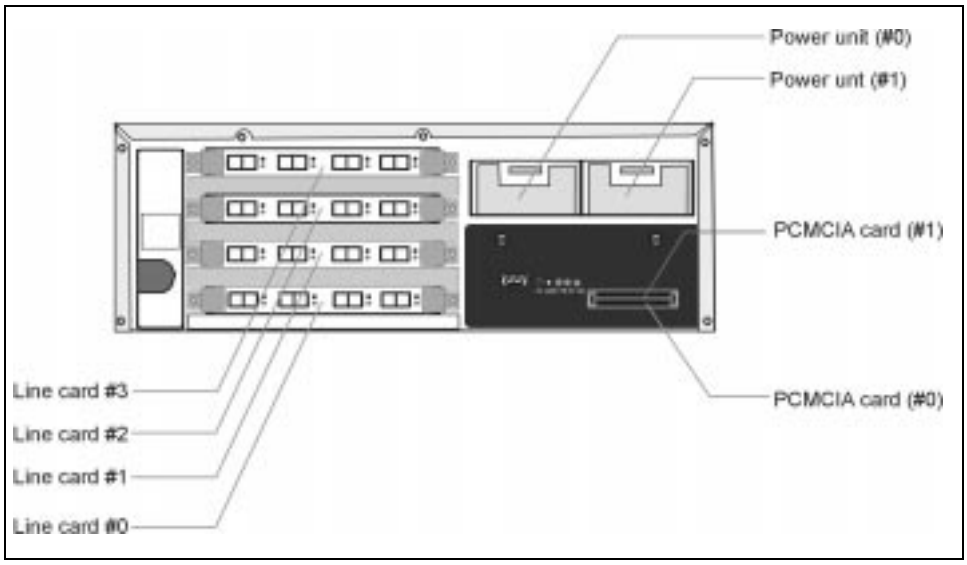


Figure 3-11: Slot Numbers

Power Unit Slot

When viewed from the front of the ATM Switch, slot #0 is to the left and slot #1 is to the right.

Line Card Slot

When viewed from the front of the ATM Switch, slot #0 - 3 are from bottom to top.

PCMCIA Card Slot

When viewed from the front of the ATM Switch, slot #0 is at bottom and slot #1 is at top. In principle, slot #0 is for the ATA card and slot #1 is for the LAN card.

Line Numbers

Line numbers of the ATM Switch are as shown in Figure 3-12.

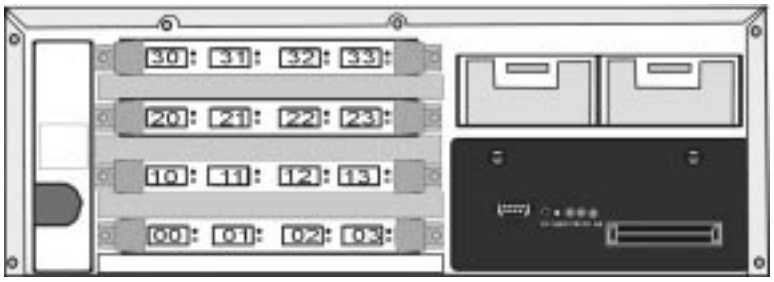


Figure 3-12: Line Numbers

Each line number of the ATM Switch is composed of two digits. The left-most digit indicates the line slot number and the last digit the position number.

Regardless of how many line ports are on a line card, the position numbers are, from the left, #0, #1, #2, and #3.

4 Hardware Specifications

This section describes overview of the flow of ATM cell and each functional block of the ATM Switch.

Principal Functions of the ATM Switch

- Accommodates various ATM lines

  The ATM Switch can interface various ATM lines by accommodating both optical lines and metallic lines, different throughputs, and different protocols. The ATM Switch is equipped with interfaces for various ATM lines.

- Cell Switching

  The ATM Switch identifies the destination ATM line using the cell header information in the ATM cell sent over the ATM line, then sends the cell. The ATM Switch has a switching capacity of 4 lines at 622 Mbps or, in throughput, 2.5 Gbps.

- Fixed path setting

  The path is normally set according to the connection information stored in the PCMCIA ATA card. Path setting is changed by changing the connection information from an external MAT. When the ATM Switch is reset, the path is set according to the PVC connection information stored in the PCMCIA card or the PVC connection information downloaded from an external source.

- Variable path setting

  The ATM Switch has a network address - line table to realize this function. This table is automatically generated by ILMI function (dynamic routing table) and/or set from a MAT (static routing table).

- Traffic control

  When competition occurs in sending out cells, this traffic control function prevents the cell with a higher priority from being delayed or discarded.

- Network management system interface

  This unit exchanges maintenance information with the network management system.

Flow of ATM Cells

The flow of ATM cells is as follows:

1. Cells sent over lines are received by the line cards.
2. The line cards generate switching information from the VPI, VCI, and PT in the cell header.
3. The switch/CPU card outputs cells to the line cards corresponding to the destination lines.
4. A line card that receives a cell converts the VPI, VCI, and PT in the cell header.
5. Cells are sent to the destination lines.

As an ATM switch, the switch/CPU card time-division multiplexes ATM cells from the four line cards, uses AFs (address filters) to sort the input ATM cells according to the destinations in their headers, then sends the ATM cells to the line cards. In addition, the switch/CPU card is equipped with a CPU and has an interface with MAT or NMS to perform hardware control, path connection control, and protocol control.

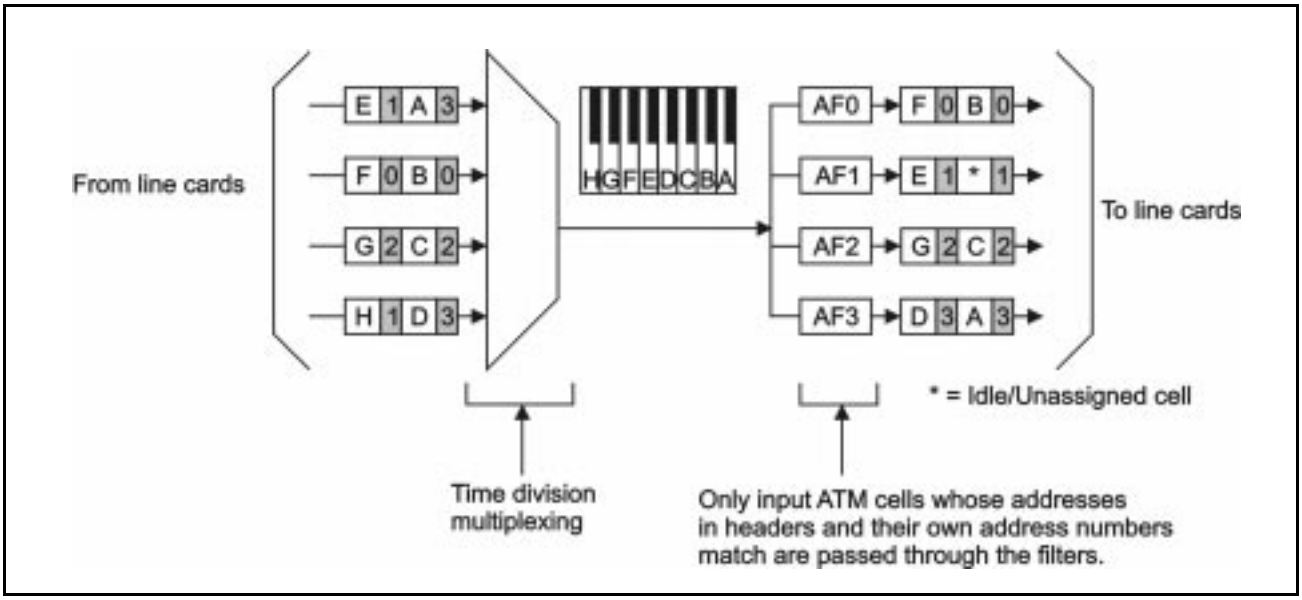


Figure 4-1: ATM Switch

Hardware Configuration and Overview of Functions

The ATM switch accommodates up to 16 ATM lines per unit and performs nonblock switching of fixed-length data (53 bytes) called ATM cells.

Shown below are the functional blocks that comprise the ATM Switch.

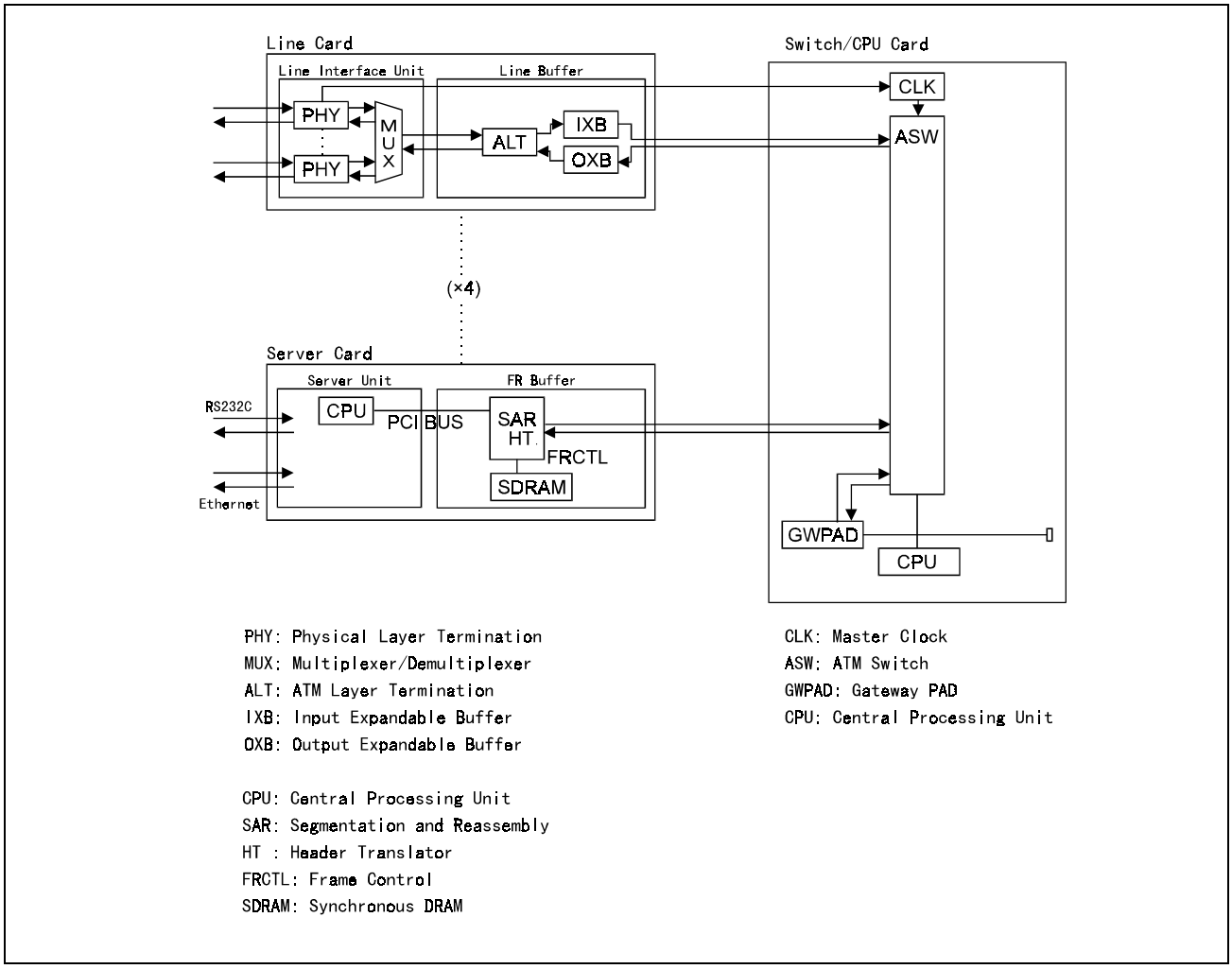


Figure 4-2: Functional Block Diagram

The principal processes performed in each functional block in the switch/CPU card are described below.

- **GWPAD** controls the assembly and disassembly of cells according to AAL5 when the CPU communicates with the NMS (Network Management System) via ATM line or when switching cells according to SVC.
- **ASW** is a functional block composed of ATOMSW (output buffer type switch). This functional block controls cell switching.
- **CLK** generates system clock.

- **CPU** is a card whose software operates to control the entire ATM Switch, and is composed of a 64-bit RISC processor, main memory, flash memory, etc.

Hardware	Block	Description of Functions
Switch/ CPU card	ASW	■ Cell switching control (point-to-point connection, point-to-multipoint connection) ■ Five-class cell delay priority control ■ Cell alignment ■ Back Pressure (BP) sampling control/generation control/multiplexing control
	CLK	■ System clock generation and distribution ■ Self-running mode (self-running precision: +/- 4.6 ppm) ■ Slave mode (pull-in range: +/- 9.2 ppm, only lines 00 - 13 can be enslaved)
	GWPAD	■ Cell assembly/disassembly control (transmission/ reception 512 connection) ■ DMA transfer control (burst access)
	CPU	■ RISC processor installed ■ Main memory 32 Mbytes ■ Flash memory (PCMCIA card) ■ LAN interface control (Ethernet) (PCMCIA card) ■ SIO interface (RS-232C) ■ Clock

Line Cards

A line card is composed of a line interface unit and a line buffer.

Basically, the line interface unit physically terminates the lines. The line interface unit takes ATM cells from the ATM line signals and sends the cells to the line buffer. In addition, the line interface unit inserts the ATM cells from the line buffer into the ATM line signals and sends the cells to the opposing hardware. In addition, the line interface unit multiplexes and demultiplexes the ATM cells from a number of lines.

The principal functions performed by the line interface unit are as follows:

- Conversion of electric signals and optical signals and detection of optical reception signal disconnection.
- Serial/parallel conversion.
- Encode/decode or termination of each line frame.
- Cell alignment and clock change (adjusts cell speed to line speed).

The line buffer converts into address number the data housed in the header of the ATM cell received from the line interface unit and sends the cell to the ATM switch. At the same time, the line buffer unit is equipped with an input buffer (IXB) that stores ATM cells according to the BP (back pressure) from the switch engine. Furthermore, the line buffer converts the address number in the header of the ATM cell received from the ATM switch into data used by the opposing hardware and sends the cell to the line terminating block. The line buffer is also equipped with an output buffer (OXB) that stores ATM cells that are input in excess of the line speed.

The principal functions performed by the line buffer are as follows:

- Valid VP bit count: 14 bits
- Input-output buffers, each 32,000 cells in size
- Congestion control (BP and EFCI functions)
- Priority control (QoS 5 class, loss 2 class)
- UPC control (GCRA)
- OAM control (loop-back, F4/F5 error control)
- Shaping (PCR & SCR guarantee type)
- Frame discard (EPD)

Types of Line Cards

The line cards are available in several types, to suit the various lines accommodated. While the line cards differ in a number of ways, such as the shape of connectors, they basically function in the same way.

- OC-12c
- OC-3c/STM-4 (single mode)
- OC-3c/STM1 (single mode/ multi-mode/UTP-5/COAX)
- TAXI
- 6.3M-J2
- 45M-DS3
- 34M-E3
- 1.5M-DS1
- 2M-E1
- FR-DS1
- CE-DS1
- CE-E1

Functional Blocks

A functional description of each functional block in the line card is shown in the following table.

Hardware	Block	Description of Functions
Line card	PHY	■ Conversion of physical media (e.g., E/O conversion, O/E conversion) ■ Reception clock recovery ■ Transmission clock generation ■ Frame termination ■ Cell alignment ■ Speed conversion ■ Line loop-back control
	MUX	■ Cell multiplexing/demultiplexing of multiple PHY ■ Cell loop-back control
	ALT	■ SSO (Switch Specific Overhead) generation (reception side) ■ Cell header conversion (transmission side) ■ Policing control ■ Flow monitor (e.g., passing cell count) ■ OAM function (Fault Management)
	IXB	■ Cell storage buffer (32K cell buffer) ■ QoS five-class (CBR, rt-VBR, nrt-VBR, ABR, UBR) ■ Two-class cell loss priority control ■ EPD (Early Packet Discard) ■ BP (Back Pressure) reception control ■ Congestion notification control
	OXB	■ Cell storage buffer (32K cell buffer) ■ QoS five-class (CBR, rt-VBR, nrt-VBR, ABR, UBR) ■ BP (Back Pressure) generation control ■ Broadcast cell control ■ ABR (ER control, binary mode) ■ Congestion notification control ■ Shaping

Interworking Cards

The FR card and the CE card installed in the ATM Switch are equipped with a function for interworking between ATM network and other types of networks.

The CE cards provide structured service and unstructured service in circuit emulation. There are four types of CE cards:

- CE-DS1
- CE-J2
- CE-DS3
- CE-E1

With CE-DS1, 8-bit channels are stored in DS1 frames and the DS1 frames can be switched over to ATM cells depending on the type of service provided.

The frame format of CE-DS1 in shown in Figure 4-3.

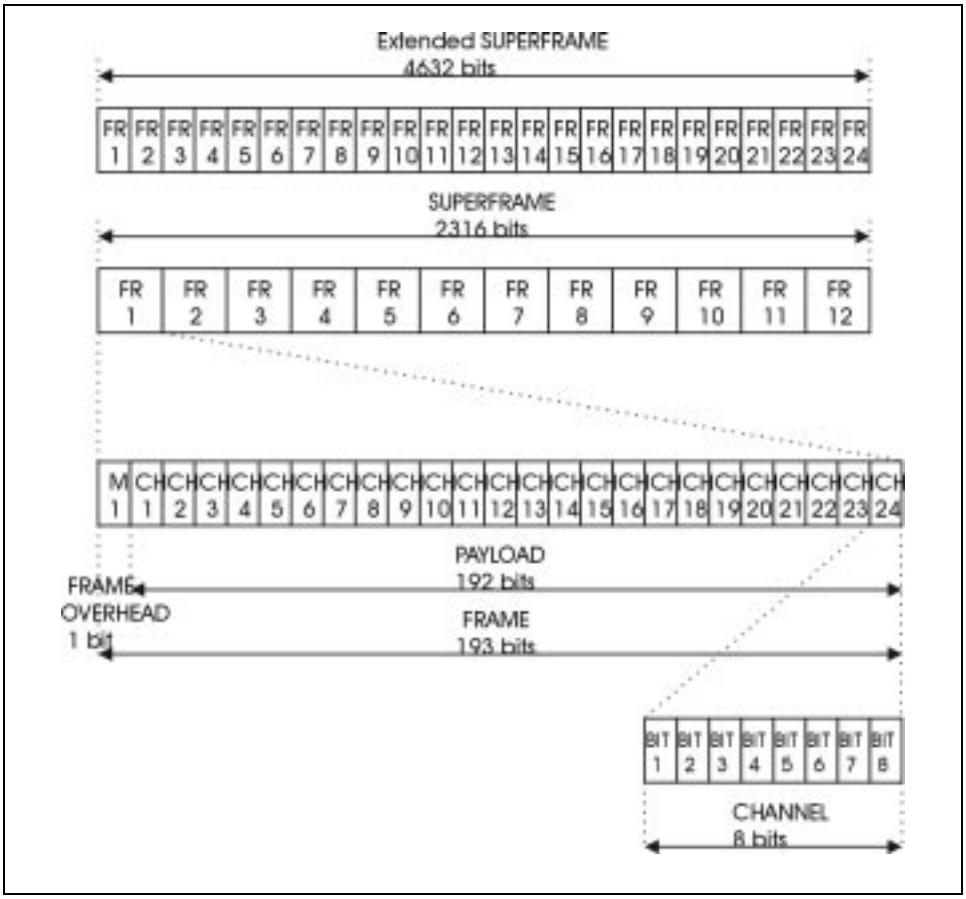


Figure 4-3: CE-DS1 Frame Format

The CE-DS1 card conforms to the following recommendations and specifications:

- ITU-T G356, G362, G702, G703, G704, G709, G823, G824
- ANSI T1.102, T1.107A, T1.403, T1.408, T1.630, T1.627
- Bellcore TR-NWT-000170
- ATM Forum Circuit Emulation Service Interoperability Spec, UNI Spec 3.1

Server Cards

A server card is composed of a server unit and an FR buffer.

The server unit is a basic component of the Server Card. Featuring a CPU with a R4650 processor and flash memory, the server unit provides server functions and controls the Server Card.

The FR buffer realizes a communication function between the Server Card's CPU and the switching system's CPU. Inter-processor communication is realized by FRCTL-LSI, via the inter-processor message communication table on the SDRAM.

Shown below are the specifications of the server card:

CPU R4650	CLK 100MHz Cache Memory 8KB+8KB DRAM 16MB Flash Memory (ROM) 2MB Flash Memory (FILE) 8MB
Interface	PCI BUS 33MHz RS232C Ethernet 10BaseT
Redundancy configuration	Redundant

This page is for your notes.

5 Software Specifications

This section briefly describes the functions of the ATM Switch.

As a core entity in an ATM network, the ATM Switch provides a variety of functions to sustain and operate the network most efficiently and at high quality. Here, the following functions of the ATM Switch are explained.

- Connection Management
- Signaling Control
- Routing
- Traffic Management
- Hardware Management

Connection Management

The ATM Switch supports both fixed connections (PVCs) and variable connections (SVCs).

PVC is a fixed connection that is manually established on the ATM Switch. Normally, the connection is established according to the connection information stored in the PCMCIA ATA card. The connection establishment can be changed by changing the connection information from an external MAT. When the ATM Switch is reset, the connection is established according to the PVC connection information stored in the PCMCIA ATA card or PVC connection information downloaded from an external source.

SVC is a variable connection that is prepared by a protocol called signaling that establishes and releases SVCs. The ATM Switch maintains a network address - line correspondence table to realize the best suited SVC routing for the given network condition. This table is generated and changed manually (static routing table), or automatically generated by the ILMI function and the PNNI function (dynamic routing table).

Both types of connection can be set to either point-to-point connection or point-to-multipoint connection.

The number of connections per system is as follows:

- Point-to-point (PVC): 8,000 connections
- Point-to-multipoint (PVC): 1,000 connections
- Point-to-point (SVC): 4,000 connections
- Point-to-multipoint (SVC): 1,000 end points

The ATM Switch also supports two connections, Soft PVC and tunneling, that take advantage of the characteristics of PVC and SVC mentioned above.

Soft PVC is a PVPC (Permanent Virtual Path Connection) or a PVCC (Permanent Virtual Circuit Connection) that is established by SVC procedure over several switches.

The ATM Switch allows the user to register up to 64 Soft PVCs. To use the Soft PVC service, the remote side switch must be a NETNEX ATM Switch.

Tunneling is a connection that is established over a PVP (Permanent Virtual Path) network (e.g., existing public network that does not support SVC).

A VP (Virtual Path) is established in a physical link that connects the switches in a PVP network, and the VP is used as a tunneling path. The switch (edge switch) that is adjacent to the PVP network establishes PVCs in the tunneling path and sends SVC setup messages. The ATM Switch allows the user to register up to 64 tunneling paths. Figure 5-1 is a conceptual diagram of the connections supported by the ATM Switch.

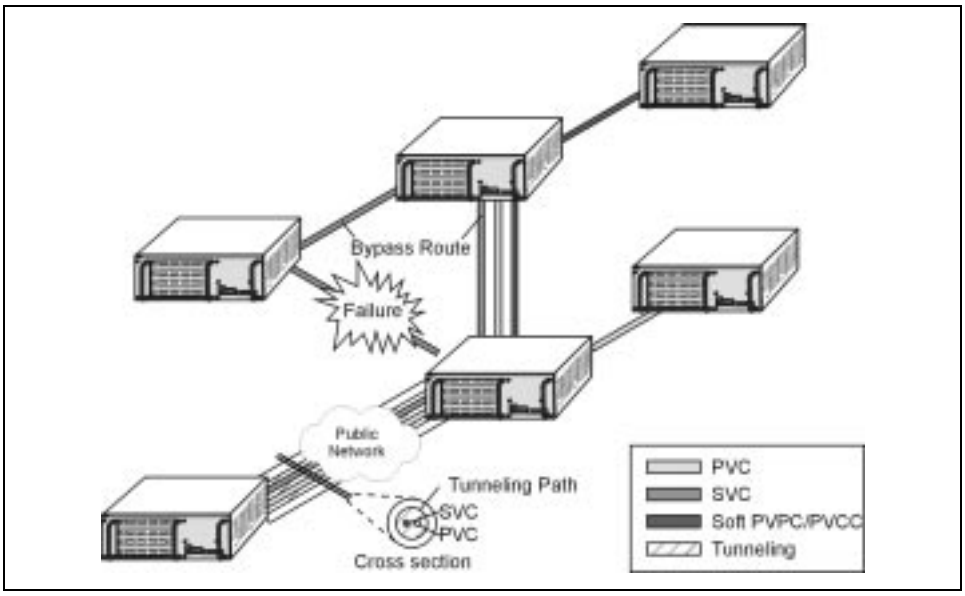


Figure 5-1: The ATM Switch Connections

Connections are established by inputting commands from a MAT connected to the ATM Switch. The information on the established connection can be read by a command from the MAT or sending a GET request from an NMS. (For details on the commands, refer to the ATM Command Manual.)

Signaling Control

SVC connections provided by the ATM Switch are prepared by a protocol called signaling that establishes and releases SVCs.

The signaling protocol is used by the calling terminal to notify the network of the destination of the established SVC, communication band, and traffic quality.

The signaling protocols supported by the ATM Switch are as follows:

- ITU-T recommendation draft Q.2931 at the May 1993 meeting of the ITU-T Study Group II.
- ATM Forum UNI 3.0 based on Q.SAAL1 (SSCOP) of ITU-T Study Group 11 Document DT/11/3-28.
- ATM Forum UNI 3.1
- ATM Forum UNI 4.0

The addresses that can be used for signaling are:

- Address format E.164.
- NSAP incorporated ATM private network address defined by ATM Forum.
- Besides UNI, the ATM Switch also supports routing function and signaling function conforming to ATM Forum PNNI 1.0. Consequently, a signaling request may be routed through a network composed of more than one switch.
- Control layer AAL5 (ATM Adaptation Layer 5) called "C plane" is used to convey the signaling request.

Figure 5-2 shows the protocol stack of the C plane.

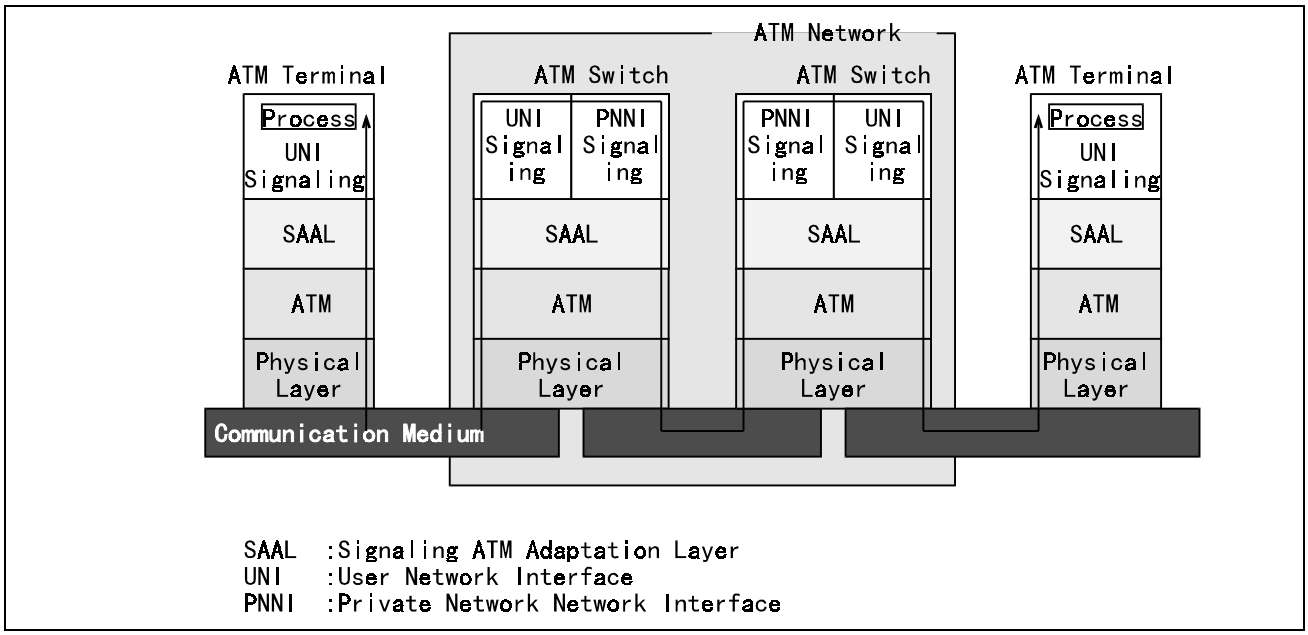


Figure 5-2: Protocol Stack of C plane

Routing

The signaling for establishing SVC connections is transferred by referring to the routing table maintained by each switch in the network.

There are two types of routing table: static routing table and dynamic routing table. the ATM Switch provides the ILMI (Integrated Local Management Interface) and PNNI (Private Network-Network Interface) functions for preparing and revising the dynamic routing tables. Static routing tables can also be revised manually.

ILMI Functions

ILMI is a function for learning the configuration data of neighboring equipment when an end system is connected to a switch or when a switch is connected to another switch.

The ILMI function includes a switch-terminal address registration function. This function is triggered by a trap. The switch adds the inherent address of each terminal to its network prefix and registers the result as the ATM address of each terminal.

A switch prepares dynamic routing tables by this address registration function. Figure 5-3 illustrates the procedure of ILMI address registration.

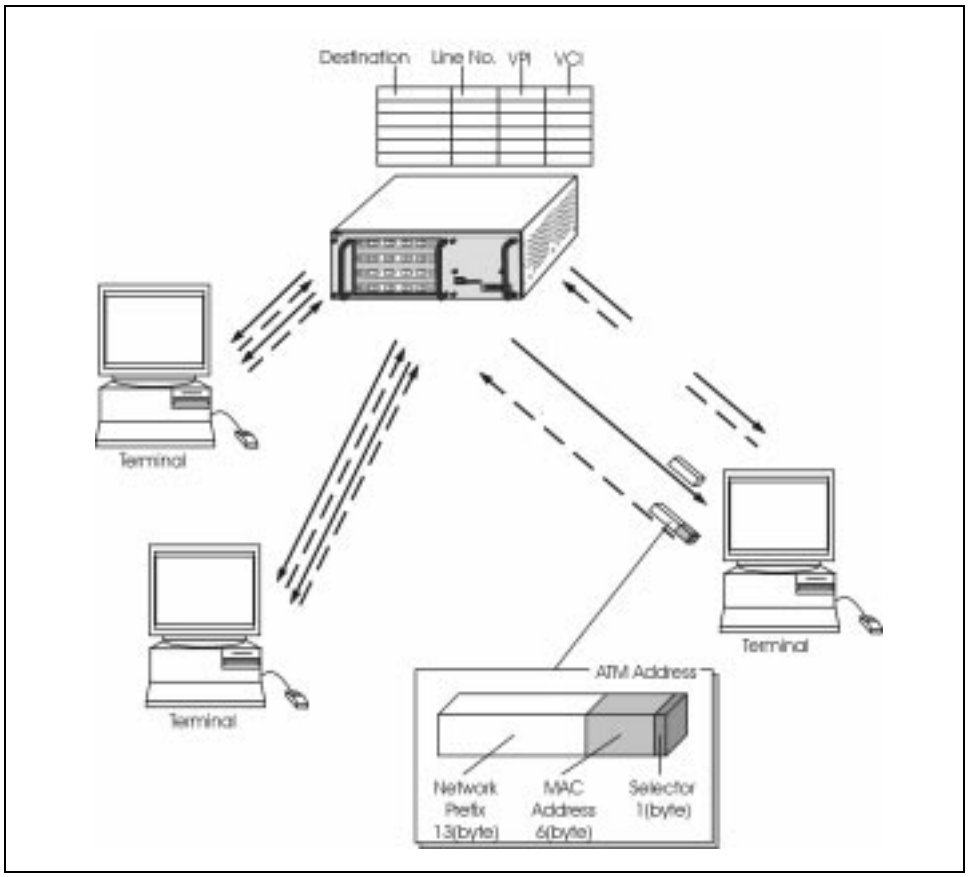


Figure 5-3: ILMI Address Registration

PNNI Functions

PNNI is a function whereby switches in a network exchange information to automatically prepare a dynamic routing table and route cells by referring to that table. Such information is exchanged periodically or whenever there is a change. The information is used by each switch to prepare a dynamic routing table between PNNIs that reflects network status in a timely fashion.

Figure 5-4 illustrates the procedure by which the PNNI function prepares a dynamic routing table.

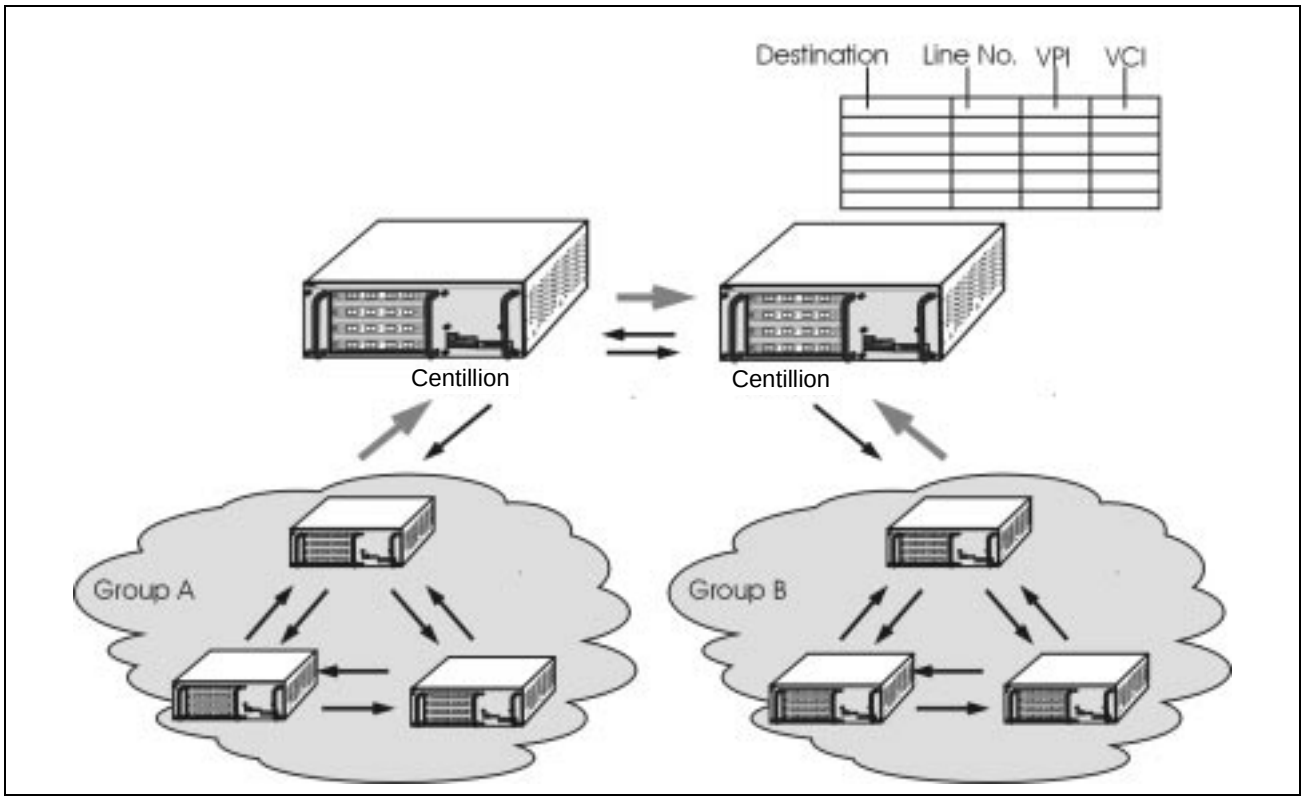


Figure 5-4: Generating Dynamic Routing Table by PNNI Function

Traffic Management

The ATM Switch provides the following traffic management functions.

- Call Admission Control
- Usage Parameter Control
- Congestion Control
- Priority Control
- Shaping
- Monitoring

Figure 5-5 shows how traffic is controlled and how each function fits into the process in the ATM Switch.

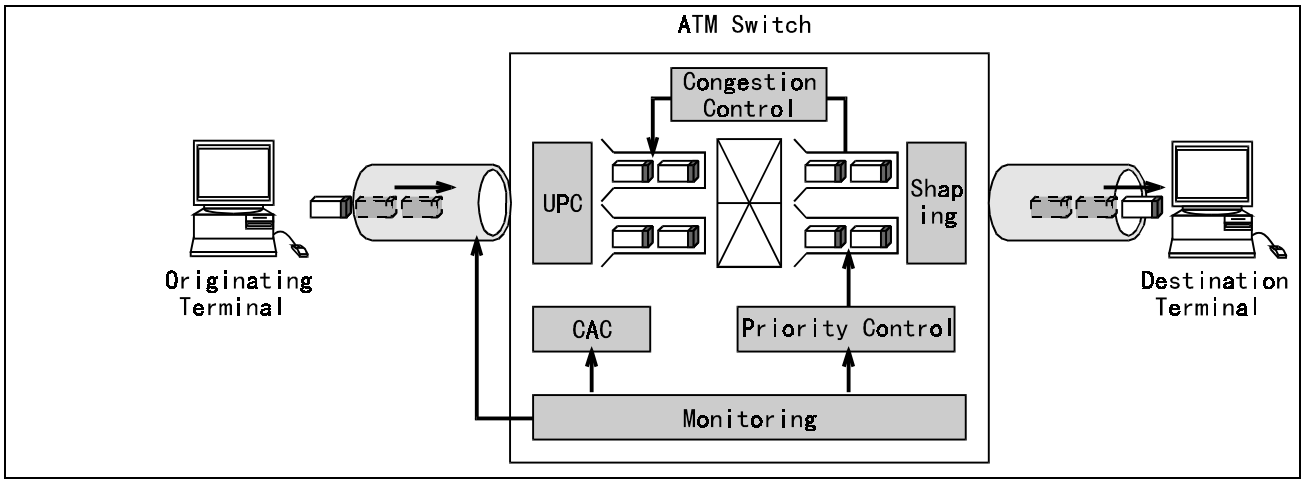


Figure 5-5: Traffic Management

Call Admission Control (CAC)

When a SVC establishment request signaling is received from the originating terminal, CAC, or Call Admission Control, determines whether to accept that request. CAC checks the current usage of the network to determine whether the communication band and traffic quality requested by that SVC can be satisfied, then decides whether to establish the connection.

Usage Parameter Control (UPC)

UPC, or Usage Parameter Control, monitors whether the traffic of the user's communication in progress has exceeded the band declared in the request for SVC establishment. This control is necessary to prevent deterioration to the quality of the communications of the user and other users in the network.

The ATM Switch employs a six-stage parameter control using the dual leaky bucket method.

Congestion Control

In the ATM Switch, congestion is controlled by applying a back pressure in the direction of line output unit » switch » line input unit and restricting the number of incoming cells. The ATM Switch also supports congestion control using Explicit Forward Congestion Indicator (EFCI) and RM (Resource Management) cell.

Furthermore, the ATM Switch controls congestion from ABR/UBR class traffic by using EPD (Early Packet Discard), or a function that discards cells in frame increments when the input buffer is congested.

Priority Control

The ATM Switch performs the five classes of controls below on traffic delay:

- CBR (Constant Bit Rate service)
- rt-VBR (Variable Bit Rate service (real time))
- nrt-VBR (Variable Bit Rate service (non real time))
- ABR (Available Bit Rate service)
- UBR (Unspecified Bit Rate service)

In this list, the higher the control, the better the delay characteristics. Priority is given to CBR and rt-VBR traffic as they are transmitted ahead of other classes of traffic.

These delay priorities can be selected for each connection when establishing the connection.

In the switch, a cell delay of no less than 40 µsec occurs depending on the degree of passing cell congestion and the degree of priority.

The ATM Switch performs two classes of controls on cell loss. Cell loss priority control is performed in cell increments based on the CLP bit value in the header of each cell. The definition of CLP bit value is as follows:

- CLP bit "0" (high priority)
- CLP bit "1" (low priority)

In the ATM Switch, to ensure traffic quality, every line card shares one input buffer (32,000 cell capacity) and one output buffer (32,000 cell capacity).

Shaping

Shaping is a function that schedules cell transfer so it complies with the communication rate and traffic parameters declared by each connection. This function ensures that even bursty data are transferred at a consistent rate without being discarded and that the network bands are used efficiently.

The ATM Switch allows one of eight stages of shaping to be set for each port.

Monitoring

Monitoring is a function that reads the cell counter of the hardware. It checks the total number of cells exchanged in the ATM Switch, the number of error cells, and the number of discarded cells, etc.

NOTE When an overflow occurs (at 4 billion+ cells), the cell counter stops counting cells.

The information on the ATM Switch traffic and performance can be checked for each line, connection, or line physical level by inputting the command **`DISPLAY traffic`** from a MAT. For details on the **`DISPLAY traffic`** command, refer to the appropriate Command Manual.

Hardware Management

The hardware management unit controls the following:

- Static hardware configuration
- Dynamic hardware configuration (operation status management)
- Hardware revision
- Software revision
- Own IP address
- NMS address
- Connection-related parameter control (e.g., the number of VPIs of the line)

These pieces of information are stored in a database called a Management Information Base (MIB). Information stored in the MIB can be set and read from a MAT.

The NMS uses Simple Network Management Protocol (SNMP) to access the MIB of each device in the network and centrally manage faults and configuration data of the devices.

6 Hardware Interface

This chapter describes the line interfaces that the ATM Switch supports.

UNI and NNI

As illustrated in Figure 6-1, there are two types of interfaces in an ATM network. One is the User Network Interface (UNI) that connects an end system (a router, for example) to an ATM switch. The other is the Network Node Interface (NNI) that connects two ATM switches. These interfaces are further classified into public network interface and private network interface, depending on the type of the network they are connected to.

The ATM Switch provides various line cards to accommodate these interfaces.

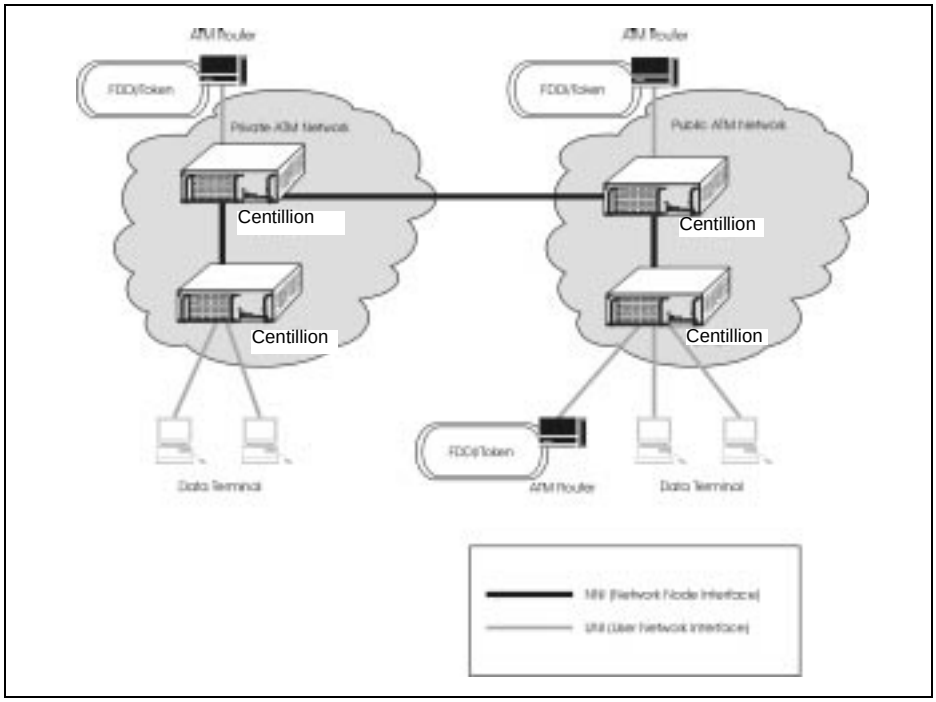


Figure 6-1: ATM Network Interface

Line Interface

Provided below is an outline of the line interface specifications of the ATM Switch:

SONET OC-12/SDH STM-4 Frame Format

- For public network UNI and private network UNI/NNI
- Physical layer: SONET PMD
- Optical fiber (single mode)
- Line coding: NRZ
- Data rate/line rate: 622.08 Mbps
- Cell rate: 622.08 × 1040/1080 = 599.04 Mbps

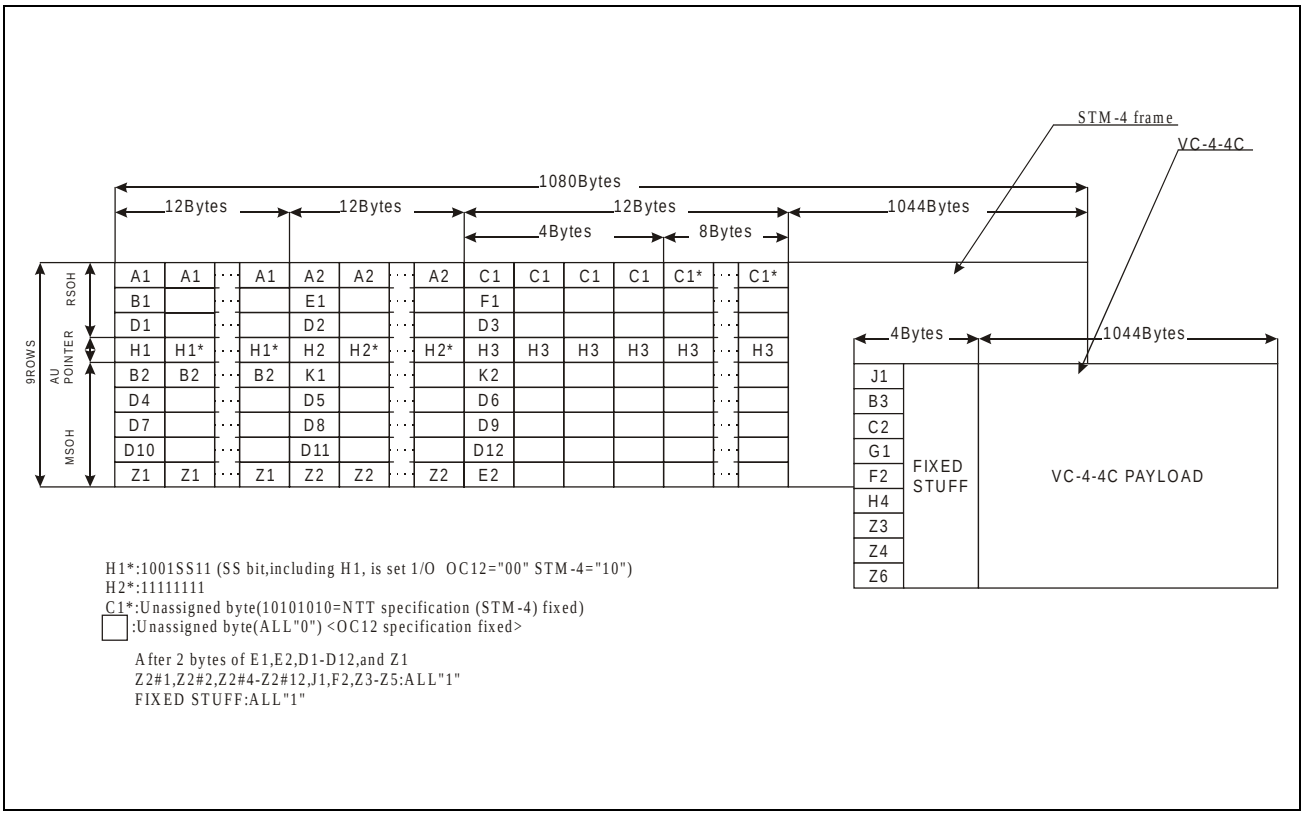


Figure 6-2: SONET OC-12/SDH STM-4 Frame Format

SONET OC3/SDH STM-1 Frame Format

- For public network UNI and private network UNI/NNI
- Physical layer: SONET PMD
- Optical fiber (multi mode/single mode), UTP5
- Line coding: NRZ
- Data rate/line rate: 155.52 Mbps
- Cell rate: 155.52 × 260/270 = 149.76 Mbps

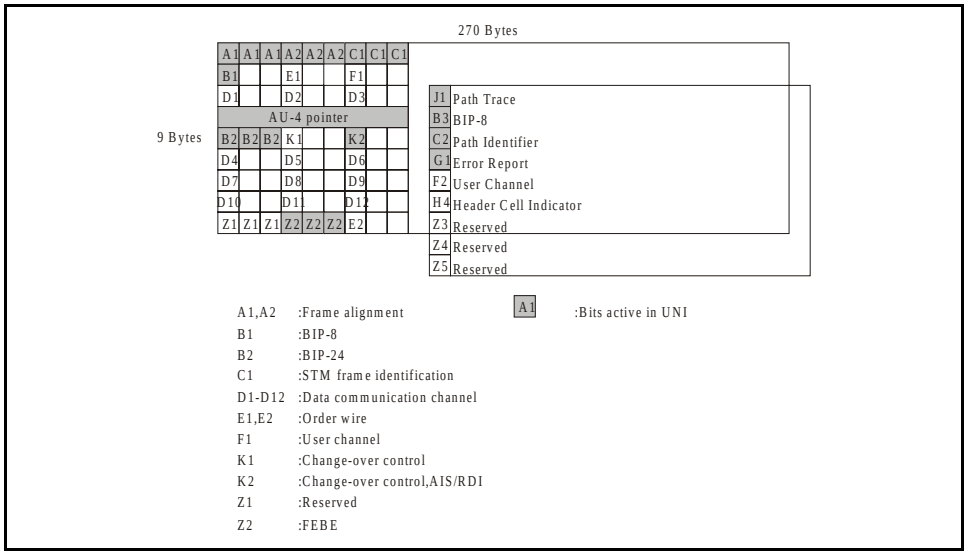


Figure 6-3: SONET OC-3/SDH STM-1 Frame Format

100M TAXI Frame Format

- For private network UNI/NNI
- Physical layer: FDDI PMD
- Optical fiber: multi mode
- Line coding: 4B/5B
- Data rate: 100 Mbps
- Line rate: 125 Mbaud

NOTE In 100M TAXI, there is no frame for existing STM. A field is established for aligning the cells.

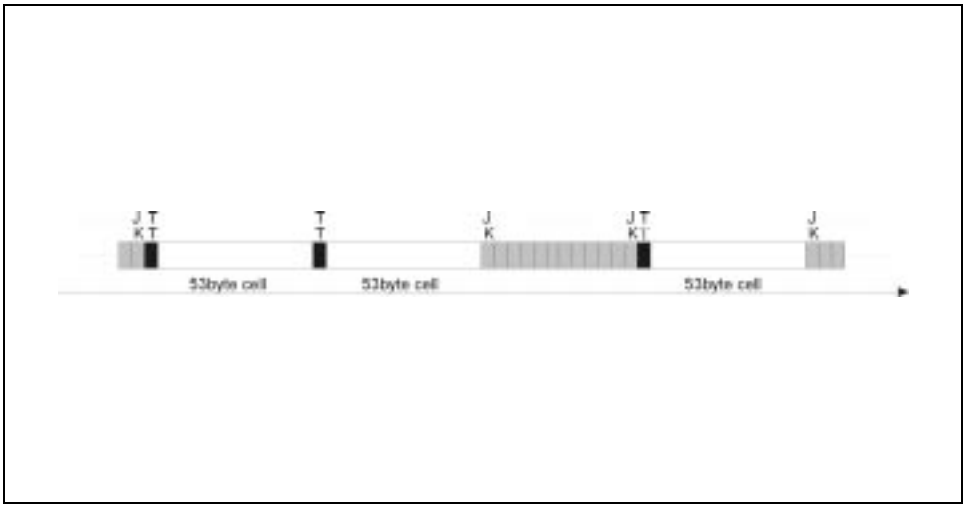


Figure 6-4: 100M TAXI Frame Format

6.3M-J2 Frame Format

- For public network UNI
- Physical layer: TTC standard JT-G703-a
- Coaxial cable
- Line coding: NRZ
- Data rate/line rate: 6.312 Mbps
- Cell rate: 6.144 Mbps
- Cell alignment: HEC is used

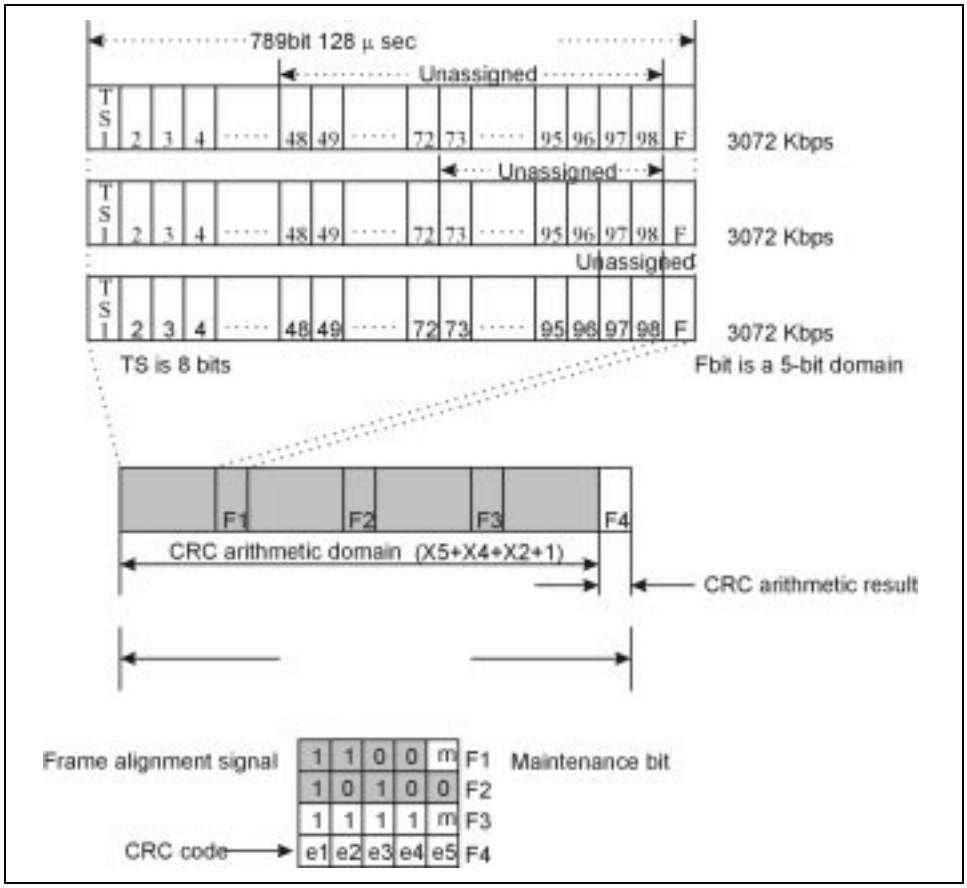


Figure 6-5: Secondary Speed Interface (6.3M) Frame Format

DS3 Frame Format

- For public network UNI and private network UNI/NNI
- Physical layer:
  - ITU-T G703
  - G804
  - I432
  - ANSI T1.102-1933
  - T1.107a-1990
  - T1.404-1994
  - T1.646-1995
  - Bellcore TR-NWT-001112
  - TR-NWT-000499
- Coaxial cable
- Line coding: B3ZS
- Data rate/line rate: 44.736 Mbps
- Cell rate: 44.21 Mbps (Direct Mapping), 40.70 Mbps (PLCP)

Figure 6-6 and Figure 6-7 illustrate DS3 frame format and DS3 PLACP frame format.

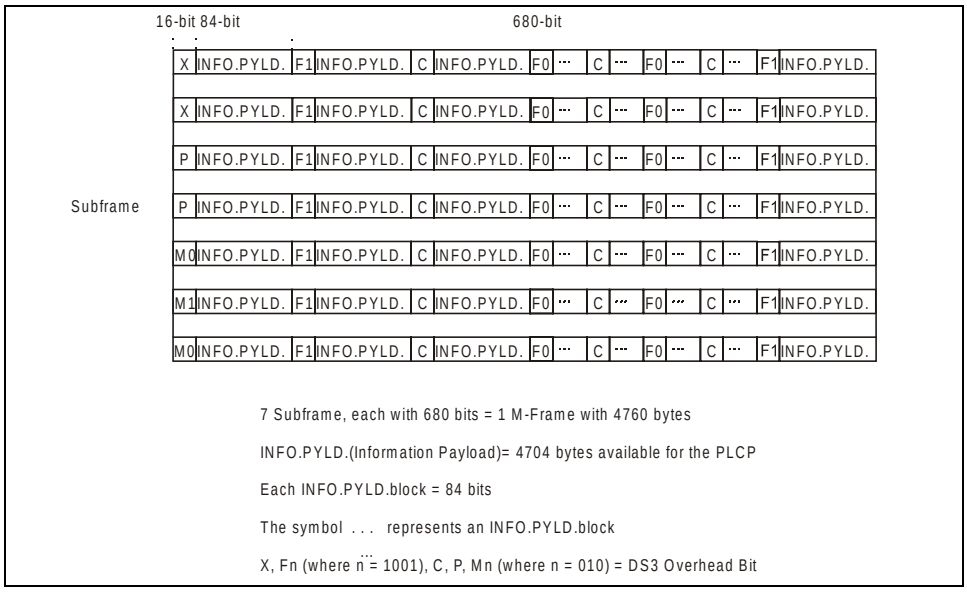


Figure 6-6: DS3 Frame Format

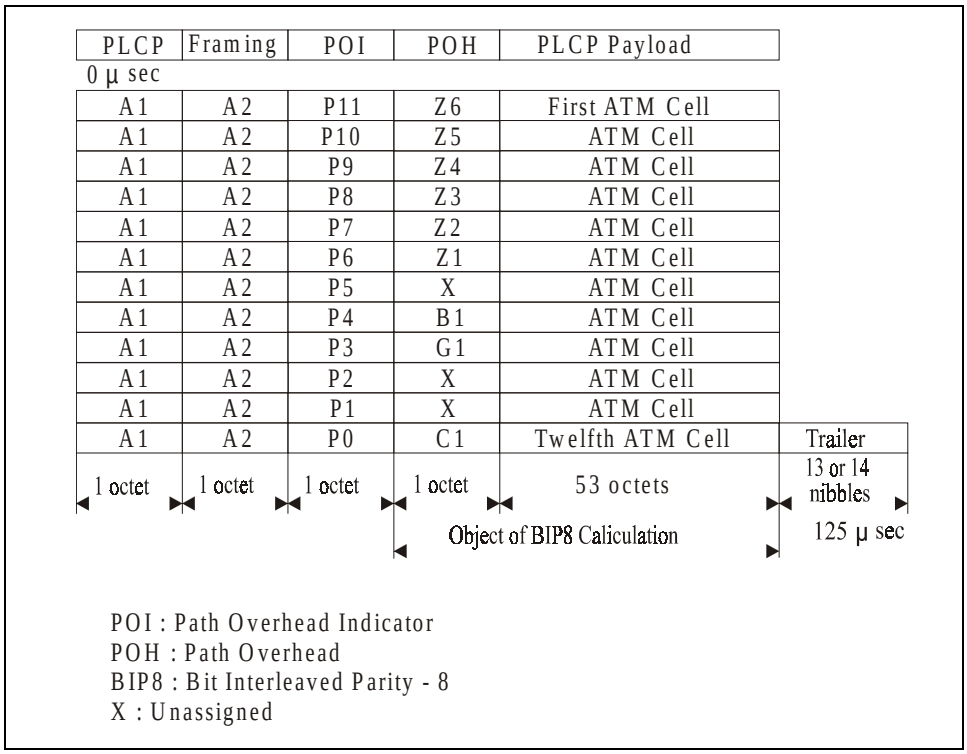


Figure 6-7: DS3 PLCP Frame Format

E3 Frame Format

- For public network UNI and private network UNI/NNI
- Physical layer
  - ITU-T G703
  - G751
  - G804
  - G832
  - I432
  - ETSI T/NA (91)18
- Coaxial cable
- Line coding: HDB3
- Data rate/line rate: 34.368 Mbps +/-20ppm
- Cell rate: 33.92 Mbps (G832), 34.01 Mbps (G751 Direct Mapping)

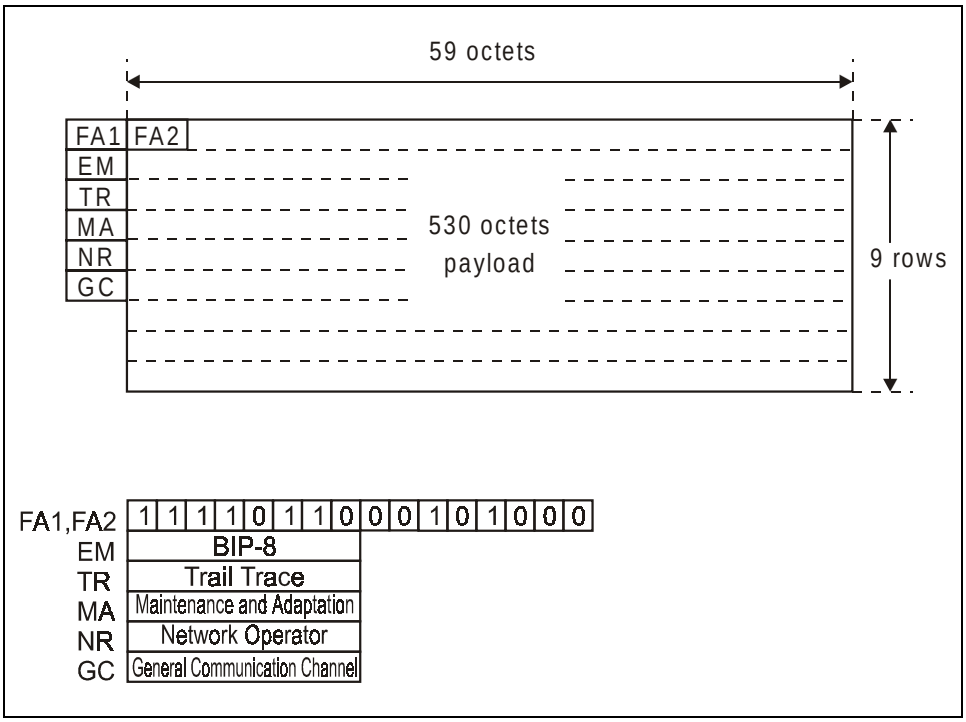
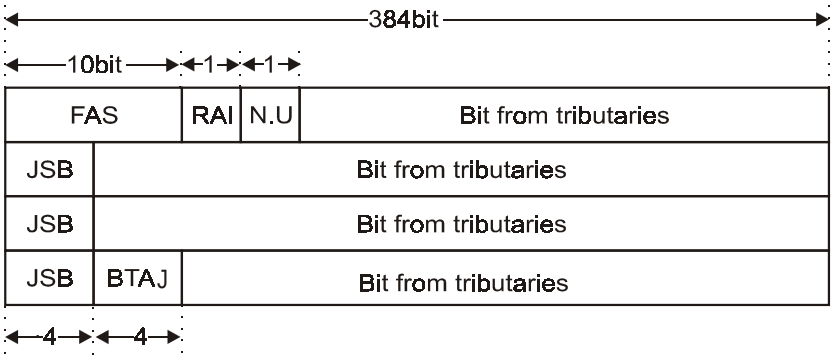


Figure 6-8: G.832 E3 Frame Format



FAS : Frame alignment signal

RAI : Alarm indication to the remote digital multiplex equipment

N.U : Bit reserved for national use

JSB : Justification service bits

BTAJ : Bits from tributaire available for justification

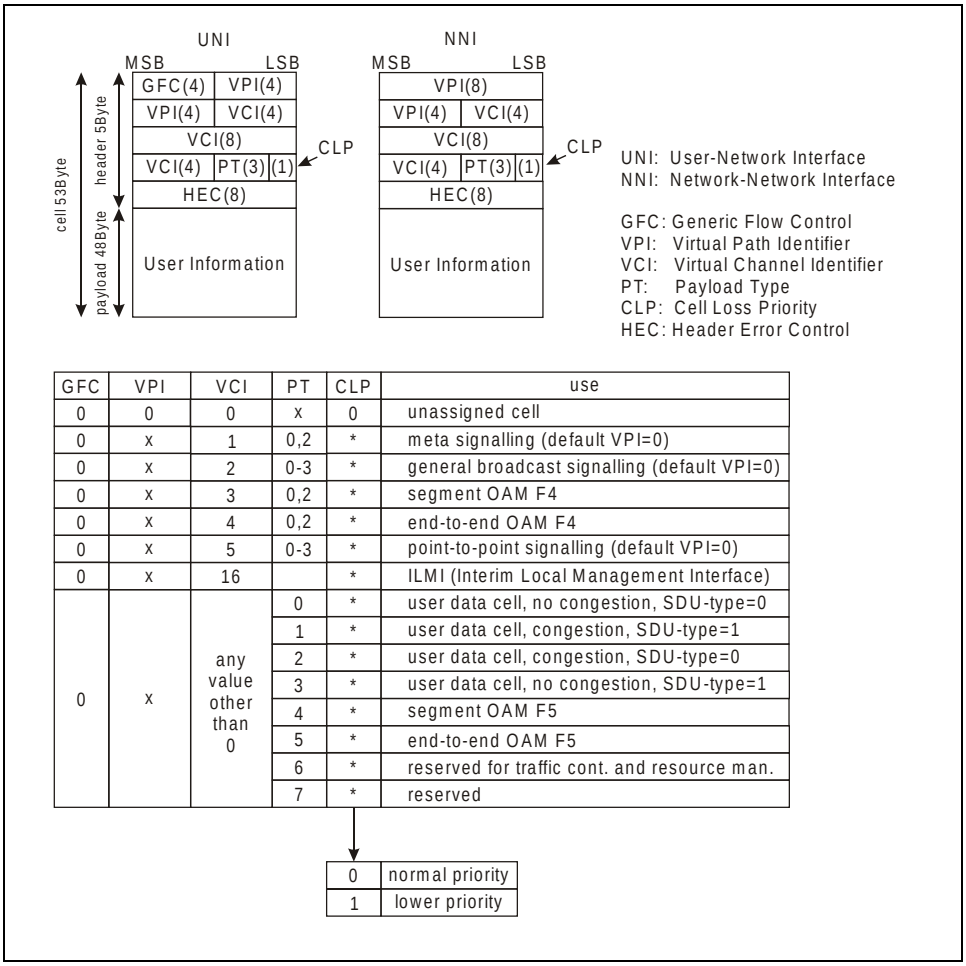
Figure 6-9: G.751 E3 Frame Format

1	1	1	1	53 octets	
A1	A2	P 8	Z3	First ATM Cell	
A1	A2	P 7	Z2	ATM Cell	
A1	A2	P 6	Z1	ATM Cell	
A1	A2	P 5	F1	ATM Cell	
A1	A2	P 4	B1	ATM Cell	
A1	A2	P 3	G1	ATM Cell	
A1	A2	P 2	M2(1)	ATM Cell	
A1	A2	P 1	M1(2)	ATM Cell	18(17) to 20(21) octets
A1	A2	P 0	C1	Last ATM Cell	Trailer

125 □s

A1,A2 : framing octets.
P0-P8 : path overhead idenfier octet.
C1 : cycle stuff counter.
M1,M2 : DQDB layer management information octets.
G1 : PLCP path status.
B1 : Bit Interleaved Parity-8 (BIP-8).
F1 : PLCP path user channel.
Z1-Z3 : growth octets.

Figure 6-10: G.832 (G.751) E3 PLCP Frame Format



GFC	VPI	VCI	PT	CLP	use
0	0	0	x	0	unassigned cell
0	x	1	0,2	*	meta signalling (default VPI=0)
0	x	2	0-3	*	general broadcast signalling (default VPI=0)
0	x	3	0,2	*	segment OAM F4
0	x	4	0,2	*	end-to-end OAM F4
0	x	5	0-3	*	point-to-point signalling (default VPI=0)
0	x	16		*	ILMI (Interim Local Management Interface)
0	x	any value other than 0	0	*	user data cell, no congestion, SDU-type=0
			1	*	user data cell, congestion, SDU-type=1
			2	*	user data cell, congestion, SDU-type=0
			3	*	user data cell, no congestion, SDU-type=1
			4	*	segment OAM F5
			5	*	end-to-end OAM F5
			6	*	reserved for traffic cont. and resource man.
			7	*	reserved

0	normal priority
1	lower priority

Figure 6-11: ATM Cell Format

Installation

7

This section describes procedures for installing the ATM Switch.

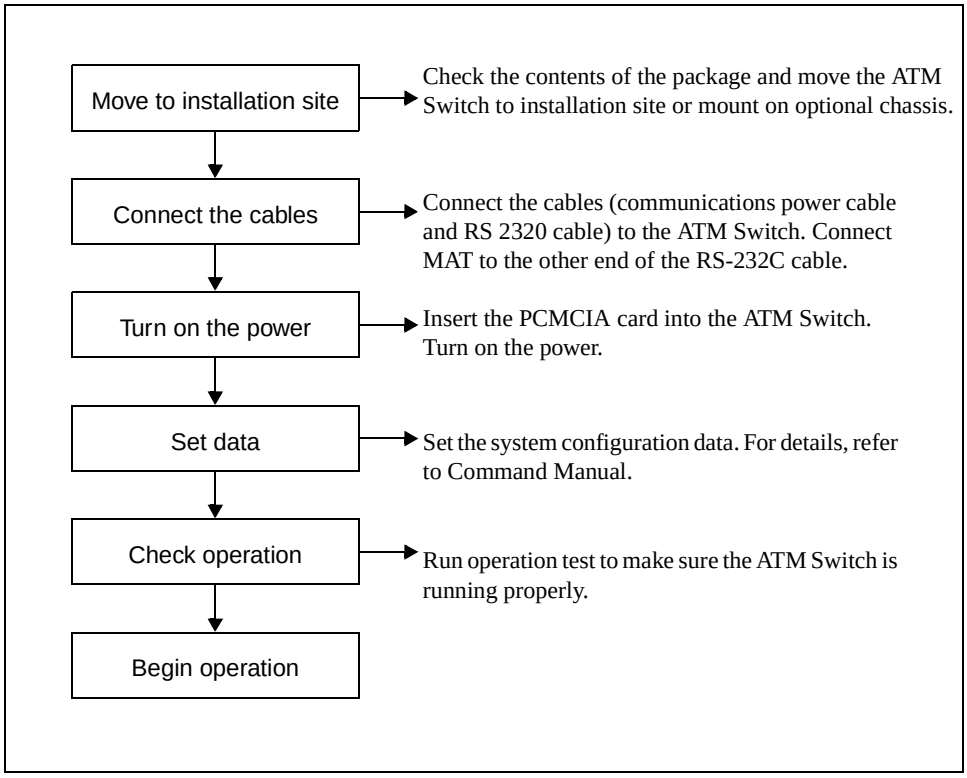


Figure 7-1: Procedures for Installing the ATM Switch

Installation Conditions

This section provides precautions on the installation area of the ATM Switch. Be sure to install the ATM Switch in an environment that meets the conditions described in this chapter. For more information, refer to "Precautionary Messages" on Page 1-1.

Environmental Conditions

Environmental conditions under which Nortel Networks guarantees the ATM Switch will function:

- Temperature: 41~104°F (5~40°C)
- Humidity: 10~80% (must be free of condensation)
- Storage temperature: 23~113°F (-5~45°C)

Installation Space

The air flows from the right to left as shown in Figure 7-2.

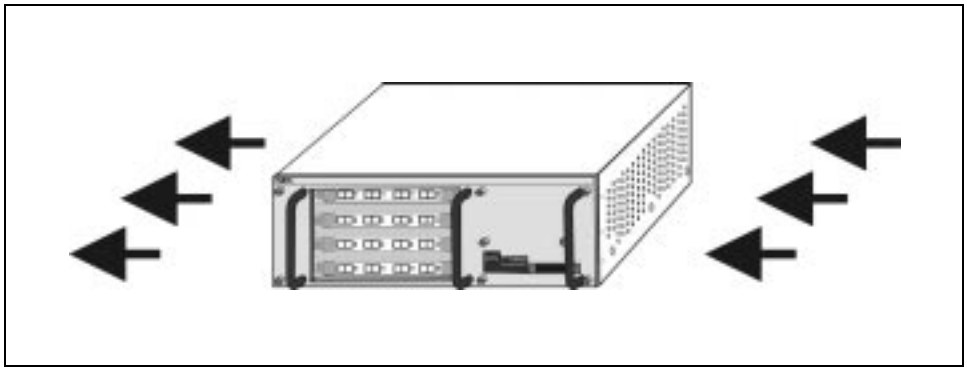


Figure 7-2: Air Flow

⚠ PRECAUTION

To allow the ATM Switch to radiate heat, be sure to install it sufficiently away from walls and other equipment.

Allow adequate distance away from areas prone to heavy foot traffic and from doors.

Installation area necessary when installing the ATM Switch is as follows.

Floor Space Requirements

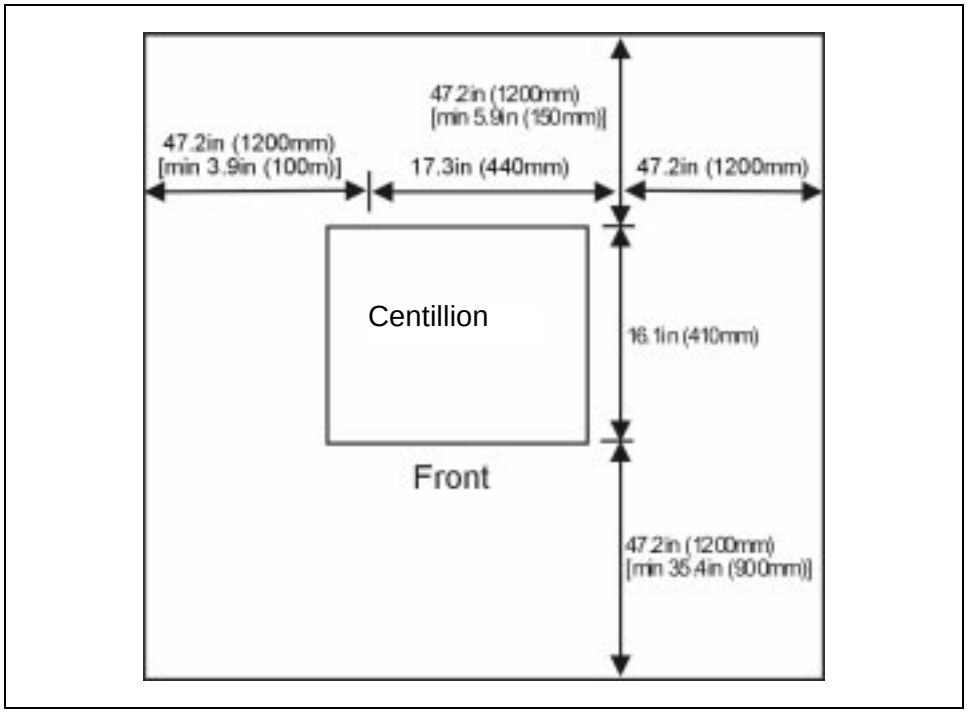


Figure 7-3: Floor Space Requirements

Chassis Space Requirements

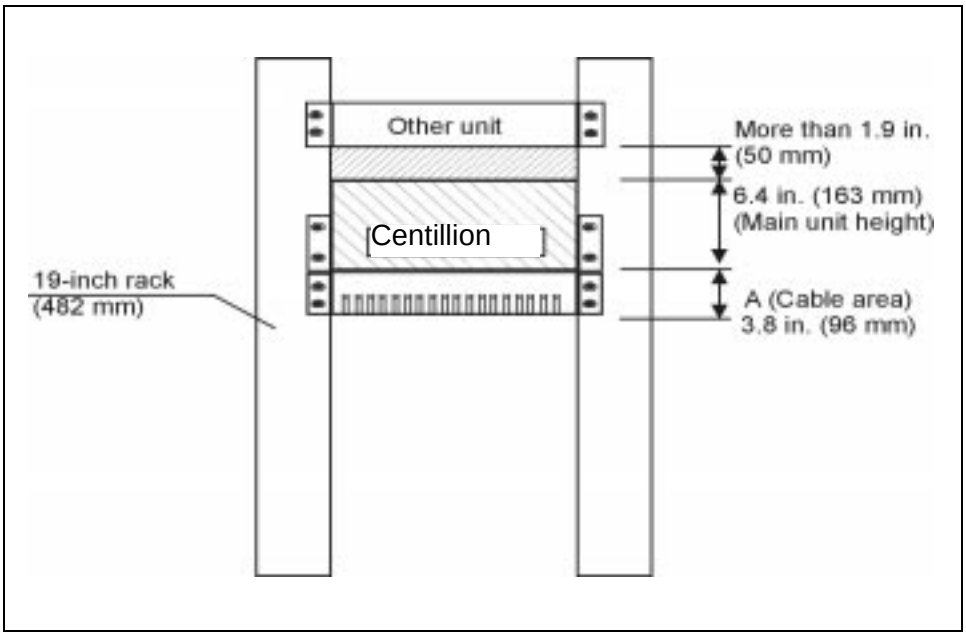


Figure 7-4: Chassis Space Requirements

Cable Space Requirements

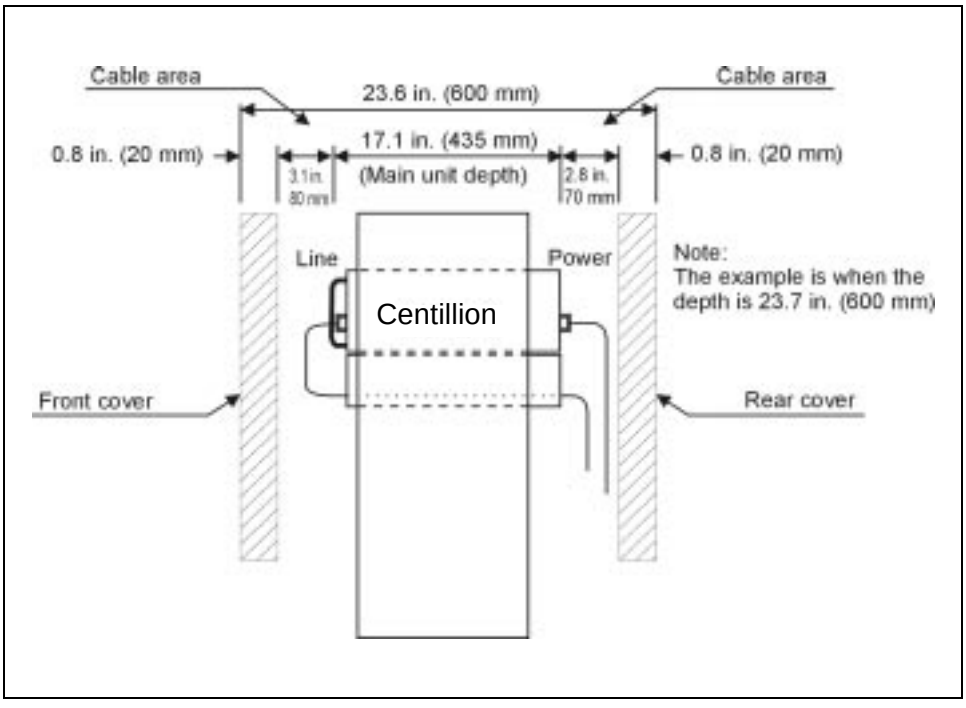


Figure 7-5: Cable Space Requirements

Areas Suitable for Installation

- Areas safe from exposure to water or chemicals.
- Areas that are isolated from shocks and vibration.
- Horizontal areas.
- Areas where there is little dust.
- Areas shielded from direct sunlight.
- Areas isolated from equipment generating strong magnetism (for example, television set, speakers).

Checking the Package Contents and Preparation for Setting

This section describes the contents of the package and preparation for setting.

Packages

Make sure that the box holding the ATM Switch contains two packages (three packages with an optional item) shown below:

- The ATM Switch main unit package
- PCMCIA ATA (flash disk) card package
- PCMCIA LAN card package (optional)

Packing List

Make sure all the products are contained in the packages. Product lists are provided below.

- The ATM Switch main unit package
  - The ATM Switch main unit
  - Power cable

NOTE The following parts are installed on the ATM Switch main unit. Types and quantities differ depending on the system configuration.

- Switch/CPU card
- Line cards
- Fan unit
- Power unit
- PCMCIA ATA (flash disk) card package
  - PCMCIA ATA (flash disk) card
- PCMCIA LAN card package (optional)
  - PCMCIA LAN card
  - Cable
  - Relay connector

Tools and Equipment Necessary for Installation

- Tools

  Use Phillips screwdrivers.

- MAT

  MAT is a terminal for setting the configuration data of the ATM Switch and performing routine management of the equipment. Some of the terminals that may be used as a MAT are a personal computer (PC), workstation (WS), or dumb terminal with an RS-232C port and communications capability. The MAT and the ATM Switch are connected via an RS-232C cross cable.

- Electrostatic kit and clean gloves

  Static electricity may cause the ATM Switch to fail. Be sure to use the electrostatic kit and clean gloves.

- RS-232C cross cable

  This cable is used to interconnect the ATM Switch to a PC or workstation that supports serial communication software and can act as a VT100 terminal or a MAT. The null-modem cable has a D-SUB 9-pin male connector connected to the 8550 and the other end varies from a D-SUB 9-pin female connector (for connection to a PC) or a 25-pin male connector (for connection to a workstation). Connector gender changers may be used to acquire the correct connector type.

- Communications software

  When using a PC or WS as the MAT, install the proper communications software for the model and establish an interface that facilitates automatic controls.

NOTE No communications software is required when the PC or WS is used in terminal mode. The installation of a communications software is recommended, however, to facilitate operations.

Transfer

Once you have checked the contents of the packages, move the ATM Switch to the new installation site. Before moving the ATM Switch, though, make sure the installation area meets the conditions of the installation environment described above. In addition, when carrying the ATM Switch, be sure to support the bottom of the ATM Switch with both hands.

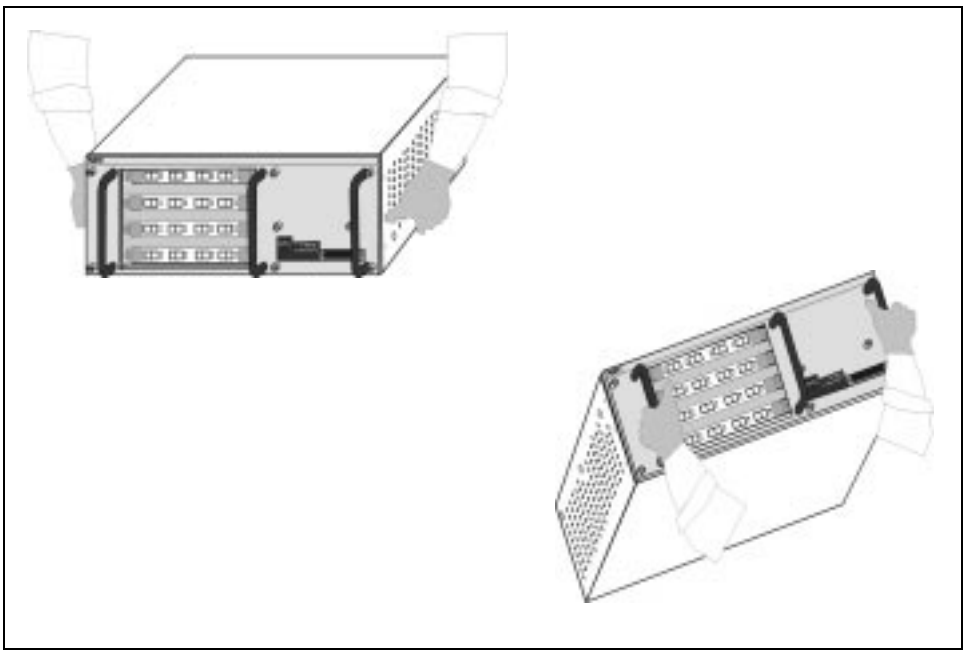


Figure 7-6: Main Unit Transfer

⚠ PRECAUTION

When carrying the main unit, be sure to hold the specified positions. Holding positions other than the specified positions may not only cause a failure but may cause the ATM Switch to fall and result in bodily injury.

Mounting of Switch on Chassis

This section explains how to mount the ATM Switch on the chassis.

The ATM Switch chassis is optional. Refer to the preceding section on “Installation Environmental Conditions” for the space necessary for chassis installation.

Recommended Chassis

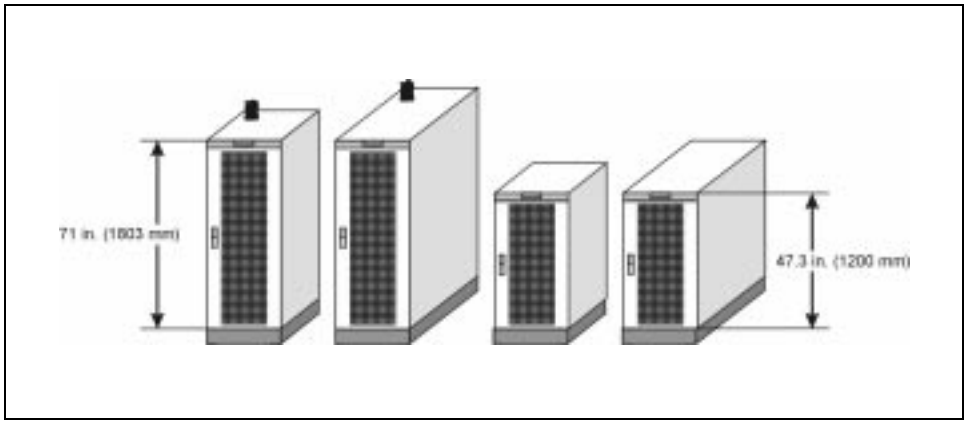


Figure 7-7: Recommended Chassis

From the left:

- E176 JEB SPL Chassis (depth: 23.7 in. / 600 mm)
- E178 JEB SPL Chassis (depth: 31.5 in. / 800 mm)
- E116 JEB SPL Chassis (depth: 23.7 in. / 600 mm)
- E118 JEB SPL Chassis (depth: 31.5 in. / 800 mm)

Installing the Chassis Brackets

1. Install chassis brackets on the left and right sides of the ATM Switch. The chassis brackets are designed to be installed on a 19-inch chassis whose depth is either 23.7 inches (600 mm) or 31.5 inches (800 mm), depending on which chassis is used.
2. Securely fasten the chassis brackets to the main unit with two screws on the left and right.

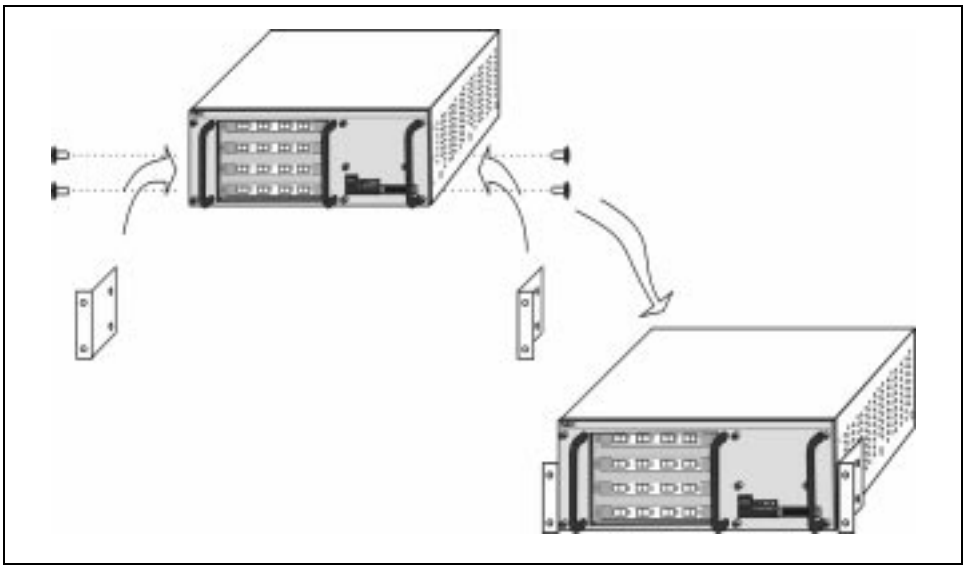


Figure 7-8: Chassis Bracket Installation

Installing the Shelf

Mount the shelf, then securely affix to the chassis at the two locations in the front.

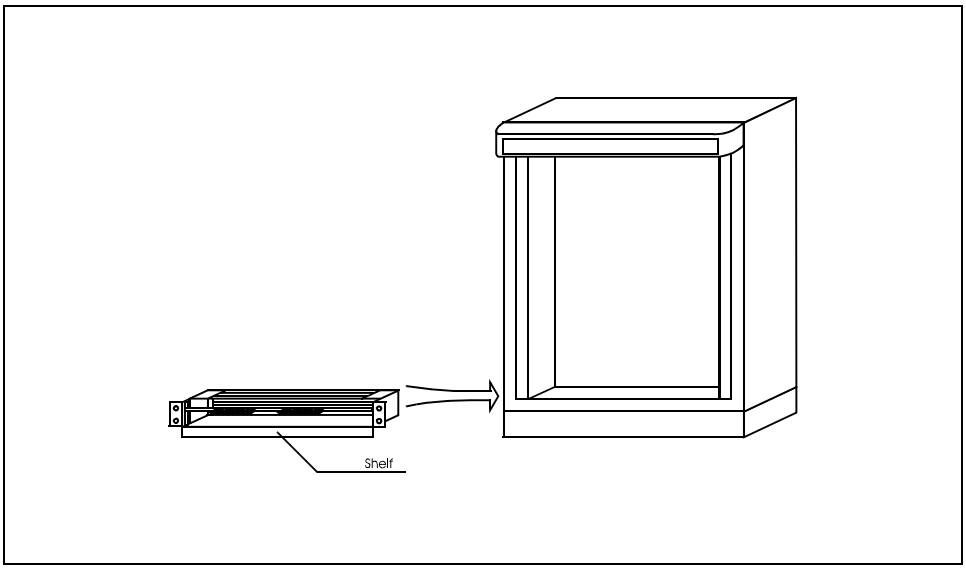


Figure 7-9: Shelf Installation

ATM Switch Installation

1. Install the assembly of the ATM Switch and chassis brackets above the shelf installed on the chassis.
2. Securely fasten the ATM Switch to the chassis with the two screws to the left and right on the front of the chassis brackets.

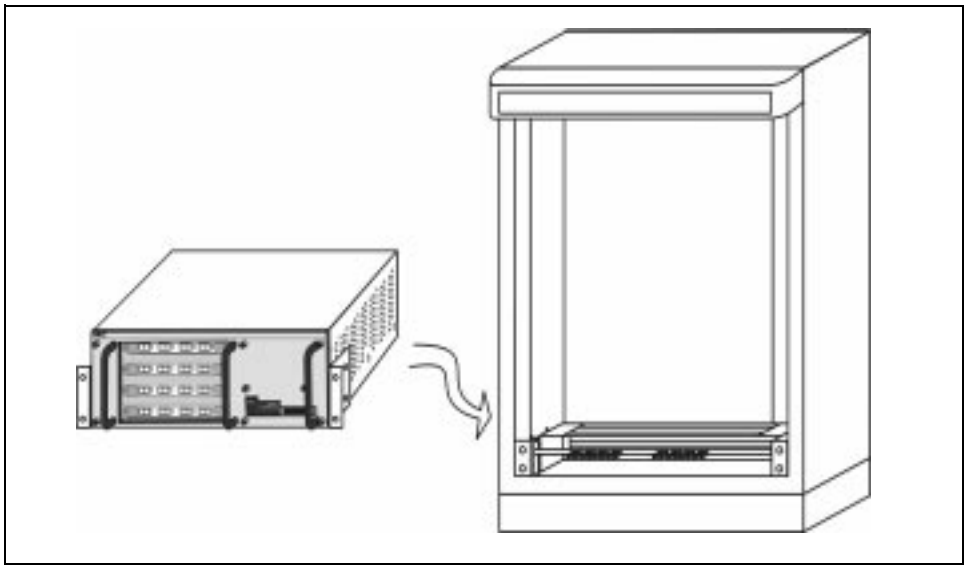


Figure 7-10: ATM Switch Installation

Connecting Communication Cables

This section describes the various communication cables connected to the line cards installed in the ATM Switch and how to connect them.

Types of Communication Cables

The following types of communication cables are available for the ATM Switch:

Physical Layer	Throughput	Transmission Medium	Connector
OC-12/STM-4	622 Mbps	Single mode optical fiber	SC
OC-3/STM-1	155 Mbps	Multi mode optical fiber	SC
OC-3/STM-1	155 Mbps	Single mode optical fiber	SC
TAXI	100 Mbps	Multi mode fiber	SC
OC-3/STM-1	155 Mbps	UTP-5	RJ-45 modular jack
J2	6.3 Mbps	Coaxial cable	BNC
DS3	45 Mbps	Coaxial cable	BNC
E3	34 Mbps	Coaxial cable	BNC

Optical Cables

There are two types of optical cables: single-mode optical fiber cables and multi-mode optical fiber cables. The single-mode optical fiber cables are used for OC-12c and OC-3c/STM1-SMF and the multi-mode optical fiber cables for OC-3c/STM-1-MMF and TAXI.

The single-mode optical fiber cables used for the ATM Switch have core/clad diameters of 9.5/125 µm and the multi-mode optical fiber cables of 50/125 µm or 62.5/125 µm.

The optical cables are connected with SC connectors. When connecting the cables, be careful of the transmission-reception direction. Be sure to connect one end to the transmission side and the other to the reception side.

Optical fiber cable can transmit cells over a distance so as long as the optical reception level shown in the following table is satisfied.

Cable Type	Optical Reception Level [dBm]
SMF-Long	-34~-8
SMF-Short	-28~-8
MMF	-30~-14

Unshielded Twisted Pair Cables

The ATM Switch uses UTP (Unshielded Twisted Pair) category 5 cables for OC-3c/STM1-UTP-5.

The UTP-5 cables are connected with RJ-45 modular connectors.

The pin assignment of the RJ-45 modular jacks conform to that of ATM Network Equipment of ATM Forum UNI standard Ver 3.1.

Maximum transmission distance is 328 ft. (100 m).

Pin No.	Signal
1	Receive+
2	Receive-
3	NC
4	NC
5	NC
6	NC
7	Transmit+
8	Transmit-

Twisted Pair Cables

Twisted pair cables are connected with RJ-45 connectors. Twisted pair cables are used for Primary, DS1, and E1. When equipment is installed in a Central Office environment, shielded cables and connectors must be used.

Coaxial Cables

Coaxial cables are connected with BNC connectors. Coaxial cables are used for 6.3M-J2, 45M-DS3 and 34M-E3. 6.3M uses a 3C-2V coaxial cable to transmit cells up to 200 m.

Connection

The type and quantity of cables differ from one line card to another. Prepare the necessary cables in necessary quantities and connect the line cards.

Be careful of the cable type (single-mode or multi-mode) and the transmission-reception direction when connecting optical fiber cable and the transmission-reception direction when connecting coaxial cable.

Whatever the cable type, be sure to connect them securely.

NOTE Always hold the connector when connecting or disconnecting cable. Holding the cable or pulling on the cable may cause disconnection.

MAT Connection

Connect the MAT to the ATM Switch. Refer to "Physical Connection of MAT" on page 9-3.

Inserting PCMCIA Cards

Insert a PCMCIA ATA card into the PCMCIA card slot in the front of the switch/CPU card.

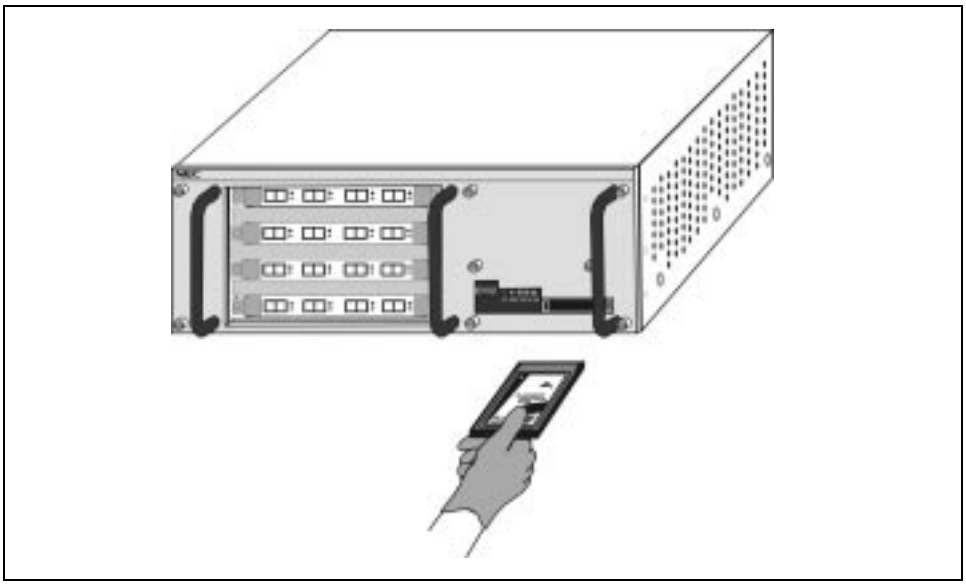


Figure 7-11: Inserting ATA Card

Turning Power On and Off

This section describes the procedures for connecting the power cable to the ATM Switch and the procedures for turning the power on and off.

Connecting the Power Cable

Make sure the power unit fastening screw on the back of the ATM Switch is properly screwed. Connect the power cable to the power connector and the other end of the cable to power supply, for example, the power outlet.

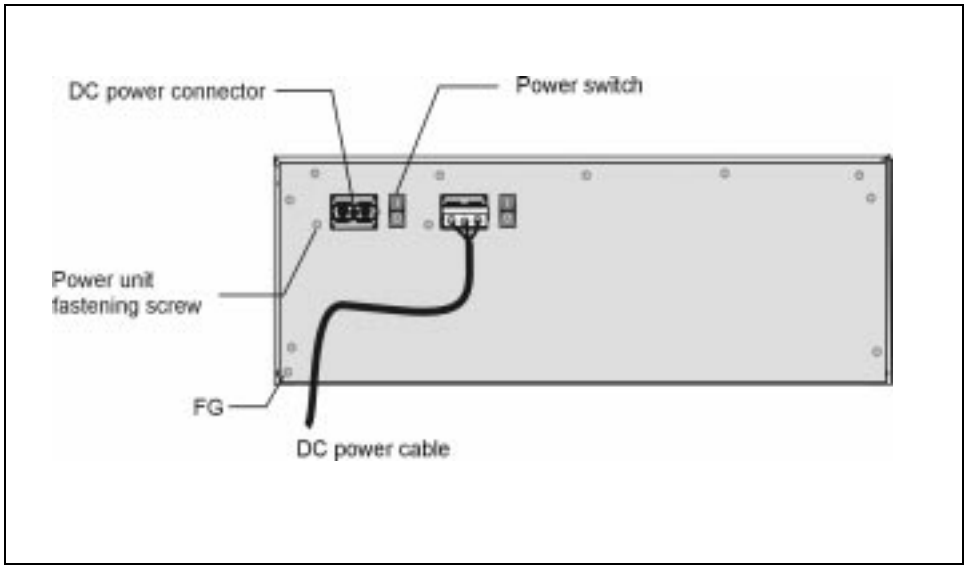


Figure 7-12: Connecting the Power Cable

NOTE DC power cable : White (0V), Brack (-48V), Green(FG)

Since maximum power consumption is large, be sure to draw power directly from an outlet. Never share the same outlet with other devices. Never connect the ground wire to a gas pipe.

Turning the Power On

Procedures for turning on the ATM Switch's power are shown below.

1. Turn on the power switch on the back of the equipment by raising the switch up. If the power unit is redundant, turn on both power switches.
2. Confirm that the POWER LED and the READY LED in the lower right area of the front of the ATM Switch are lighted green.

The ATM Switch's self-diagnosis function is activated every time its power is turned on and every time it is reset. The results of the self-diagnosis are output to the MAT that is connected to the ATM Switch.

When self-diagnosis function is executed, make sure the output message does not contain “NG” or “Not Installed” for slot numbers corresponding to slots in which a line card is installed. Also confirm that the ALARM LED in the lower right area of the ATM Switch is not lighted.

Shown below is a sample output when the ATM Switch is started.

```
The system is coming up now.
If you want to enter boot program, push [ESC]
key immediately.
If the [ESC] key is detected within 3 seconds,
boot program is loaded.
Otherwise, online program will be loaded from
the flash memory.
ATA0=00000000--->dram=a0020000:size=00000200
ATA0=00001000--->dram=a0030000:size=00007000
ATA0=00008000--->dram=a0038000:size=00008000
:
:

Nortel Networks Corporation
ATM Service Node Model 5E
Software Version X.X(X)
Boot Program Version X.XX DD MM YY

Hardware Configuration:
CPU Board: OK;
Switch Board: OK;
PCMCIA 00: ATA OK;
PCMCIA 01: LAN OK;
Slot 00: OC-3C(MMF)OK;
Slot 01: OC-3C(MMF)OK;
Slot 02: Not Installed;
Slot 03: Not Installed;

System Initialization Complete
```

Figure 7-13: Sample MAT Display when ATM Switch is Started

Turning the Power Off

Procedures for turning off the ATM Switch's power are shown below.

1. Turn off the power switch on the back of the equipment. If the power unit is redundant, turn off both power switches.
2. Confirm that the POWER LED and the READY LED in the lower right area of the front of the ATM Switch are off.

⚠ PRECAUTION

All communications will be severed when the power is turned off. All unsaved setting data will also be lost. In principle, do not allow anyone other than the system manager and service personnel to touch the power switch.

To replace one of the power units during operation, only turn off the power of the power unit you wish to replace.

Power Source and Power Consumption

Shown below is the power supply and power consumption of the ATM Switch.

- Input
  - DC -48V
  - Input voltage: -40V to -58V DC
- Maximum power consumption
  - 6.0 A

Setting System Configuration Data

Set system configuration data of the newly installed ATM Switch from the MAT connected to it.

Refer to the Command Manual for the commands from the MAT.

Operation Check

Before performing an operation test, make sure that no error response has been output after setting configuration data (see above).

This section describes the procedures for performing an operation test after the ATM Switch is installed.

ATM Switch Alarms

Check for the ATM Switch hardware errors by entering a command from the MAT. The following hardware operation tests should be performed:

- Switch/CPU card
- Line cards
- Fan unit
- Power unit

1. Enter the command for performing the hardware operation test. The command should be entered as follows:

   `DISPLAY alarm[RETURN]`

2. After entering the command, make sure only the prompt is displayed on the MAT screen. A response is displayed only when an error has been detected.

Line Interface Test

Test the line interface of the line cards installed in the ATM Switch by entering a command from the MAT.

1. Enter the command for performing the line operation test. The command should be entered as follows:

   `DISPLAY line[RETURN]`

2. After entering the command, response of the lines for which line cards are installed is displayed.

3. Make sure that “GOOD” is the response for all lines for which line cards are installed. No response is displayed for a line for which no line card is installed. This completes the operation test. The ATM Switch can now be used properly.

NOTE Follow the instructions below when using the equipment in a country or region where it must conform to EMI VCCI Type 1, FCC Class A, or EN55022 Class A.

- Coaxial cable

  As shown in the illustration below, install a ferrite core near the connector so the cable makes a loop.

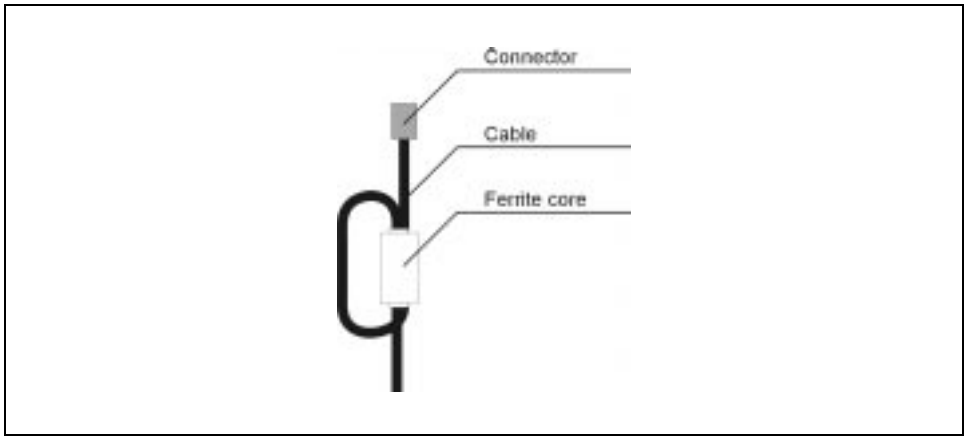


Figure 7-14: Ferrite Core Installation

- RS-232C cable
  - Use a metal connector
  - Use a shielded cable
  - Securely fasten the metal connector to the main unit

NOTE Follow the instructions below when using the equipment in a country or region where it must conform to EMI EN55022 Class B.

- Coaxial cable

  Install near the connector a ferrite core so the cable makes a loop. (See Figure number 7-14.)

- UTP cable

  Install near the connector a ferrite core so the cable makes a loop. (See Figure number 7-14.)

- AC power cable

  Install near the connector a ferrite core so the cable makes a loop. (See Figure number 7-14.).

- RS-232C cable
  - Use a metal connector.
  - Use a shielded cable.
  - Securely fasten the metal connector to the main unit.

- Do not use DS3, 6.3M interface cards.

8 Basic Configuration and Setup

This chapter explains the software setup and configuration of the ATM Switch.

Hardware Installation and Connection

Install and connect the hardware for the ATM Switch in the following order:

1. Install line interface cards.
2. Install blank line interface panels (if necessary).
3. Install power supply(ies).
4. Connect the MAT terminal cable.
5. Install the Ethernet PCMCIA card (optional).
6. Connect the Ethernet cable (optional).
7. At this point, you may want to connect a terminal to the MAT interface, so that you can observe and monitor the entire boot cycle. (See "MAT Connection" on page 7-14.)
8. Connect the power cables to the rear of the ATM Switch.
9. Turn on the ATM Switch power switch(es).

If you have performed these steps properly, the ATM Switch should be fully operational. If the software does not load properly during the initial startup or is not the correct version, verify the PCMCIA software card is installed correctly, and follow the procedures outlined for installing new software versions. (See "Upgrading Software" on page 10-16.)

Setting Configuration Data

Before performing the initial switch configuration, you should obtain the following information:

- Name of the switch (hostname)
- ATM address (NSAP address)
- Switch IP address (ATM management network)
- Switch IP netmask
- Clock source (network clocking structure)
- Enable password
- Telnet password
- Ethernet IP address (optional) (Ethernet management network)
- Ethernet IP netmask (optional)

Once you have collected this information, continue with Step 1 below. Refer to Appendix C for configuration worksheets designed to help you obtain the necessary configurations prior to setting the switch.

Using a terminal connected to the MAT interface (DB9) perform the following steps.

1. Boot the ATM Switch interface.
2. During the boot sequence, a self diagnosis of all components is performed by the ATM Switch, including all of the interfaces. Do one of the following:
   - If no errors were encountered during the self test, verify that the prompt is > and go to the next step. If a switch name had been previously identified, it would be located to the left of the > prompt.
   - If errors were encountered during the self test, turn the power off, verify that everything is installed properly, and turn the power back on.

NOTE At this point, the operator is not logged into the privileged mode of the switch.

3. Enter a question mark (**?**).

NOTE The question mark (**?**) is a help request and can be entered at any point in a valid command. (Exception: during some configuration subroutines, help cannot be accomplished without exiting the command.) To continue viewing possible commands, hit any key; to stop, type **q**.

4. Log into privileged mode by typing the following command.

   ENABLE

During the initial setup, the enable and Telnet passwords should be set. An initial password must be assigned to enter privileged mode, but it can be changed later by using the **PASSWD** and **TELNETPASSWD** commands.

5. Enter a new enable password and press **[RETURN]**. Enter the password again to verify.

6. Enter Telnet password and press **[RETURN]**. Enter the password again to verify.

NOTE Do not lose these passwords.

Once in privileged mode, the prompt changes from **>** to **#**. All commands are available in privileged mode. The next steps set the basic configuration parameters for the switch.

7. Set the clock source.

   ```
   SET clock master
   ```

8. Set the time and date of the switch.

   ```
   SET time [yy-mm-dd][hh:mm:ss]
   ```

9. Set the local switch host name, ATM IP network address and netmask, and ATM network address.

   ```
   SET local [host name] [ATM IP network address]
       [ATM  IP  network  netmask] [ATM address]
   ```

NOTE The ATM network IP address must be on a different IP network from the Ethernet port. Please take caution in configuring both IP addresses to ensure that they are on different networks.

If an Ethernet PCMCIA card is installed, continue with step 10 to configure the Ethernet interface to allow Telnet sessions to the MAT interface. Otherwise, continue with step 11.

10. Set the Ethernet interface configuration.

    ```
    SET ether [Ethernet IP address[x.x.x.x]] [Ethernet
    IP mask [x.x.x.x]]
    ```

11. Save the configuration.

    ```
    SAVE
    ```

12. Reboot the switch by turning the power supply(s) off and then on.

    After modifying items such as clock source and switch addressing information and saving the configuration, reboot the switch to ensure that the new information is updated properly. (Refer to the **RESET ?** command in the Command Manual.)

This completes the basic configuration and setup of the ATM Switch.

Optional Commands

`SET iproute` - Configures an IP route within the switch, usually for remote hosts for network management, etc. Use this command when the network that you want to connect to is either connected to an ATM port or an Ethernet port. For more information, see the "SET iproute (Privileged Command)" section of the *ATM Switch Command Manual*.

`SET nms` - If an NMS system is installed, this command allows up to 4 remote NMS systems to be installed. Options for this command allow you to set community name access and read/write privileges.

`DIAGNOSIS all` - Performs a self test on all the components within the switch. This command takes a few minutes to execute and displays the results after completion.

`DISPLAY configuration all` - Displays the current configuration defined within the switch. There are a number of default settings predefined within the switch. You may save time during configuration and setup by looking at the default configuration and determining what items are already configured to the desired setting.

Software Upgrading

See "Upgrading Software" on page 10-16.

Ongoing Configuration

Interface, ILMI, and SVC Signaling

This section describes how to configure different interface types and PVCs.

Interface Configuration

The **SET INTERFACE** command sets the type of interface, such as Private UNI, Private NNI, or Public UNI. Each interface complies with ATM Forum specifications and has its own unique applications. If you want to keep the default interface configuration, you can skip this section.

1. Display the current configuration of the interfaces.

   DISPLAY interface

Line	Interface	Physical layer	Forum/ITU	Unassigned/Idle	Valid VPI/VCI
00	pri_UNI	<dependent on card type>	ATM Forum	Unassigned	6/8
01	pri_UNI	<dependent on card type>	ATM Forum	Unassigned	6/8
02	pri_UNI	<dependent on card type>	ATM Forum	Unassigned	6/8
03	pri_UNI	<dependent on card type>	ATM Forum	Unassigned	6/8

   To display only a particular interface, use the following command:

   DISPLAY interface [slot number][port number]

   The default response should look something like this:

```
Line:                00
Interface type       pri_UNI
Physical layer:      <dependent on card type>
Forum/ITU:           ATM Forum
Unassigned/Idle:     Unassigned
Valid VPI:           6
Valid VCI:           8
```

   Because the default configuration is already active and in service, you must remove all connections before changing a port configuration.

2. Suspend SVC activity for the port that you are modifying.

   SET svcline [slot number][port number] [vpi number] suspend

   Example: **SET SVCline 23 0 suspend**

3. Delete the ILMI signaling PVC connection.

   DELETE ilmi [slot number][port number] [vpi number]

   This command deletes the ILMI PVC connection for the specified port. The default VPI/VCI of ILMI is 0/16.

   Example: **DELETE ILMI 23 0**

4. Delete the SVC signaling PVC connection.

   DELETE signaling [slot number][port number] [vpi number]

   This command deletes the PVC connection signaling VCI for the specified port. The default VPI/VCI is 0/5.

   Example: **DELETE sig 23 0**

Because of intelligent traffic being sent between ATM switches, sometimes the port configures itself with a PNNI signaling channel. If the interface needs to be modified, this PVC connection will also need to be deleted. The default PNNI VPI/VCI is 0/18.

5. Delete the PNNI signaling PVC connection.

   DELETE pnni [slot number][port number] [vpi number]

   Example: **DELETE PNNI 23 0**

   At this time you are able to modify the interface port.

6. Configure the interface.

   SET interface [slot number][port number]

   Example: **SET int 23**

This command opens a configuration sub-routine. The parameters already identified in Step 1 will be prompted on an individual basis. Remember that the VPI and VCI bit field entries DO NOT identify the VPI/VCI that you will be using for the port. These two fields identify the number of bits that will be used for each field. The defaults are 6 and 8 for VPI and VCI, respectively.

With the interface properly configured, ILMI signaling and PNNI should be restored (as needed).

7. Install the ILMI and SVC signaling connections.

   SET ilmi [slot number][port number] [vpi]

   Example: **SET ilmi 23**

   Default=0
   VPI/VCI ilmi default=0/16

   SET signaling [slot number][port number] [vpi][vci]

   Example: **SET sig 23**

   Default=0
   VPI/VCI signaling default=0/5

8. Sometimes the signaling parameters are incorrect for the port that you are configuring. Use the following command to check the parameters:

   DISPLAY atmsig

   This command displays all of the ports and their signaling parameters.

9. Use the **SET ATMSIG** command to change the parameters of the signaling.

   SET atmsig [slot number][port number] [vpi number]

   This command will enter a configuration sub-routine which will prompt you for 12 different parameters, including the UNI version (3.0, 3.1 or 4.0) and the location of the port (logical network side or user side). It is not recommended that the timer values be changed unless the user is fully aware of the consequences.

10. Once configured, the SVC signaling must be returned to normal operation.

    SET svcline [slot number][port number] [vpi number] resume

    If all is configured properly, the port should be ready to respond to SVC requests. Continue with the next section which describes how to set up the PVCs.

11. Install the PNNI signaling VCI. (This step is only required if the interface will be a NNI port.)

    SET pnni [slot number][port number] [vpi number]

    Example: **SET pnni 23**

    Default=0

PVC Setup and Installation

The first part of any PVC setup is the definition of a profile. There are 16 available profiles that can be defined and configured. These profiles determine characteristics for shaping and managing traffic.

When establishing a PVC, the traffic class (such as CBR, UBR, etc.), the QoS parameters, traffic shaping parameters, and UPC parameters can be set. The **SET PROFILE** command allows the user to specify the traffic type, unique name, PCR, SCR, MBS, and whether to use EPD. There are also 8 shapers that can be configured, with values for PCR, SCR, and MBS.

The ATM Forum has the following table to assist with configuring profiles:

Traffic Class	PCR Flow	Tagging Option	Traffic	Parameters
			PCR/CDPTp	SCR/MBS/ CDVTs
CBR.1	0+1	N/A	Specified	N/A
UBR.1	0+1	N/A	Specified	N/A
UBR.2	0+1	Tagging against all CLP=0 cells	Specified	N/A

Traffic Class	UPC Mode	Profile	(Note1)	Traffic	Shaping	(Note2)
		PCR	EPD	PCR	SCR	MBS
CBR.1	1	Specified	Off	Specified	N/A	N/A
UBR.1	1	Specified	On		Off	
UBR.2	5	Specified	On		Off	

1. Configure a profile for the PVC.

   SET profile [traffic type] [profile name[up to 10 characters]]

   You may also be prompted to set the PCR at 1412830 (maximum) and EPD to on (1).

   Example: **SET profile 4 PVC1 1412830 1**

   The example defines a profile PVC1 with maximum PCR and EPD is on.

2. Define a shaper for the PVC (optional).

   SET shaper [slot number][port number] [shaper number[1-8]] [PCR]

   Example: **SET shaper 02 1 1412830 1412830 1412830**

   The example defines shaper #1 for port 02 with maximum PCR, SCR, and MBS.

3. Define a PVC.

   PVC establish [traffic direction] [traffic type] [originating slot number][originating port number][vpi][vci][destination slot number][destination port number] [vpi][vci] [orig-dest UPC mode] [orig-dest shaper number] [profile name] [dest-orig UPC mode] [dest-orig shaper number] [profile name]

   Example: **PVC ESTABLISH 0 4 02 0 70 03 0 70 1 0 PVC1 1 0 PVC1**

   The example is a bi-directional UBR PVC, from port 02 to port 03, with UPC mode of 1 and no shaper assigned. It is using the profile PVC1.

   Once defined the PVC becomes operational.

   To examine the PVC, perform the command **DISPLAY pvc [slot number][port number]**.

   (Refer to the **DISPLAY pvc** command in the Command Manual.)

4. Save the configuration. (optional)

   SAVE

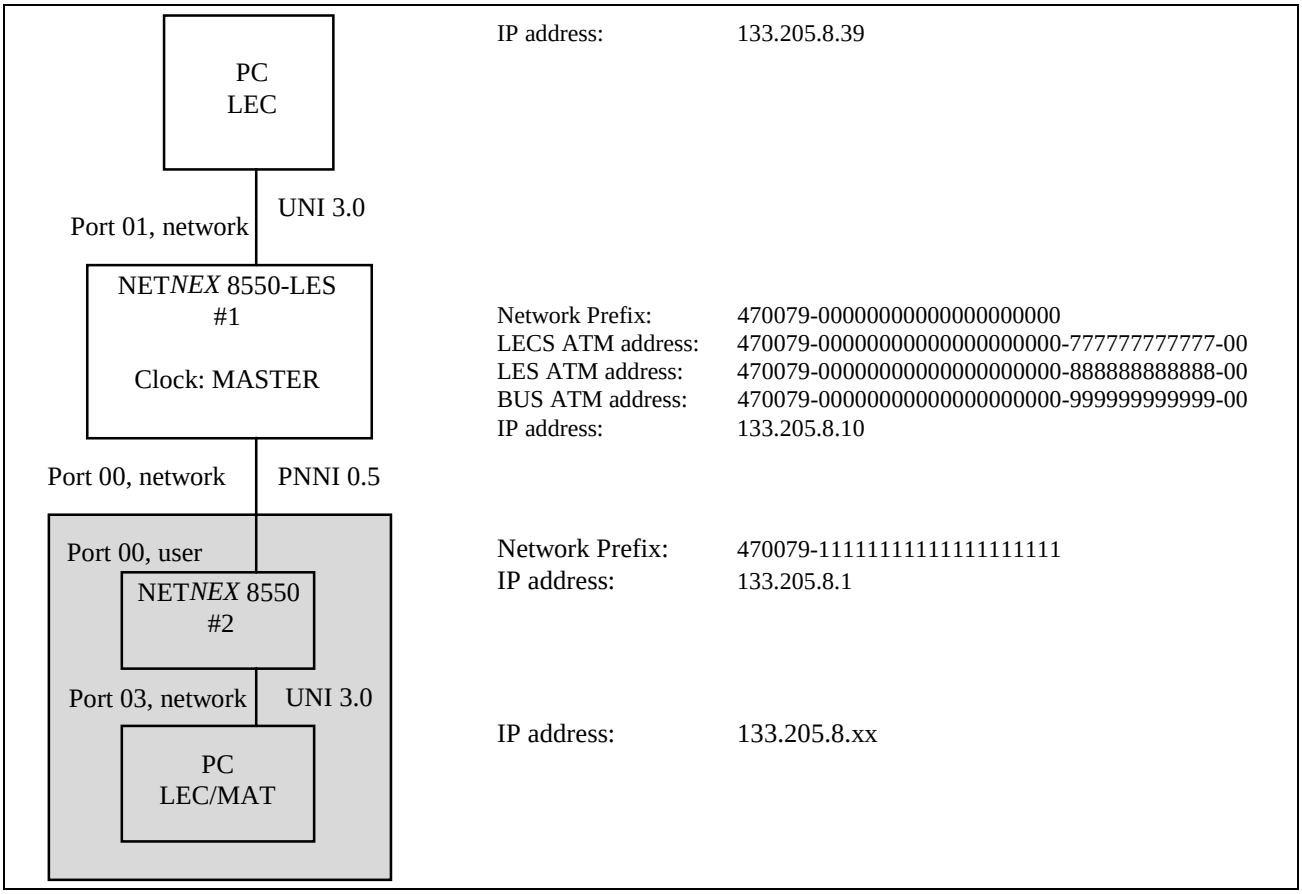
NOTE When changing the configuration, it is always a good idea to save the configuration.

Setting up LAN Emulation

The following shows an example of LAN emulation with two ATM switches interconnected and a LAN emulation client attached to each switch.

LAN emulation, as its name suggests, emulates an Ethernet LAN environment and is also known as MAC over ATM. Various protocols such as TCP/IP, Netware IPX, and Appletalk can be transported over the Ethernet. In this section we will assume that a successful LAN emulation environment is built by confirming a TCP/IP connection with a **`ping`** command between clients.

LAN emulation requires a LAN Emulation Service within an emulated LAN to provide services for features of a shared media network which have to be specially emulated in a switched network, such as address resolution or broadcast message. An example is a broadcast message. An example is a broadcast message. A LAN emulation service consists of three servers: LAN Emulation Configuration Server (LECS), LAN Emulation Server (LES), and Broadcast/Unknown Server (BUS). All of these three servers are implemented in software within an 8550 switch interface card/or module which is not currently available for a product release.



Use the following steps to set up shaded area of the diagram. All data in this section, including addresses, are examples:

1. Connect cables as in the diagram above and power on all the equipment.
2. Adjust the clock mode of the switch (#2) to SLAVE. The LES is set to provide a MASTER clock.
3. Check the switch's local information.

   ```
   DISPLAY network
   ```

4. Set the line interface card parameters, ILMI parameters and ATM signaling parameters. (For both PNNI interface port 00 and UNI interface port 03.)

   If connections such as an ILMI signaling or PNNI exist for that port, those must be deleted before line interface parameters can be changed.

   ```
   DEL  signaling  00  0
   DEL  ilmi  00  0
   DEL  signaling  03  0
   DEL  ilmi  03  0
   ```

5. Set the line interface parameters for PNNI interface port 00.

   ```
   SET interface  00
   Interface  (pri_uni|0  pri_nni|1  pub_uni|2)?  1
   Forum/ITU  (forum|0  itu|1)?  0
   IDLE Cell  (unassigned|0  idle|1)?  0
   Valid  VPI  (0-8[bit])?  6 (based on interface type)
   Valid  VCI  (0-8[bit])?  8 (based on interface type)
   Line  Interface  00 has been registered.
   ```

6. Set the line interface parameters for UNI interface port 03.

   ```
   SET interface  03
   Interface  (pri_uni|0  pri_nni|1  pub_uni|2)?  0
   Forum/ITU  (forum|0  itu|1)?  0
   IDLE Cell  (unassigned|0  idle|1)?  0
   Valid  VPI  (0-8[bit])?  0
   Valid  VCI  (0-8[bit])?  10
   Line  Interface  03 has been registered.
   ```

   If a line interface port is connected to an ATM-NIC, verify that the Valid VPI and Valid VCI values are 0 and 10 respectively. The ATM-NIC in this example only supports VPI=0 and VCI up to 1023.

   If the NIC attached to the line interface port carries Management Information Base (MIB) information, ILMI can automatically obtain these valid VPI and VCI parameters, otherwise they must be set manually.

7. For UNI interface port 03 connected to the ATM-NIC, set ILMI timing parameters. ILMI uses VPI/VCI=0/16.

   ```
   SET ilmi 03 0 16 5 60 20
   ```

Adjust ILMI timing parameters. This is specific to a connection to an ATM-NIC. Use the following values: Timer value = 5, Times of retry = 60 (default) and Keepalive = 20.

8. Before svcline can be turned on, you must:

```
SET  signaling  00  0  5
```

Re-set the signaling connection deleted previously. A signaling connection is set with VPI/VCI=0/5

```
SET  signaling  03  0  5
```

9. When connecting two switches together, one has to be set to Network side and another set to User side. (In this example, 8550-LES is set to Network side; therefore, 8550 must be set to User side.)

   For PNNI interface port 00:

```
SET atmsig  00  0
Interface  (network|0  user|1)?  1
T303  (1-255,default=4)?  4
T308  (1-511,default=30)?  30
T309  (1-511,default=90)?  90
T310  (1-255,default=10)?  10
T313  (1-255,default=4)?  4
T316  (1-511,default=120)?  120
T317  (1-255,default=60)?  60
T322  (1-255,default=4)?  4
T398  (1-255,default=4)?  4
T399  (1-511,default=14)?  4
UNI Version (UNI3.0|0 UNI3.1|1,default=3.0)? 3.0
```

10. For UNI interface port 03:

```
SET atmsig  03  0
Interface  (network|0  user|1)?  0
T303  (1-255,default=4)?  4
T308  (1-511,default=30)?  30
T309  (1-511,default=90)?  90
T310  (1-255,default=10)?  10
T313  (1-255,default=4)?  4
T316  (1-511,default=120)?  120
T317  (1-255,default=60)?  60
T322  (1-255,default=4)?  4
T398  (1-255,default=4)?  4
T399  (1-511,default=14)?  4
UNI Version (UNI3.0|0 UNI3.1|1,default=3.0)? 3.0
```

↑ Set UNI 3.0

```
SET  svcline  00  resume
SET  svcline  03  resume
```

11. For the PNNI interface port 00, set a PNNI connection. Use values, VPI=0 and VCI=18.

    SET pnni 00 0 18

12. Manually register an address of LECS to the switch. Upon an ILMI query of the LECS address from a prospective LE client, the switch will inform the LECS address registered with this command.

SET configserver 0 47007900000000000000000077777777777700

LECS ATM address

LECS index (Up to 4 LECS can be registered.)

13. Save the configuration data you have just entered.

    SAVE

14. Confirm that SVCLINE mode for connected line interface ports are enabled.

    DISPLAY svcline [slot number][port number]

15. Confirm that dynamic SVC connections are established for connected line interface ports.

    DISPLAY dynamicroute [slot number][port number]

16. Confirm that SVC connections for each connected line interface ports.

    DISPLAY svc [slot number][port number]

SVC Tunneling

This section describes how to interconnect two ATM Switches (1 & 2) configured for LAN Emulation with an LE client attached to each, over a PVC connection using a SVC tunneling technique.

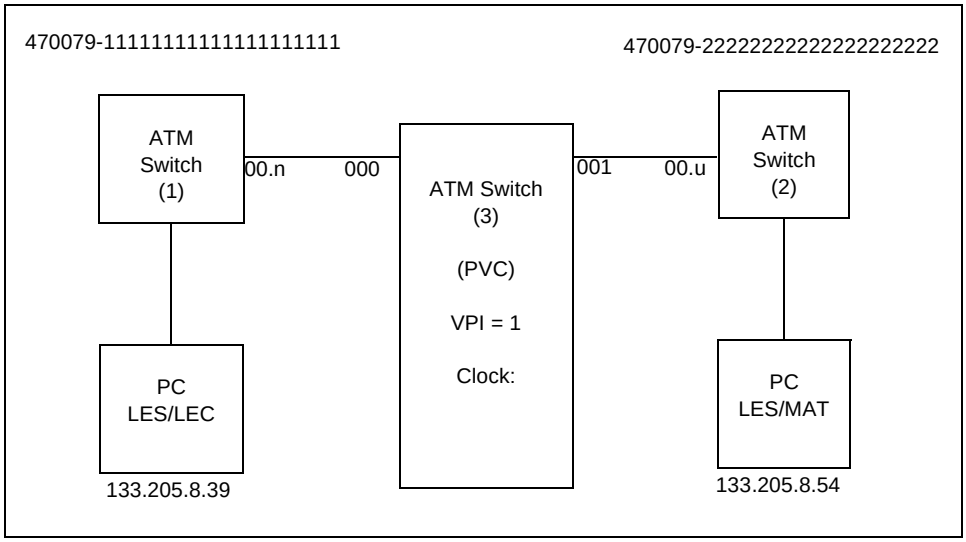


Figure 8-1: SVC Tunneling

1. Refer to Figure 8-1 and make cable connections.
2. Set up both LE clients and Switch 3 configurations except for switch interconnections.
3. On Switch 1 and 2, set interface 00 to a NNI port.
4. On Switch 2, set to User Side.
5. On Switch 1 and 2, execute the following commands:

   SET tunnel 00 1

   SET signal 00 1

   SET ILMI 00 1
6. On Switch 1 execute the following command:

   route add NSAP 47007922 00 1
7. On Switch 2 execute the following command:

   route add NSAP 47007911 00 1
8. **SAVE**

NOTE All signaling, ILMI and SVCs will use VPI and will pass unobstructed through Switch 3.

9 Maintenance and Operations

This section describes how the ATM Switch is operated, maintained, and managed.

Overview

The ATM Switch is primarily maintained and operated using a dedicated terminal called MAT that is connected to the ATM Switch via RS-232C. Some of the functions may also be performed from an NMS connected via the ATM or Ether network. SNMP, the standard protocol for Internet hardware, is used over UDP/IP/SNAP/LLC/AAL5 for communications between the NMS and the ATM Switch.

Figure 9-1 illustrates how the MAT and the NMS are used to control maintenance operations.

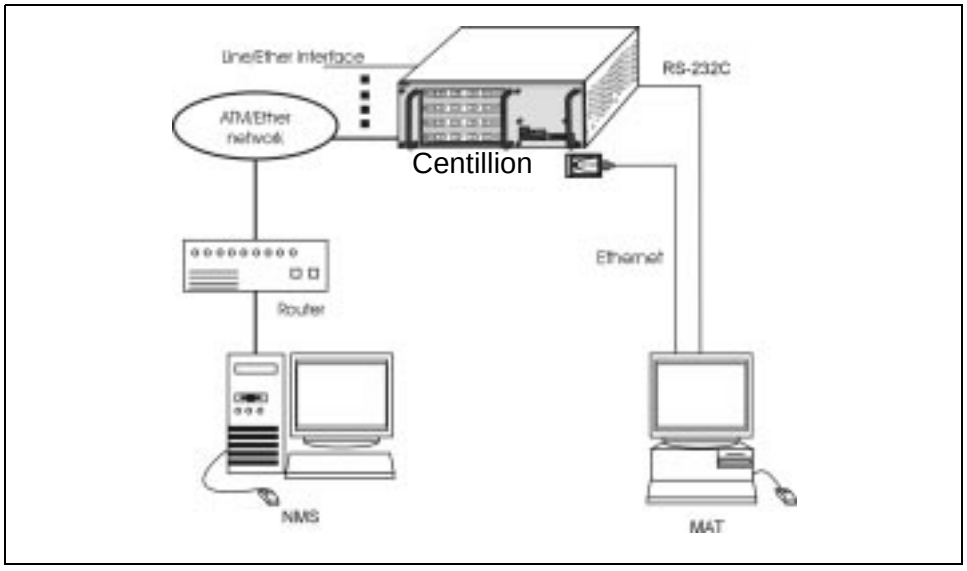


Figure 9-1: Control with MAT and NMS

MAT and NMS

The primary functions that can be used from a MAT and NMS are as listed below.

MAT

- Initialize the system
- Input system configuration data
- Set, delete, or display PVC (including connection with NMS)
- Set, delete, or display SVC routing table
- Display system alarm and line alarm
- Display the operation status of a line card
- Display the types of line cards mounted

NMS

- Display/set PVC
- Display system alarm and line alarm
- Display the operation status of a line card
- Display the types of line cards mounted
- Display SVC (number of connections only)
- Monitor traffic
- Display trap

MAT

The ATM Switch is mainly controlled by commands sent from an external MAT connected via RS-232C interface.

Any terminal equipped with an RS-232C port and communications capability may be used as the MAT.

MAT may be connected when necessary or left connected to the ATM Switch. However, note that the ATM Switch will not automatically display messages on MAT other than when power is turned on or the ATM Switch is reset.

Also note that RS-232C cross cable for connecting the MAT and communication software is not supplied with the ATM Switch.

Physical Connection of MAT

In connecting the ATM Switch and MAT, use a RS-232C cross cable fitted on one end with a D-SUB 9 pin (male) connector for the ATM Switch and on the other end with a connector meeting the shape of the MAT side connector.

There are two types of RS-232C cables used, straight cable and cross cable, depending on the difference in the connection conditions of signal lines. Use the RS-232C cross cable for connecting the ATM Switch and MAT.

The RS-232C connector of the MAT differs in shape depending on the model of the MAT. Use an RS-232C cross cable that has on one end a connector that can be connected to the MAT and on the other end a D-SUB 9-pin male connector for the ATM Switch.

This section describes how to set PC9801 or IBM-PC as the MAT.

Figure 9-2 and Figure 9-3 show the RS-232C connector. Figure 9-4 and Figure 9-5 show the connection method with a PC9801 and an IBM-PC, respectively.

The shape of the RS-232C connector on the 98 side is a D-SUB 25-pin (male) connector.

The shape of the RS-232C connector on the IBM-PC side is a D-SUB 9-pin (male) connector.

Specifications of the ATM Switch RS-232C connector are shown below.

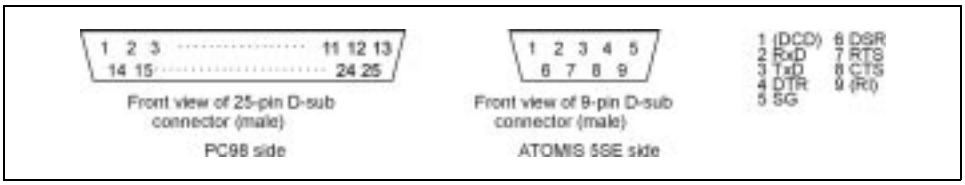


Figure 9-2: PC98-ATM Switch RS-232C Connector

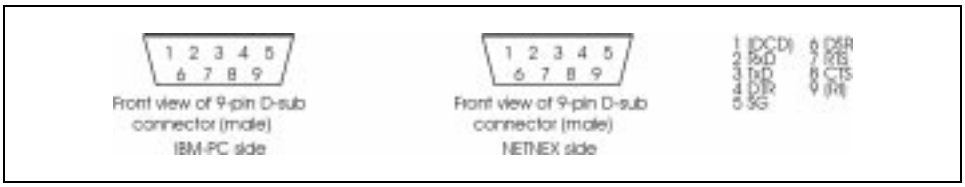


Figure 9-3: IBM-PC-ATM Switch Interface RS-232C Connector

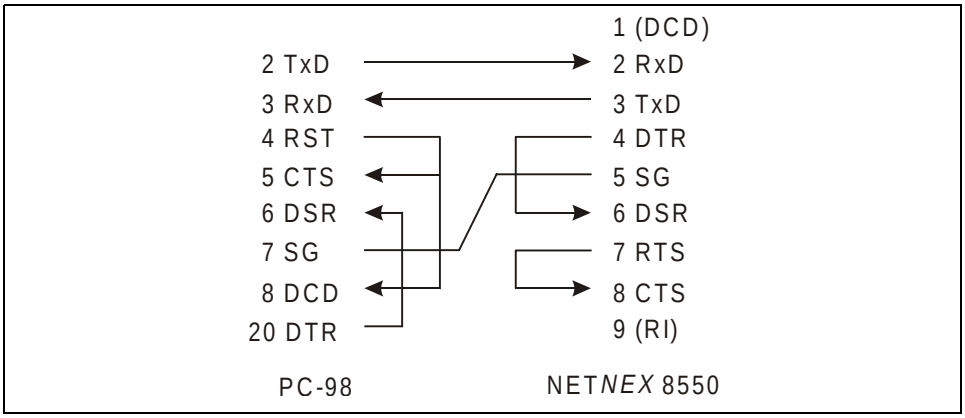


Figure 9-4: Connection with PC98

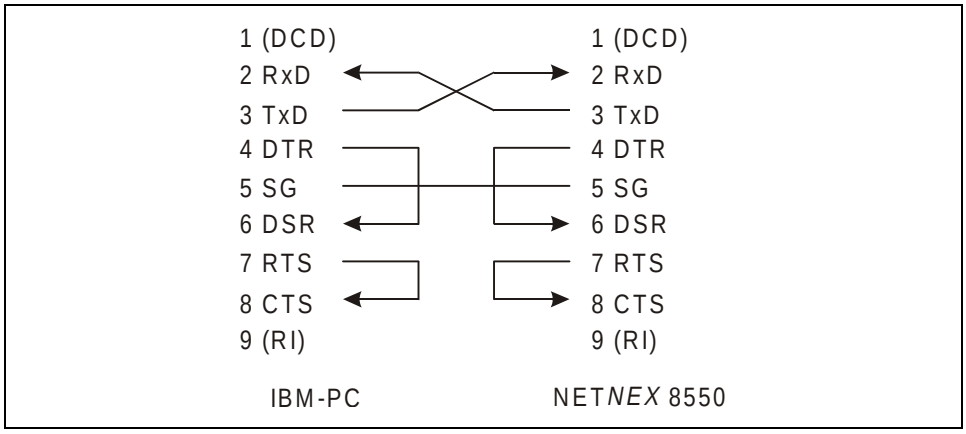


Figure 9-5: Connection with IBM-PC

Connection

The ATM Switch is equipped with a RS-232C connector on the front of the switch/CPU card. The RS-232C cable may be inserted or removed whether or not power is supplied to the ATM Switch.

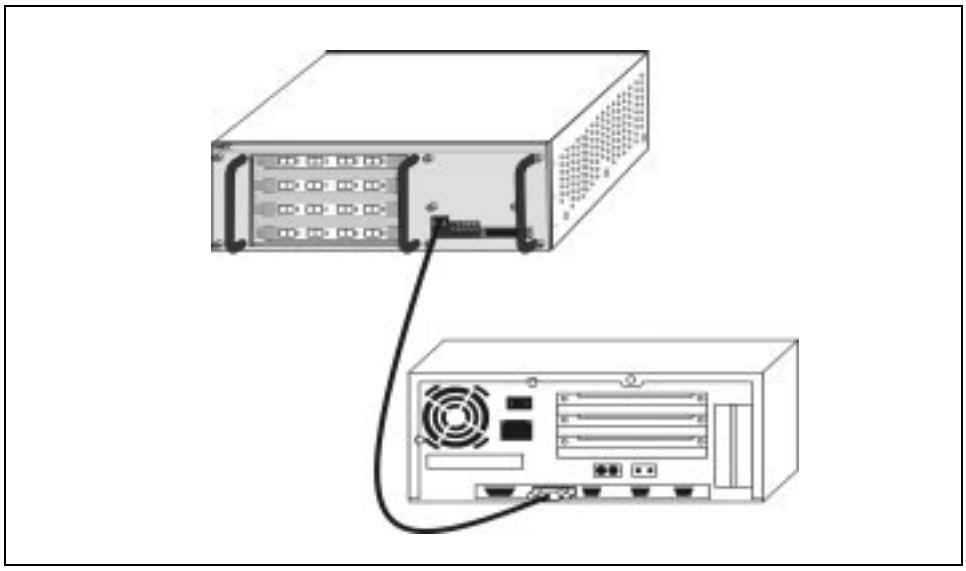


Figure 9-6: Example of the ATM Switch MAT Connection

Communications Software

A dumb terminal may be used as MAT, but when using a personal computer or workstation as MAT, it is recommended that you use communication software compatible to the hardware model you are using.

Setting the MAT

Turn on the power switch of the MAT. Set the communications parameters of the MAT as follows. For instructions on setting the parameters, refer to the manual on the installed communications software.

- Line rate: 9600 Bps
- Character bit length: 8 bits
- Stop bit length: 1 bit
- Parity: None
- Flow control: Yes

MAT Screen Display

MAT's standard screen size is a text screen of 80 × 24 lines.

All the commands entered by the user and the responses to the commands are scroll-displayed on the same screen.

In the event the screen size of the commands and responses combined exceeds 24 lines, the screen will stop to scroll. Scroll can be resumed by pressing any key except “Q”.

The number of lines displayed on the screen can be changed by using the **`SET scroll`** command.

NMS

The ATM Switch may be operated and managed from personal computers and workstations called MATs as well as from the NMS that is connected to the ATM Switch via ATM or ether network.

SNMP, the standard protocol for Internet hardware, is used over UDP/IP/SNAP/LLC/AAL5 for communications between the NMS and the ATM Switch. To realize this function, the ATM Switch maintains Management information base MIB-II stipulated by RFC1213.

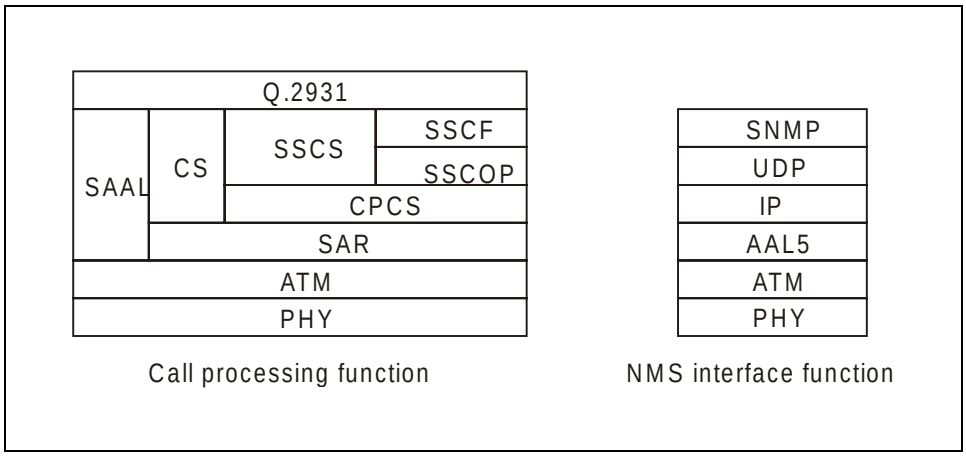


Figure 9-7: Protocol Stack

NMS Interface (via ATM)

The CPU can exchange data with the NMS via ATM lines. To realize this function GWPAD assembles ATM cells into data and disassembles data into ATM cells. The CPU monitors errors in the hardware and sends to the NMS error information. Figure 9-8 shows how data is transferred from the NMS to CPU.

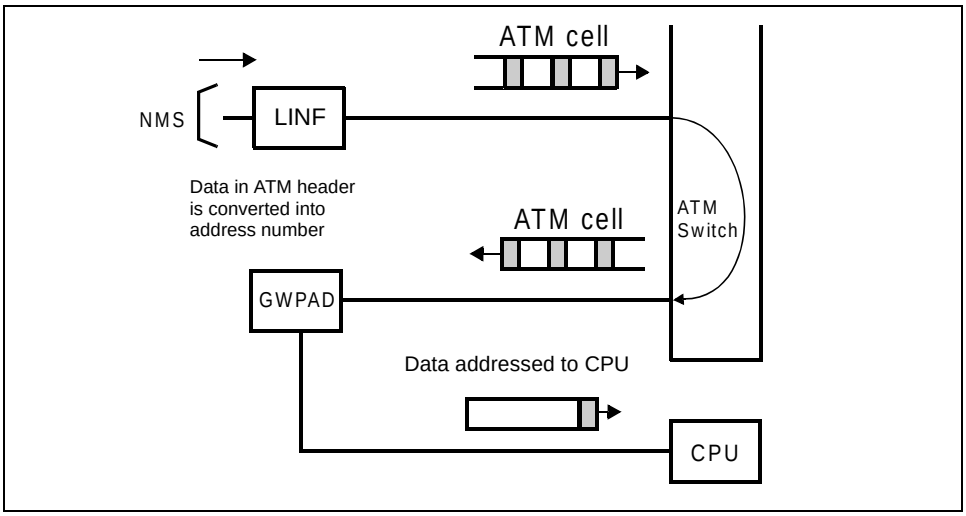


Figure 9-8: NMS Interface (via ATM)

NMS Interface (via Ethernet)

By using a PCMCIA LAN card, the CPU can directly exchange data with NMS via Ethernet. Refer to "Inserting PCMCIA Cards" on Page 7-14 for details on the PCMCIA LAN card.

Periodic Maintenance

This section describes the periodic maintenance that must be performed after the ATM Switch is put into operation.

In general, the following two tasks are required for the operation, maintenance, and management of the ATM Switch:

- Check to make sure that the ATM Switch is operating properly.
- Take action when a fault is found.

The system manager of the ATM Switch should perform the following periodic inspection to make sure that the ATM Switch is operating properly:

- Check visually
- Check with commands
- Diagnose the equipment

In addition, when a fault is detected in the ATM Switch, take appropriate action.

The user does not need to control the equipment once operation begins. The user merely needs to carefully read the Precautions on Handling the Product and the Handling Precautions in the following sections and provide an environment around the equipment so that the ATM Switch can function properly.

When an error occurs to the equipment during operation, the ALARM LED on the front of the equipment will light. In this case, promptly call the system manager.

Backing up Configuration Data

It is recommended that configuration data be backed up any time there have been changes made to the switch configuration that are intended to be permanent.

Ethernet Interface

1. Connect the TFTP server and the switch Ethernet port to a common Ethernet network. They may be directly connected to each other if an ethernet cross-connect cable is used.
2. Set the Ethernet IP address of the switch using the **`SET ether`** command.
3. If the two are not on the same Ether subnet, and are separated by a router, use the **`SET iproute`** command to direct the switch to the router.
4. Backup the configuration data using the **`BACKUP config`** command.
5. To download a backed up configuration into the switch using the **`INSTALL config`** command.

ATM Interface

1. Connect the switch and the workstation (TFTP server) with an ATM-PVC interface.
2. Setup the ATM-PVC workstation (TFTP server) to use a PVC.
3. Set the IP routing information within the switch such that the switch can upload the configuration data to a host within a different sub network. Use the **`SET iproute`** command.
4. Backup the configuration data using the **`BACKUP config`** command.
5. To download a backed up configuration into the switch, use the **`INSTALL config`** command.

Flash Memory Card

1. Power off the ATM Switch.
2. Insert a spare flash memory card (with an on-line program) into the PCMCIA slot #0 (bottom slot).
3. Insert the flash memory card with configuration data into the PCMCIA slot #1 (upper slot).
4. Power up the ATM Switch while simultaneously pressing (and hold down) the **"Esc"** key on the MAT console. The 8550 will enter the boot program.
5. At the BOOT# prompt, type the following:

   SET boot flash_up_save
6. At the BOOT# prompt, type the following:

   exit

   Data from slot #1 will be copied to the card in slot #0.

Cosmetic Check

Recommended monthly.

Since alarm status is checked directly from the MAT or NMS on as "as needed" basis, a cosmetic check of the ATM Switch is simply performed as routine, periodic maintenance.

- Is the ALARM LED lighted?
- Is there irregular noise?
- Is there warp, etc., in the shell?
- Is there a missing screw?

Checking Cables and Connectors

Recommended every six months.

- Is there a disconnected cable or a loose connector?
- Is there an excessive bend in a cable?
- Is a front plate installed on every open slot?

Checking with MAT

Recommended every six months.

1. Check alarm status from a MAT using the **DISPLAY alarm** command.
2. Perform system diagnosis from a MAT using the **DIAGNOSIS ?** command.

Cleaning

- Wipe the main unit with dry cloth.
- Do not allow water drops in the main unit.
- Do not let the cleaning cloth catch on a connector while cleaning.
- Do not use chemically-treated cloths as they may harm the paint.
- Do not place any foreign objects in the main unit.

10 Modifications

This chapter describes the procedures for moving the ATM Switch to another location, replacing mounted packages, upgrading software, and adding hardware.

Moving the Equipment

This section describes the procedures for moving the ATM Switch to another location.

1. Turn off the power switch of the ATM Switch and remove the power cable.

NOTE If the power unit is redundant, be sure to remove both cables.

2. Remove the communication cable connector from the ATM Switch.
3. Move the ATM Switch to the new installation site. Make sure in advance that the installation site meets the installation environmental condition. Refer to "Installation Conditions" on page 7-2.

When carrying the main unit, be sure to securely hold the bottom of the main unit as shown in Figure 10-1.

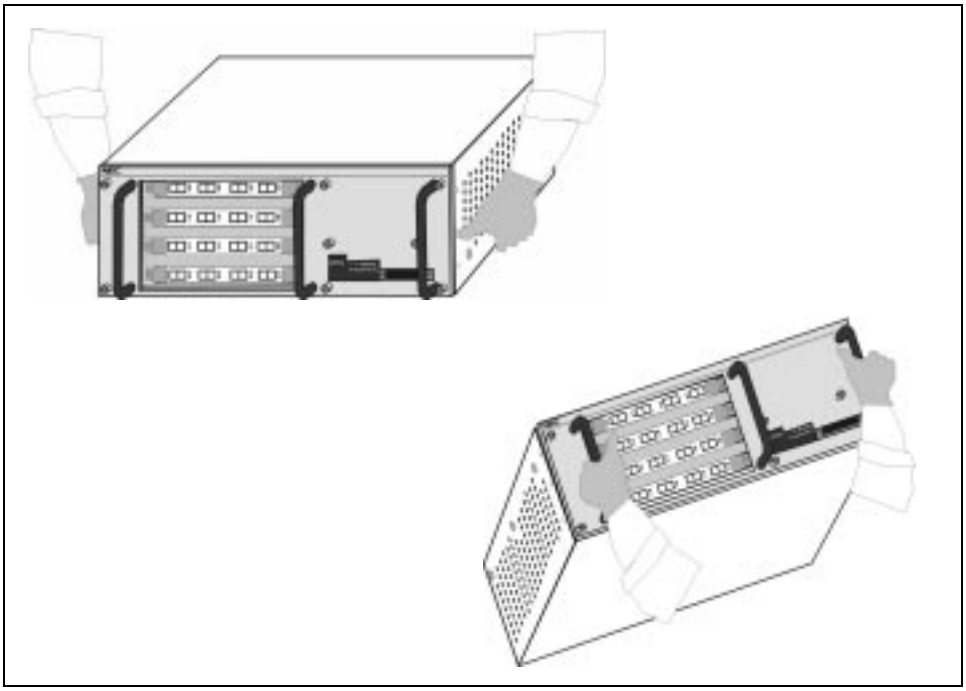


Figure 10-1: Carrying the ATM Switch

NOTE Be sure to hold the specified positions. Holding positions other than the specified positions may cause a failure.

4. Connect the power cable and the communication cable. Refer to "Connecting the Power Cable" on page 7-15.
5. Connect the MAT to ATM Switch with RS-232C cable. Refer to "MAT Connection" on page 7-14.
6. Turn on the MAT's power switch and set the communication parameters. Refer to "Setting the MAT" on page 9-6.
7. Turn on the ATM Switch's power switch. Check the messages displayed on the MAT screen to make sure that the move did not cause a problem with the ATM Switch. Refer to "ATM Switch Alarms" on page 7-18.
8. Enter the alarm message display command from the MAT to make sure that there is no hardware error. Refer to "ATM Switch Alarms" on page 7-18.

General Precautions on Handling Packages

This section provides the procedures for installing units and packages on the ATM Switch.

Pay attention to the following precautions when handling packages.

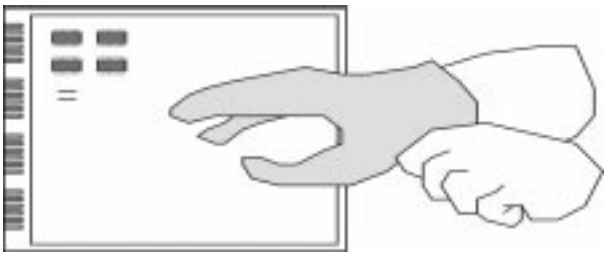


Figure 10-2: Precaution - Wear Clean Gloves

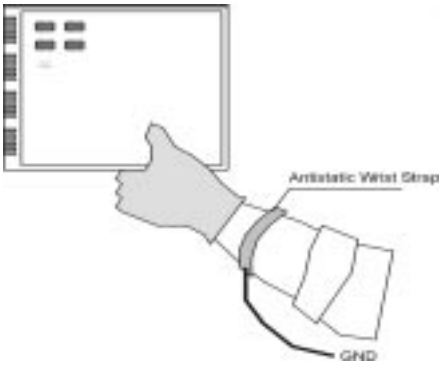


Figure 10-3: Precaution - Take Electrostatic Measures

Figure 10-4: Precaution - Do Not Bend Cards

Power Unit Installation

This section describes the procedures for installing the power unit.

Inserting the Power Unit

1. Make sure the power switch of the power unit that is inserted is turned off.
2. Remove the front cover from the front of the main unit. Refer to "Removing the Front Cover" on page 10-15.

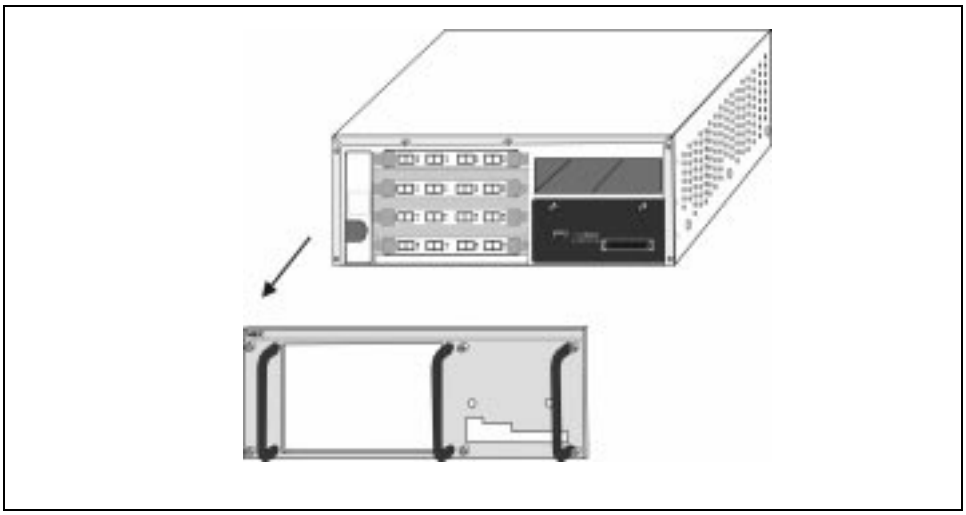


Figure 10-5: Removing the Front Cover

3. Insert the power unit into the power unit slot. As the power unit can be made redundant, there are two slots, left and right. When using only one power unit, insert the power unit into the slot #0 that is on the left-hand side facing the main unit. When inserting the power unit, make sure you securely hold the power unit with both hands (as shown in Figure 10-6)and insert it all the way in until it is secure.

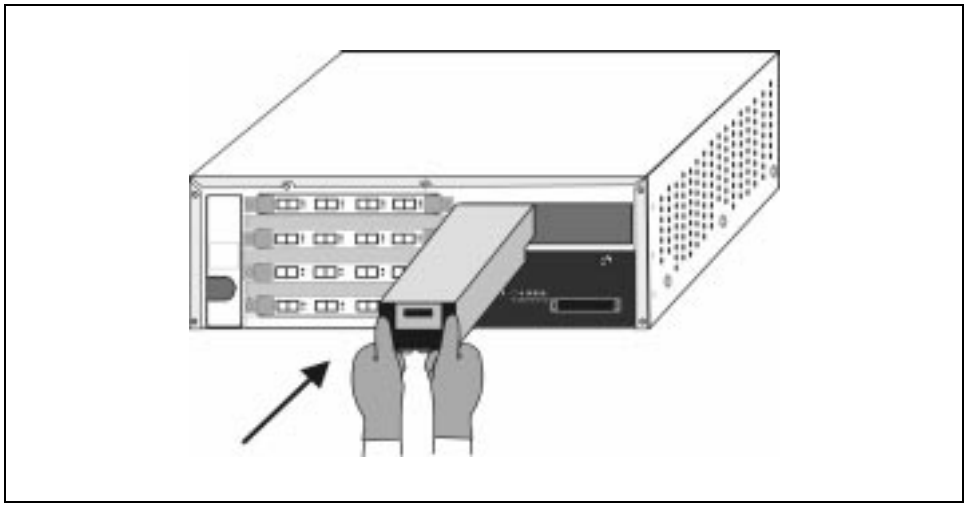


Figure 10-6: Inserting the Power Unit

⚠ PRECAUTION

Make sure you use both hands and insert the power unit slowly. Inserting the power unit quickly may cause damage to the connector or a failure. An injury may result if you hold the power unit with only one hand.

4. Tighten the screw on the back of the main unit to fix the power unit.
5. Install power unit cover and securely fasten with the screws on both ends. Make sure the right side is up when installing the power unit cover.
6. Install the front cover. Refer to "Installing the Front Cover" on page 10-15.

Removing the Power Unit

1. Turn off the power switch on the back of the main unit (if redundant, only the power switch of the power unit to be removed).
2. Remove the power cable from the connector and remove the fastening screws.
3. Remove the front cover.
4. Turn the screws on both ends of the power unit cover and remove the cover.
5. Hold the power unit securely with both hands as shown in Figure 10-7 and remove it slowly.

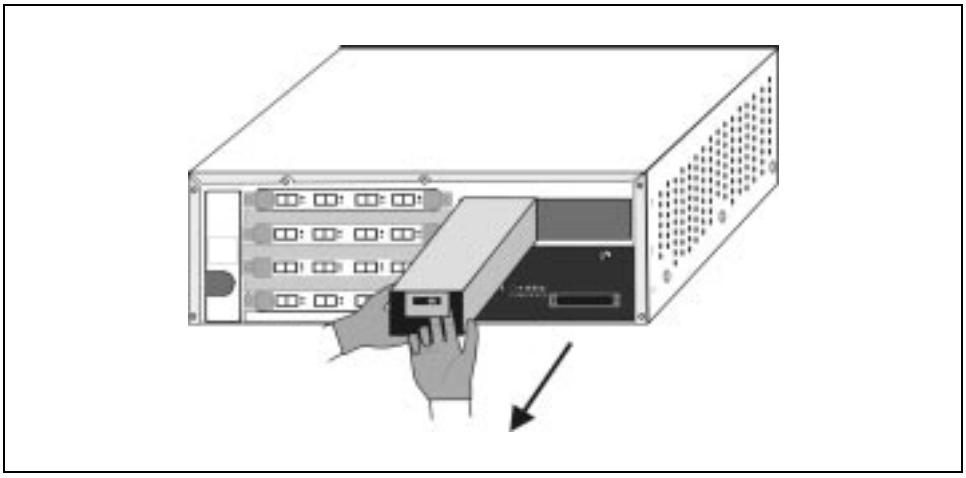


Figure 10-7: Removing the Power Unit

⚠ PRECAUTION

Be sure to turn the power off before inserting or removing the power unit. Leaving the power on while inserting or removing the power unit may cause the unit to fail.

6. Install the power unit cover and securely fasten with the screws on both ends. Make sure the right side is up when installing the power unit cover.
7. Install the front cover.

If the power unit is redundant and one power unit is in operation, the other power unit can be inserted or removed without affecting the switching functions of the main unit.

Switch/CPU Card Installation

This section describes the procedures for installing the switch/CPU card.

Inserting the Switch/CPU Card

1. Clean the connector with cleaner before inserting the switch/CPU card.
2. Turn off the power switch on the back of the main unit. Turn off both switches if the power unit is redundant.
3. Remove the front cover from the front of the main unit
4. Insert the switch/CPU card into the switch/CPU card slot by running the card through the guide rails in the slot (inside the slot, there are two guide rails on the left-hand side for the switch and CPU card and one guide rail on the right-hand side for the CPU card). When inserting the switch/CPU card, securely hold the card with both hands (as shown in Figure 10-8) and insert the card evenly on the left and right sides. Finally, press the center of the front plate of the switch/CPU card with the thumbs of both hands until it clicks in place.

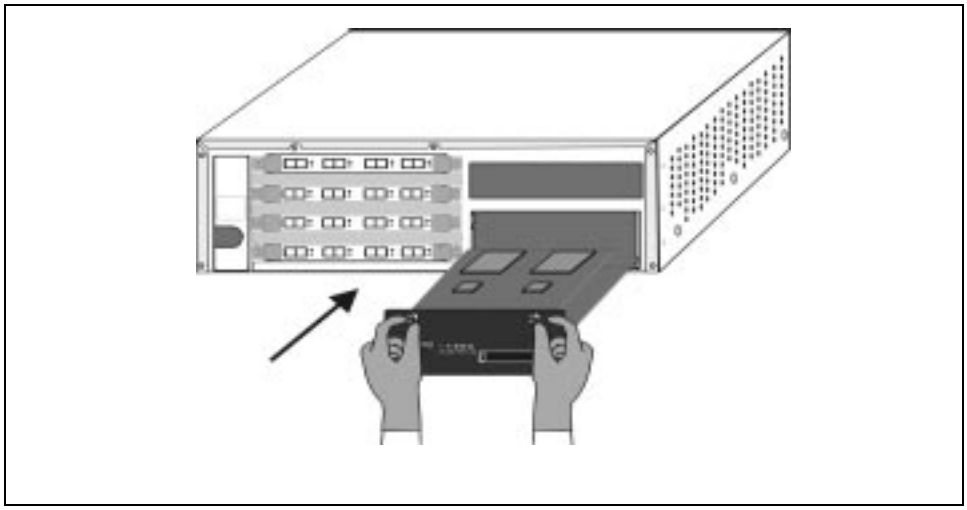


Figure 10-8: Inserting the Switch/CPU Card

⚠ PRECAUTION

Be sure to slowly insert the switch/CPU card with both hands. The connector may become damaged or the switch/CPU card may fail if the switch/CPU card is inserted too quickly.

Make sure the switch/CPU card is fitted into both left and right guide rails before inserting it. If the switch/CPU card is slid outside of the guide rails, the card may be damaged.

5. Tighten the two screws on the left and right of the front plate of the switch/CPU card to fix the card in place.
6. Install the front cover.

Removing the Switch/CPU Card

1. Turn off the power switch on the back of the main unit. Turn off both switches if the power unit is redundant.
2. Remove the front coverf from the front of the main unit.
3. Remove the two screws on the left and right ends of the front plate of the switch/CPU card.
4. Slowly remove the switch/CPU card with both hands.

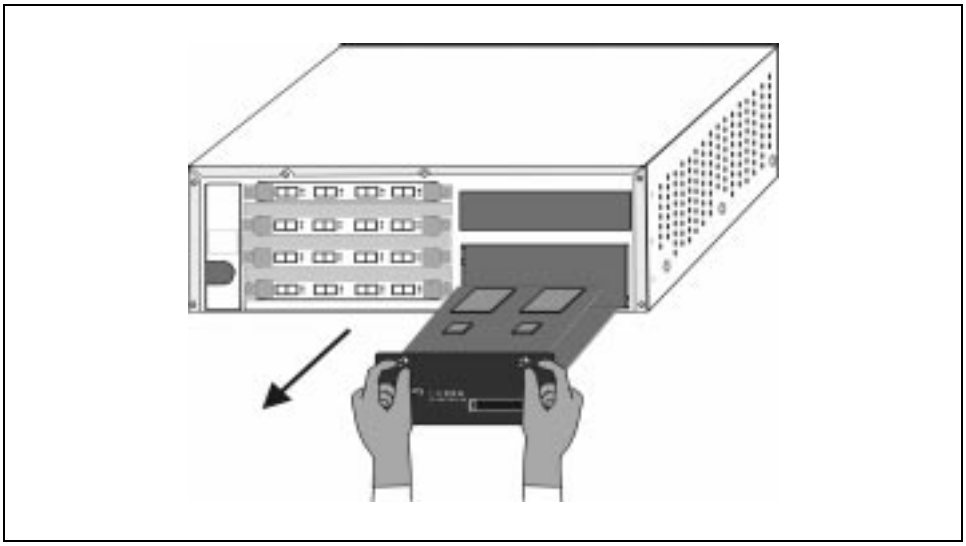


Figure 10-9: Removing the Switch/CPU Card

⚠ PRECAUTION

Be sure to turn the power off before inserting or removing the switch/CPU card. Leaving the power on while inserting or removing the switch/CPU card may cause the unit to fail.

Line Card Installation

This section describes the procedures for installing a line card. It also describes the procedures for installing a front plate over an idle line card slot.

Several types of line cards are available (listed below). They are all installed the same way.

- OC-12c-SMF(622 Mbps) (from November 1996)
- OC-3c/STM-1 -MMF
- SMF, -UTP-5 (155 Mbps)
- TAXI-MMF(100 Mbps)
- J2 (6.3 Mbps), DS3 (45 Mbps)
- E3 (34 Mbps)
- FR-DS1
- CE-DS1
- CE-E1

Inserting a Line Card

1. Clean the connector with cleaner before inserting the line card.
2. Each line card is equipped with ejectors. Close the ejectors before inserting the card.

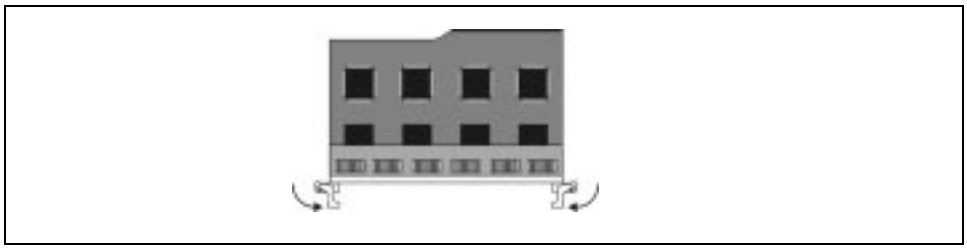


Figure 10-10: Line Card Ejectors - Closed Position

3. Insert the line card all the way into the line card slot slowly and positively by running the card through the guide rails. As shown in Figure 10-11, securely

hold the ejectors with both hands to insert the card.

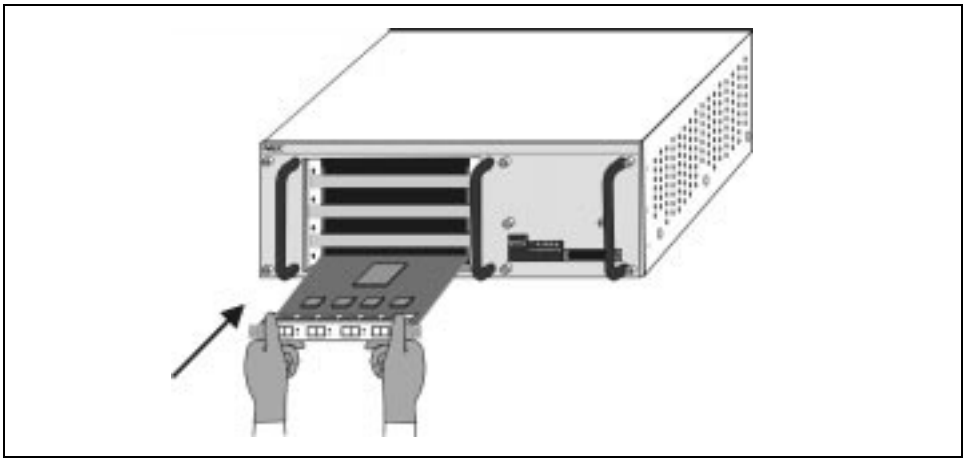


Figure 10-11: Inserting the Line Card

⚠ PRECAUTION

Figure 10-12: When pushing the line card in, do not apply excess pressure on the left and right edges of the front of the plate. The plate may become deformed.

Make sure the line card is fitted into both right and left guide rails before inserting it. If the line card is slid outside of the guide rails, it may cause a short-circuit.

Push the line card slowly all the way into the slot. Otherwise, improper contact may result. In addition, a failure may result if you insert the line card too quickly.

4. Tighten the screws on the left and right of the ejectors to fix the line card in place.
5. Install the communication cable.

⚠ PRECAUTION

Be sure to install a port cap or a loopback cable over line ports that are not in use. Unless an idle line port is covered with a port cap, dust may get inside the port and cause a failure.

Removing a Line Card

1. Remove the communication cable.
2. Remove the screws to the left and right sides of the ejectors.
3. Draw the ejectors outward to open position.

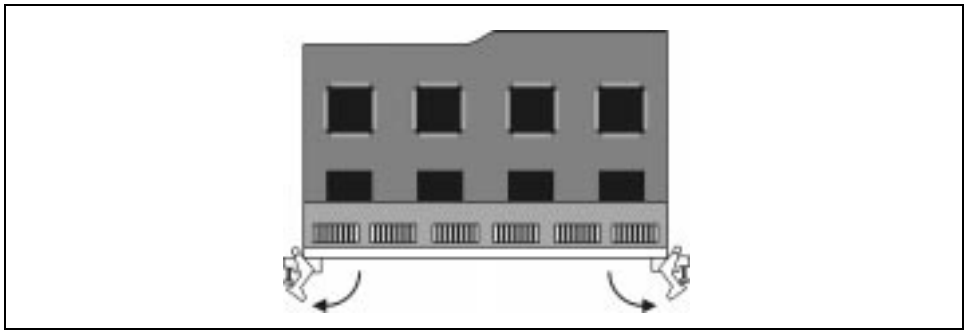


Figure 10-13: Line Card Ejectors - Open Position

4. Hold the line card with both hands and remove it slowly.

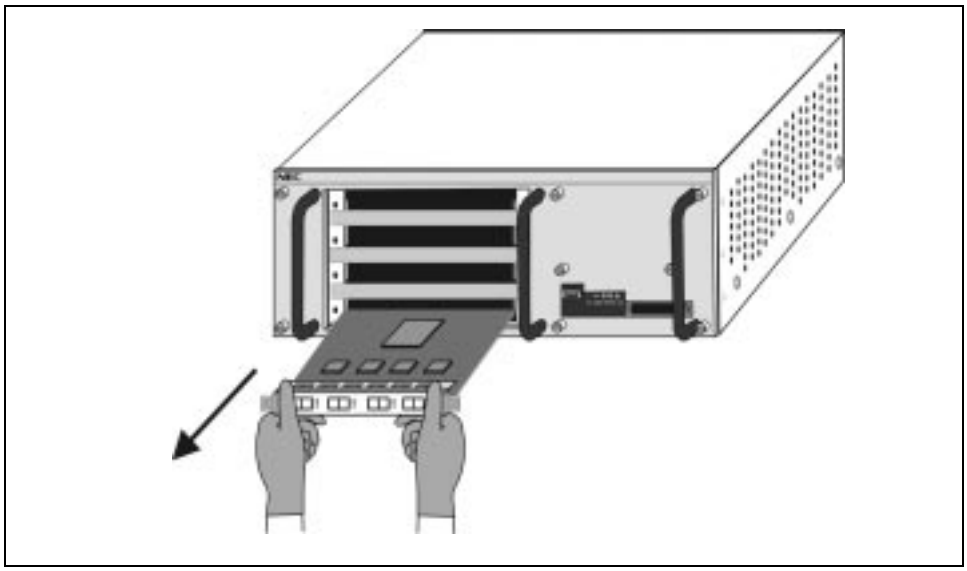


Figure 10-14: Removing the Line Card

⚠ PRECAUTION

Be sure to allow at least 3 seconds of interval when repeating line card removal or insertion. Failure may result if an adequate interval is not given.

Installing the Front Plate

Be sure to install a front plate in slots without a line card to improve the air-cooling efficiency of the main unit and to suppress the radiation of noise.

1. Install the front plate into the line card slot.
2. Tighten the screws on the left and right of the front plate to fix the front plate in place.

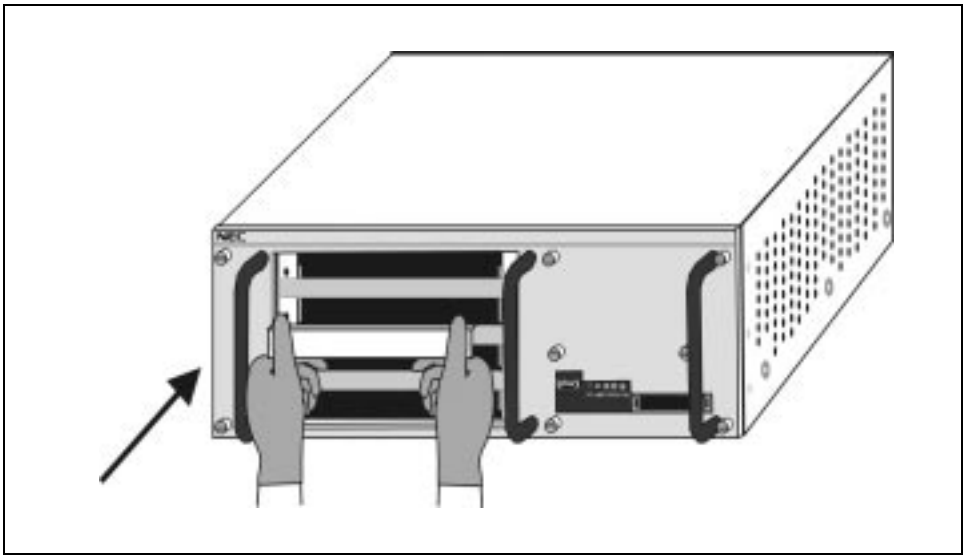


Figure 10-15: Inserting the Front Plate

⚠ PRECAUTION

Do not insert a hand into an idle slot to prevent injury from sharp guide rail corners, etc.

Be sure to install a front plate over a slot not containing a line card. Without the front plate, the slot will hinder proper cooling and may cause a failure.

Removing the Front Plate

1. Remove the screws on the left and right of the front plate that are fixing the front plate in place.
2. Remove the front plate.

Installing the Fan Unit

This section describes the procedures for installing the fan unit.

Inserting the Fan Unit

1. Clean the connector with cleaner before inserting the fan units.
2. Remove the front cover from the front of the main unit.
3. Insert the fan unit into the fan unit slot. When inserting the fan unit, securely hold it with both hands (as shown in Figure 10-16) and insert it evenly on the left and right sides and on top and bottom. Make sure the fan unit is right side up.

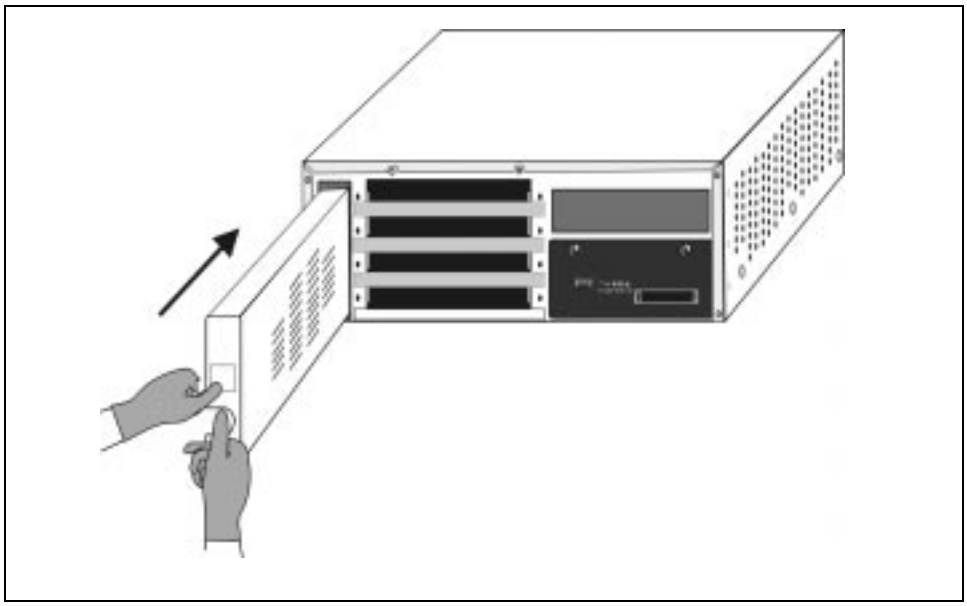


Figure 10-16: Inserting the Fan Unit

4. Tighten the screw on the top of the fan unit front plate to fix the fan unit in place.
5. Install the front cover.

Removing the Fan Unit

1. Remove the front cover from the front of the main unit.
2. Remove the screw on the top of the front plate of the fan unit.
3. Securely hold the fan unit with both hands, as shown in Figure 10-17, and remove it straight out of the slot.

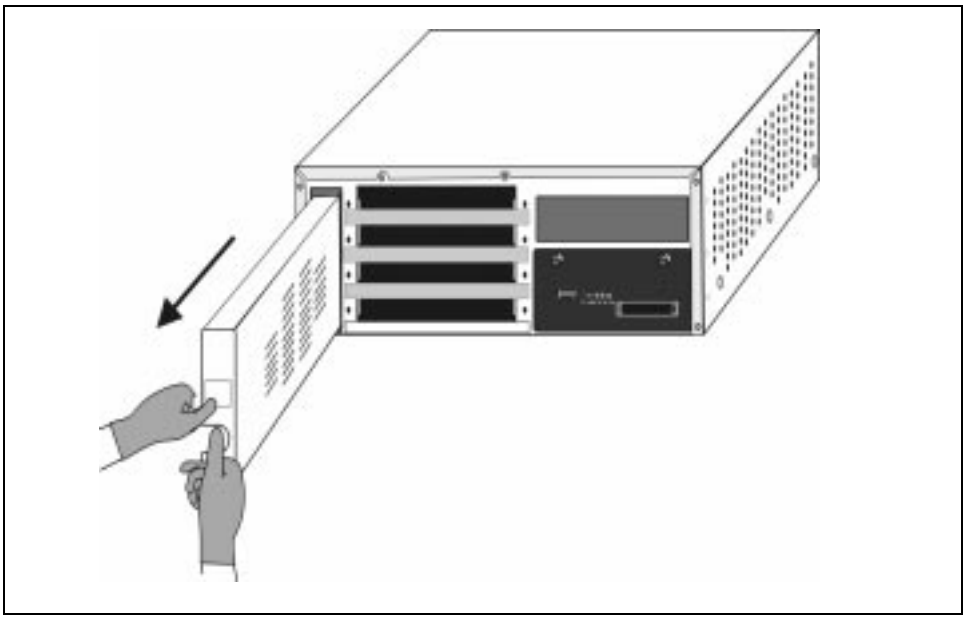


Figure 10-17: Removing the Fan Unit

⚠ PRECAUTION

The fan unit can be inserted or removed while the main unit is in operation. However, avoid running the main unit for an extended period of time without the fan unit. This may cause malfunction or failure.

A fan unit that is removed when the main unit is in operation will continue to rotate for a while. Be sure to keep fingers and foreign objects out of the finger guard.

Installing the Front Cover

This section explains the procedure for installing the front cover.

Installing the Front Cover

1. The front cover fit on the front of the main unit.

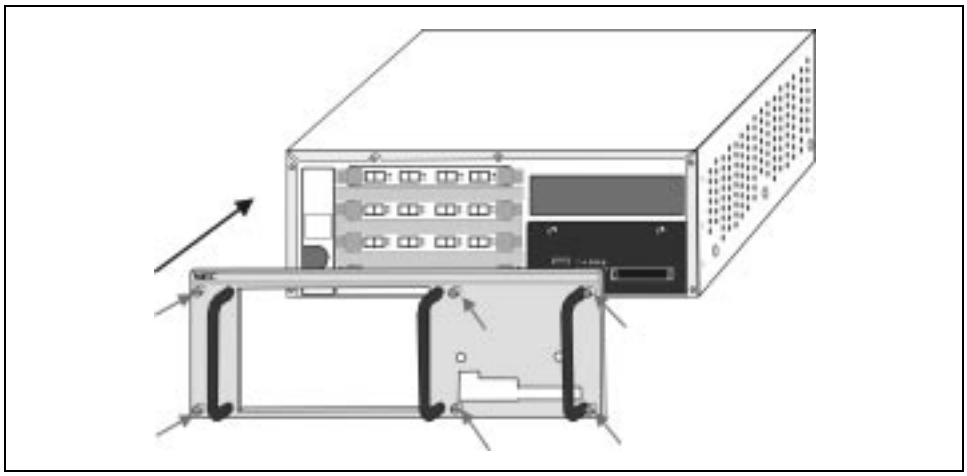


Figure 10-18: Installing the Front Cover

2. Tighten the six screws of the front cover to securely fasten the front cover to the main unit.

Removing the Front Cover

1. Remove the six screws of the front cover.
2. Remove the front cover slowly.

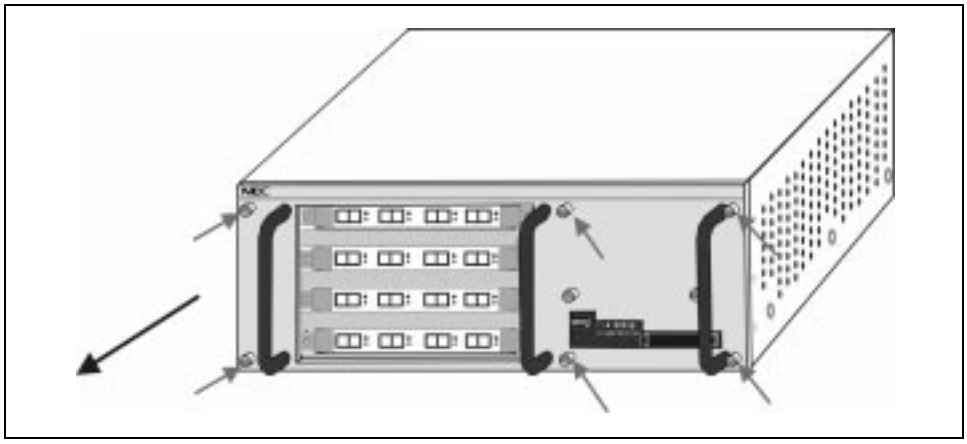


Figure 10-19: Removing the Front Cover

Upgrading Software

This section explains the procedure for upgrading the ATM Switch software.

Inserting PCMCIA Cards

There are two types of PCMCIA cards used for upgrading the software of the ATM Switch.

- ATA (flash disk) card
- LAN card (optional)

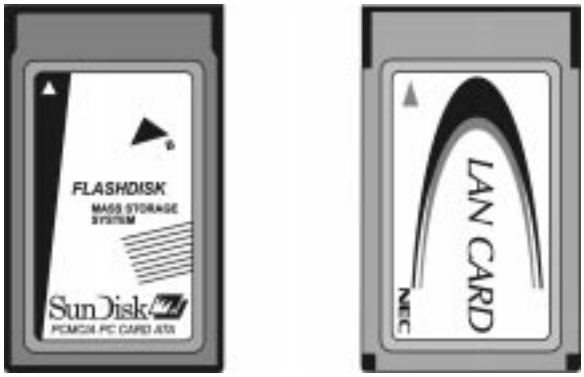


Figure 10-20: PCMCIA Card - (Left: ATA Card; Right: LAN Card)

Inserting and Removing an ATA Card

ATA cards are handled in the same manner as normal PCMCIA cards. Insert an ATA card into the PCMCIA card slot in the front of the switch/CPU card. Insert the card securely and all the way in, until the ejector button on the side of the slot pops out. (Facing the main unit, the ejector button on the right is for slot #0, the one on the left is for slot #1).

To remove the ATA card, press the ejector button on the side of the slot. The card will be automatically ejected.

Inserting and Removing a LAN Card

The LAN card is optional. It should be used to connect the ATM Switch to Ethernet (10BaseT).

Insertion Procedure

1. Before inserting the LAN card into the ATM Switch, connect the cable and relay connector as shown in Figure 10-21.

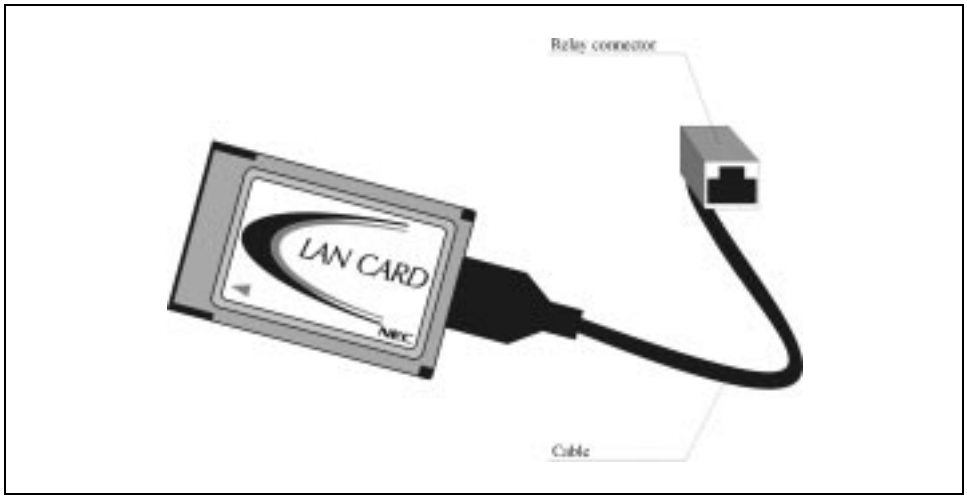


Figure 10-21: LAN Card, Cable, and Relay Connector Connections

⚠ PRECAUTION

Be sure to hold the connector when connecting or removing the cable. Pulling on the cable may cause the cable to break or the card to fail.

2. Turn off the power switch of the ATM Switch.
3. After connecting the cable and relay connector to the LAN card, insert the LAN card into the PCMCIA card slot in the front of the switch/CPU card. Insert the card securely and all the way in, until the ejector button on the side of the slot pops out. (Facing the main unit, the ejector button on the right is for slot #0, the one on the left is for slot #1).

⚠ PRECAUTION

Be sure to turn off the equipment's power before inserting or removing the card. Inserting or removing the card without turning off the power may cause a malfunction or failure.

4. Connect to the relay connector the UTP cable from the Ethernet (10BaseT) to be connected to the ATM Switch.
5. Turn on the power switch of the ATM Switch.

   To remove the LAN card, press the ejector button on the side of the slot. The card will be automatically ejected.

NOTE Refer to "PCMCIA Cards" on page 1-4 for instructions on handling the PCMCIA card.

Upgrading

The following software upgrade mode settings are available for the ATM Switch.

- FLASH
- FLASH_UP
- FLASH_UP_SAVE
- INITIALIZE
- INITIALIZE_SAVE
- NETWORK
- NETWORK_SAVE

Use the boot monitor to set the upgrade mode. The boot monitor is started by pressing **ESC** from the MAT while the booting message is displayed when the power is turned on or the unit is reset. Once in the boot monitor, the display will show the “BOOT” prompt.

```
The system is coming up now.
If you want to enter boot program, push [ESC] key immediately.
If the [ESC] key is detected within 3 seconds, boot program
is loaded.

BOOT#
```

Figure 10-22: Starting the Boot Monitor

FLASH Mode

Load the software from the ATA card mounted in the PCMCIA slot to start the software. The office data will return to the initial setting status. This is the default value of the boot mode.

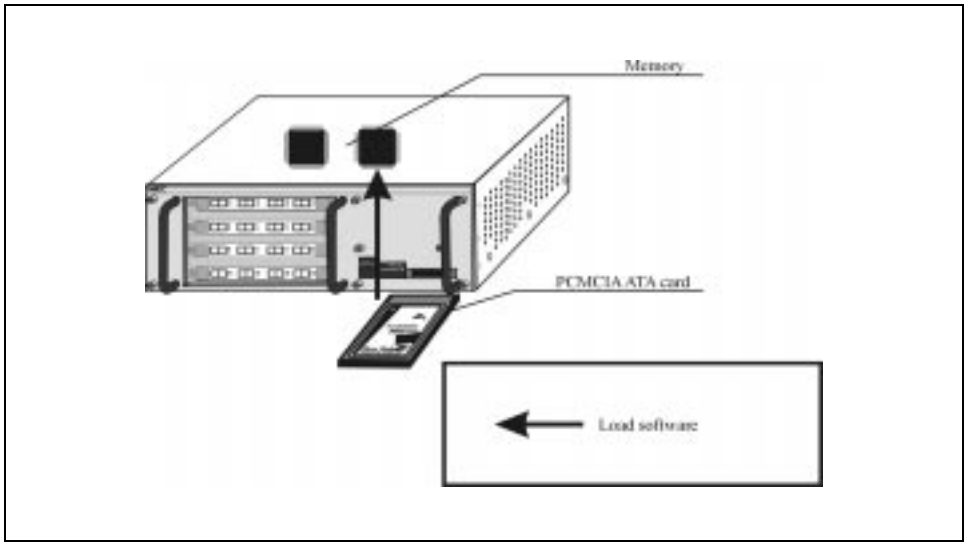


Figure 10-23: FLASH Mode

Procedure

1. Turn off the power of the ATM Switch.
2. Replace the old ATA card with the new version ATA card.
3. Turn on the power of the ATM Switch.

FLASH_UP Mode

Load the software from the ATA card mounted in the PCMCIA slot #0. The office data is loaded from the ATA card mounted in the PCMCIA slot #1. Office data is not saved.

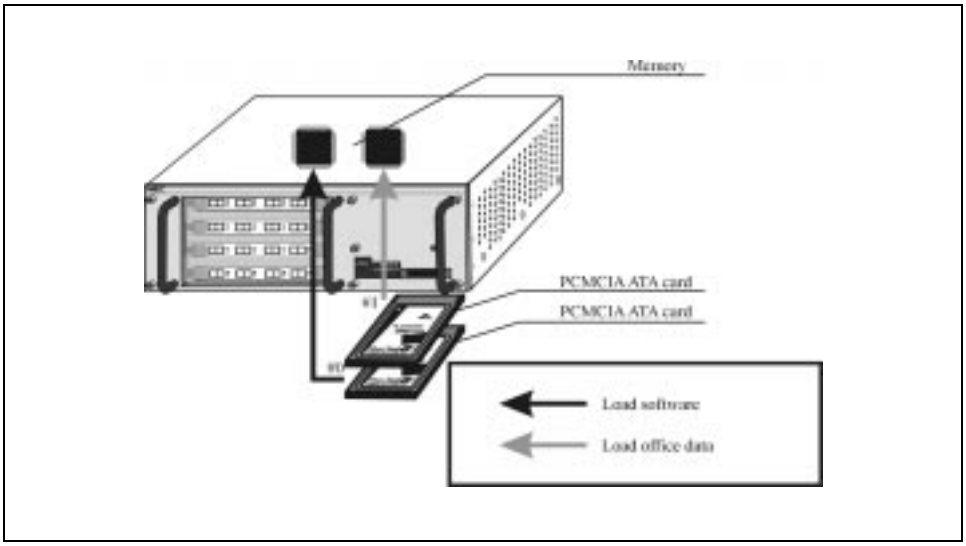


Figure 10-24: FLASH_UP Mode

Procedure

1. Turn off the power of the ATM Switch.
2. Insert the new version ATA card in PCMCIA slot #0 and the ATA card containing the office data you wish to continue to use in PCMCIA slot #1.
3. Turn on the power of the ATM Switch and start the boot monitor.
4. Set the boot mode as follows:

   ```
   BOOT# SET boot flash_up
   ```

5. End the boot monitor:

   ```
   BOOT# QUIT
   ```

FLASH_UP_SAVE Mode

Load the software from the ATA card mounted in the PCMCIA slot #0. The office data is loaded from the ATA card mounted in the PCMCIA slot #1. After loading, the office data is saved to the ATA card mounted in the PCMCIA slot #0.

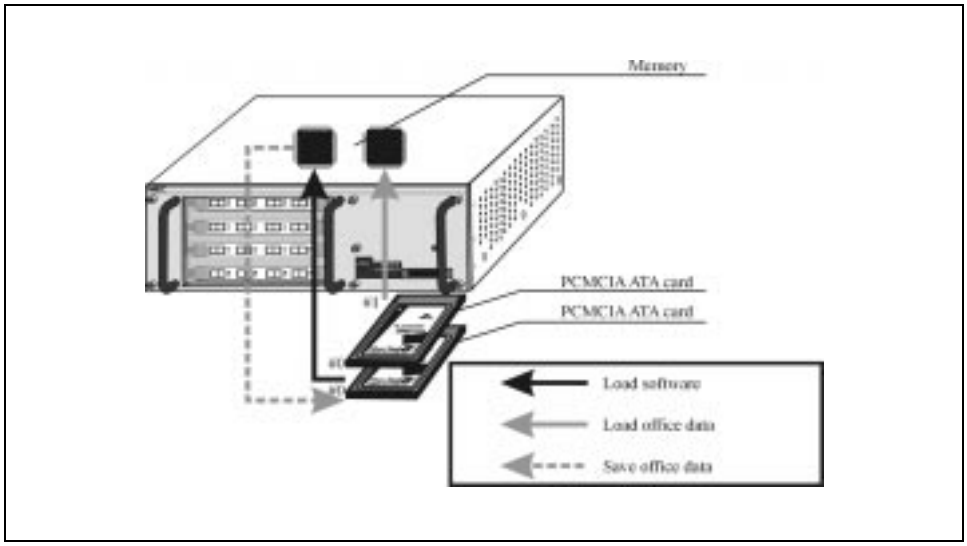


Figure 10-25: FLASH_UP_SAVE Mode

Procedure

1. Turn off the power of the ATM Switch.
2. Insert the new version ATA card in PCMCIA slot #0 and the ATA card containing the office data you wish to continue to use in PCMCIA slot #1.
3. Turn on the power of the ATM Switch and start the boot monitor.
4. Set the boot mode as follows:

   ```
   BOOT# SET boot flash_up_save
   ```

5. End the boot monitor:

   ```
   BOOT# QUIT
   ```

INITIALIZE Mode

Load the software from the Ether network server connected via the LAN card mounted in the PCMCIA slot #1. The office data is included in the software in the initial setting status. The software and office data are not saved.

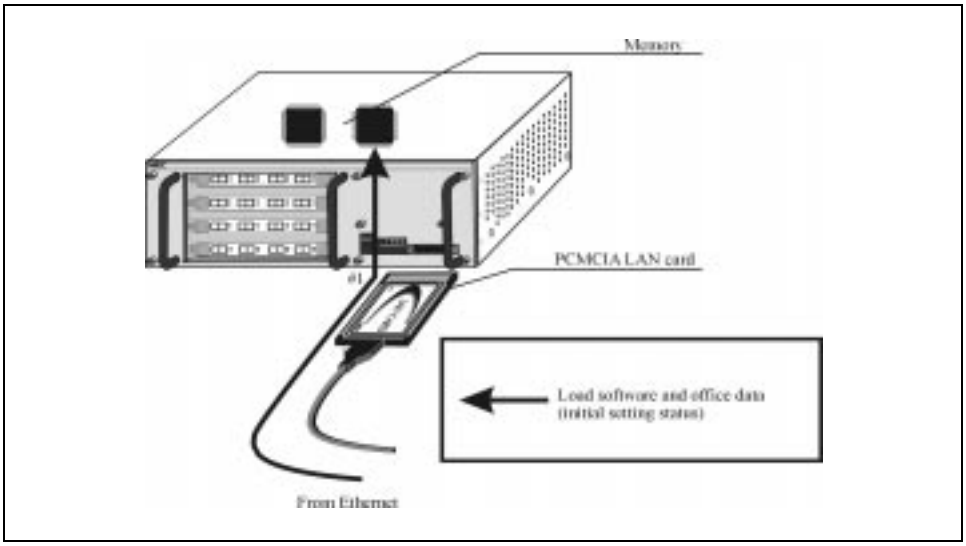


Figure 10-26: INITIALIZE Mode

Procedure

1. Turn off the power of the ATM Switch.
2. Insert into PCMCIA slot #1 the LAN card connected to the Ether network.
3. Turn on the power of the ATM Switch and start the boot monitor.
4. Set the IP address of the ATM Switch

   BOOT# SET local *.***.***.***

5. Set the server's IP address and boot file name.

   BOOT# SET server *.***.***.*** *****.bootfiles**

6. Set the IP address of the default router.

   BOOT# SET route *.***.***.***

7. Set the boot mode as follows:

   BOOT# SET boot initialize

8. End the boot monitor.

   BOOT# QUIT

INITIALIZE_SAVE Mode

Load the software from the Ether network server connected via the LAN card mounted in the PCMCIA slot #1. The office data is included in the software in the initial setting status. After loading, the software and office data are saved to the ATA card mounted in PCMCIA slot #0 and reloaded in the main memory.

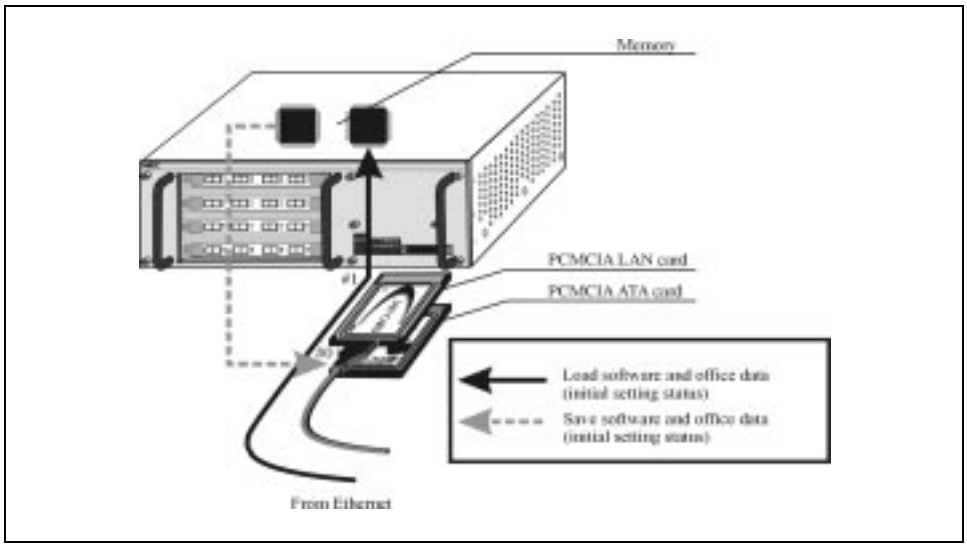


Figure 10-27: INITIALIZE_SAVE Mode

Procedure

1. Turn off the power of the ATM Switch.
2. Insert into PCMCIA slot #0 the ATA card to which to save the software and into PCMCIA slot #1 the LAN card connected to the Ether network.
3. Turn on the power of the ATM Switch and start the boot monitor.
4. Set the IP address of the ATM Switch.

   `BOOT# SET local ***.***.***.***`
5. Set the server's IP address and boot file name.

   `BOOT# SET server ***.***.***.*** *****.bootfiles`
6. Set the IP address of the default router.

   `BOOT# SET route ***.***.***.***`
7. Set the boot mode as follows:

   `BOOT# SET boot initialize_save`
8. End the boot monitor.

   `BOOT# QUIT`

NETWORK Mode

Load the software from the Ether network server connected via the LAN card mounted in the PCMCIA slot #1. The office data is loaded from the ATA cad mounted in PCMCIA slot #0. Software is not saved.

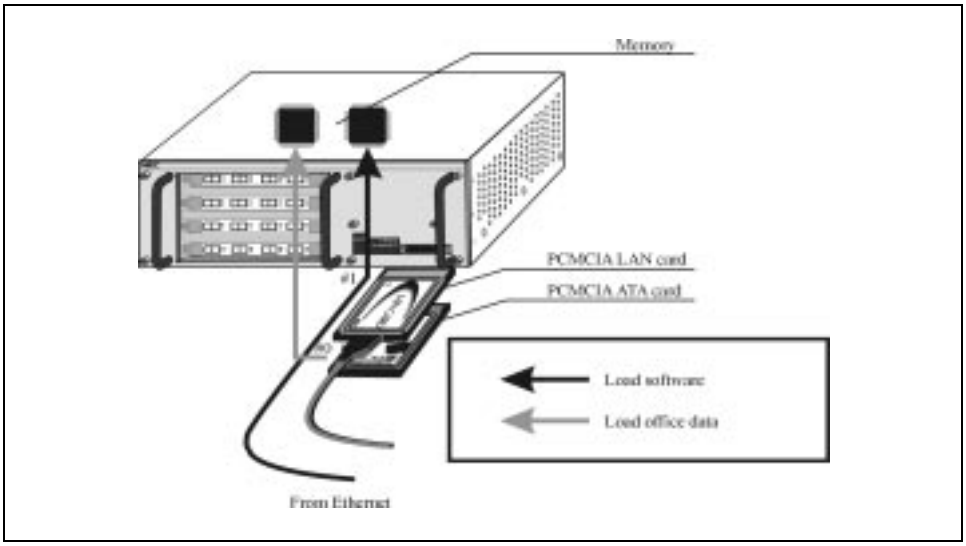


Figure 10-28: NETWORK Mode

Procedure

1. Turn off the power of the ATM Switch.
2. Insert into PCMCIA slot #0 the ATA card containing the office data you wish to continue to use and into PCMCIA slot #1 the LAN card connected to the Ether network.
3. Turn on the power of the ATM Switch and start the boot monitor.
4. Set the IP address of the ATM Switch.

   ```
   BOOT# SET local ***.***.***.***
   ```

5. Set the server's IP address and boot file name.

   ```
   BOOT# SET server ***.***.***.*** *****.bootfiles
   ```

6. Set the IP address of the default router.

   ```
   BOOT# SET route ***.***.***.***
   ```

7. Set the boot mode as follows:

   ```
   BOOT# SET boot network
   ```

8. End the boot monitor.

   ```
   BOOT# QUIT
   ```

Adding Line Cards

This section describes the procedures for adding line cards to the line slots of the ATM Switch.

Preparation

Before adding line cards, have the following equipment ready.

- The additional line cards
- Communication cables for the additional line cards
- MAT (not necessary if one is already connected to the ATM Switch)
- RS-232C cross cable for connecting the MAT to the ATM Switch (not necessary if already connected)
- Phillips screw driver
- Antistatic kit and gloves

Hardware Work

1. Remove the front plate installed in the line card slot on the front side of the ATM Switch.
2. Insert the additional line card in the line card slot of the ATM Switch.
3. Connect the communication cable for the additional line card to the line card.
4. Connect the new communication cable to other hardware, such as router or terminal.
5. Connect the RS-232C cross cable to the RS-232C connector on the front of the switch/CPU card in the lower right area of the front of the ATM Switch.
6. Connect the other end of the RS-232C cross cable connected to the ATM Switch to the MAT.

Setting the ATM Switch and MAT

1. Turn on the MAT's power switch.
2. Set the communication parameters. (refer to section 6)
3. Check the ALARM LED or MAT monitor and make sure there is no error with the ATM Switch.

Hardware Check of the Additional Line Card

Check the additional line card. For instructions on entering the commands, refer to "Line Interface Test" on page 7-19.

Setting System Configuration Data

Set the system configuration data of the additional line card. For details on the commands, refer to the ATM Switch Command Manual.

Adding Hardware

This section describes the procedures for increasing the number of input-output lines by connecting a number of ATM Switch units or an ATM Switch unit with other hardware.

Although the number of lines accommodated can be increased by connecting a number of ATM Switch units, since the ATM Switch is not equipped with an interface dedicated to connections between units, the actual number of lines accommodated is the total number of lines less the number of lines between the units.

Preparation

Before expanding the ATM Switch connections, have the following equipment ready.

- The additional hardware: the ATM Switch or other hardware
- Line cards for connecting the hardware (not necessary if you plan to use line cards already installed)
- Cables for connecting the hardware: cables meeting the line cards (not necessary if you plan to use cables already connected)
- MAT (not necessary if one is already connected to the ATM Switch)
- RS-232C cross cable for connecting the MAT to the ATM Switch: 1 cable (not necessary if already connected)
- Phillips screw driver
- Antistatic kit and gloves

Setting the New ATM Switch

If the additional hardware is the ATM Switch, refer to this manual. If the additional hardware is not an ATM Switch, refer to the manual on that hardware.

Hardware Work

When connecting two or more ATM Switch units or an ATM Switch unit with other hardware, it is necessary to synchronize the units by designating them as a master or slave. In addition, it is possible to set designated lines to transmit data according to the clock received by the line (loop time).

Designating the ATM Switch as Master

When an ATM Switch unit is designated as the master, the transmission data from all the line cards installed in its slots are output in sync with the self-running clock generated within the hardware.

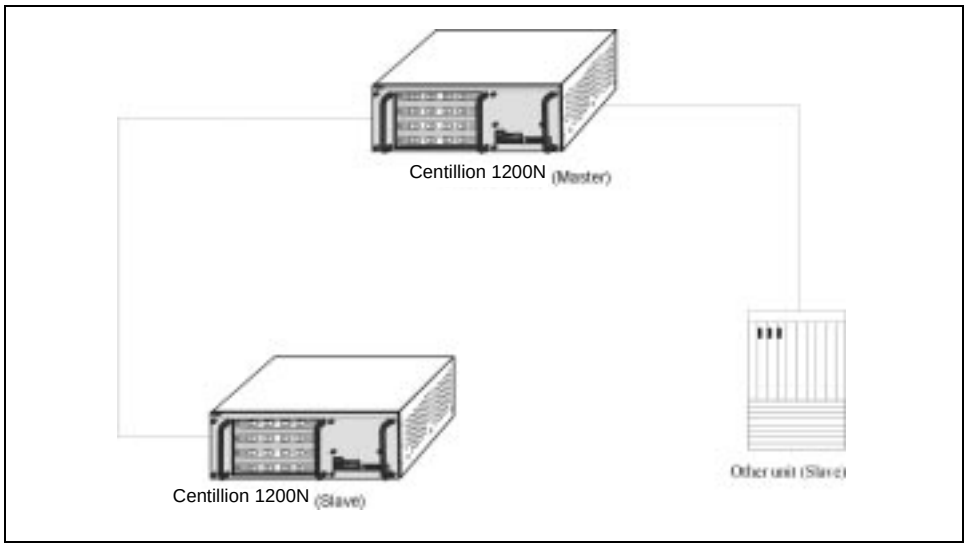


Figure 10-29: Example of Adding Hardware (ATM Switch: Master)

Designating the ATM Switch as Slave

The ATM Switch may be designated as a “slave” switch. The command **SET `clock slave`** designates a port as the slave port; a clock is derived from the signal on this receive port and the onboard clock is synchronized or phase-lock looped to it. From this, all transmit ports are subsequently clocked. Only ports in slots 0 or 1 (ports 00-13) may be slave ports. No ports on a TAXI interface card may be used as a slave port.

SET `looptime`, which is a port specific, slave clocking command, has priority regardless of whether the switch is set to master or slave. Set looptime slaves the transmit port to the adjacent receive port instead of the internal clock.

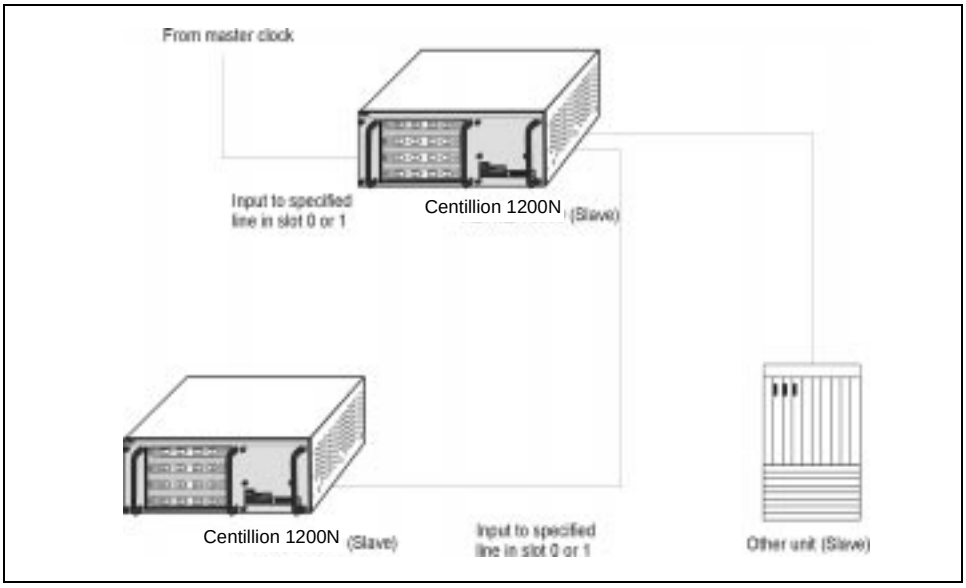


Figure 10-30: Example of Adding Hardware (ATM Switch: Slave)

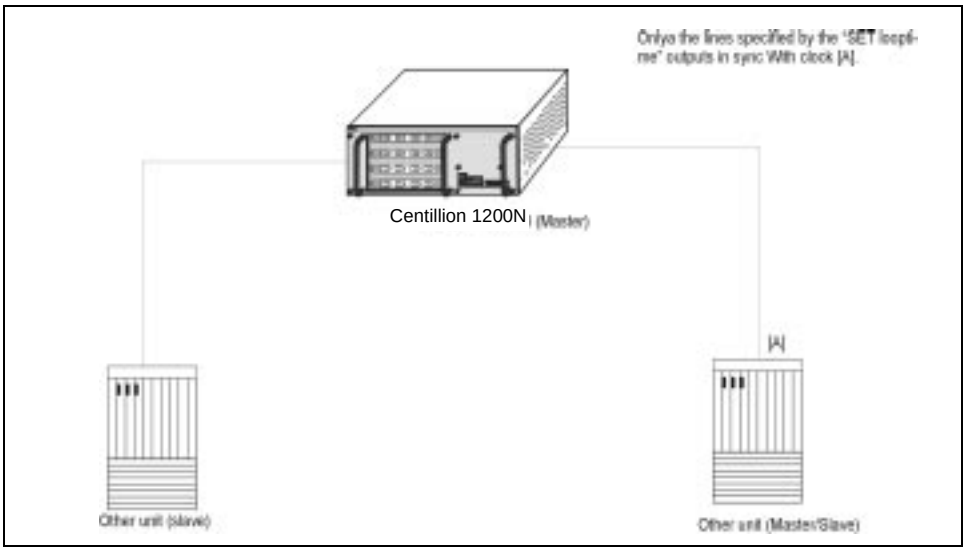


Figure 10-31: Example of Adding Hardware (When Looptime is Specified)

Setting Configuration Data

To set the clock mode of the ATM Switch, refer to the **`SET clock`** command in the Command Manual. To set the loop time, refer the **`SET looptime`** command in the Command Manual.

For other hardware, refer to the appropriate manual(s) for the other hardware.

11 Troubleshooting

This chapter describes error detection and troubleshooting of the ATM Switch.

Error Detection

This section describes how the ATM Switch detects errors.

When a problem occurs, it is automatically detected. Problems are automatically detected in the blocks shown below:

- Switch/CPU card
- Line cards
- Fan unit
- Power unit

When a problem occurs in ATM Switch, error information is sent from the hardware to software. The alarm management unit in the software compiles this information and registers it in an alarm management table.

If an alarm for the hardware or line interface alarm is detected, the ALARM LED on the ATM Switch will light up. If an external device is connected to the ALARM OUT connector, the device is also activated.

The error information can be verified by entering a command (**`DISPLAY alarm`**, **`DISPLAY line`**) from the MAT.

It is also possible to detect alarms with a diagnosis program.

NOTE When the power unit is redundant and one of the power units is turned off, ALARM LED will light. This is not an error. ALARM LED will turn off when both power units are turned on.

Detection by LED

Hardware alarms and line interface alarms are indicated by the LED on the main unit. The status of the hardware and the status of the lines are also indicated.

Each LED is described in Figure 11-1.

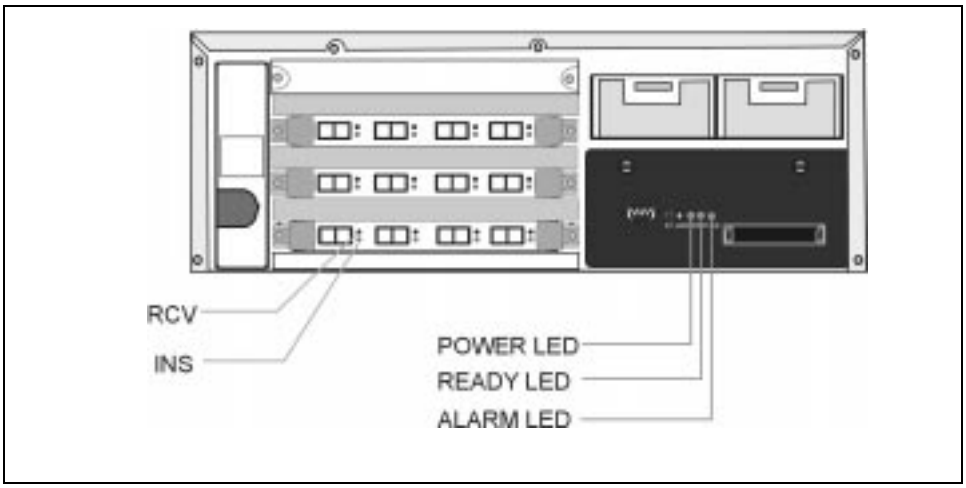


Figure 11-1: ATM Switch LED Locations

POWER LED

The POWER LED lights green when power is on and turns off when power is off.

READY LED

The READY LED turns on when the equipment is operating properly and turns off when an error occurs. It also flashes during diagnosis.

ALARM LED

The ALARM LED lights red when an error occurs in the equipment.

The ALARM lamp flashes if an error occurs when the equipment is being booted. In this case, the cause of the fault may be determined by the number of times the lamp flashes.

Flash Count	Error
1	ROM check sum
2	SKM G/A register check
3	Super I/O register check
4	DRAM memory check
5	Serial register check
6	Serial loopback

RCV, INS (LEDs on line cards)

Available for each line, these lamps indicate the status of that particular line.

RCV (red)	INS (green)	Status
Off	Lighted	Line status normal
Lighted	Off	Line error (reception error)
Off	Flashing	Line error (transmission error)
Off	Off	Hardware error

Detection by Diagnosis

The diagnosis program can be started by the following processes:

- Power on reset
- Switch/CPU card reset
- Diagnosis command

When the diagnosis is no good, the error information can be verified by executing the **`DISPLAY status`** or **`DISPLAY alarm`** commands.

Troubleshooting Procedures

When ALARM LED is Lighted (Hardware Error)

When the ALARM LED lights red while operating the ATM Switch, follow the instructions below:

1. Connect the MAT to the ATM Switch. (See "Physical Connection of MAT" on page 9-3.)

1. Turn on the MAT's power and set its communication parameters. (See "Setting the MAT" on page 9-6.)

2. Enter the **`DISPLAY alarm`** command from the MAT. The command should be entered as follows:

   `DISPLAY alarm[RETURN]`

3. Response will be output. Determine the error and take the necessary action. (See "Error Messages" on page 11-11.)

4. Disconnect the MAT from the ATM Switch.

Example of Responses

```
Hardware Alarm
96.03.10 20:11:48 - Environment000001
96.03.12 12:33:21 - FAN 0
96.02.22 08:47:38 - FAN 1
96.02.07 15:56:08 - Power Unit 0
96.02.08 12:36:15 - CPUDiagnosis NG070002
96.10.13 21:02:40 - SwitchClock Alarm010002
96.03.24 05:32:20 - Line Board  0 Clock Alarm000001
96.07.18 02:03:49 - Line Card 0 OC3c/STM-1(MMF)Path Alarm010001
```

Alarm Error Numbers

Alarm Error Number (Environment)

Alarm No.	Nature of Error
-	POWER alarm
-	FAN alarm
000001	Abnormal rise in environmental temperature

Alarm Error Number (Switch/CPU Card Error)

Alarm Type, Number	Part	Nature of Error
Diagnosis NG 070002	MEMORY	Memory diagnosis NG
Diagnosis NG 050005	SAR	SAR register NG
Path Alarm 020002	SC	Cell alignment signal error
Path Alarm 020003	SC	BMT parity error
Path Alarm 030001	BF	Regression enable match error
Path Alarm 030002	BF	Regression clear match error
Path Alarm 030003	BF	BF0 parity error
Path Alarm 030103	BF	BF1 parity error
Path Alarm 040001	ES	ES0 Up side sync error
Path Alarm 040002	ES	ES0 Down side sync error
Path Alarm 040004	ES	ES0 port A FIFO overflow
Path Alarm 040006	ES	ES0 port B FIFO overflow
Path Alarm 040101	ES	ES1 Up side sync error
Path Alarm 040102	ES	ES1 Down side sync error
Path Alarm 040104	ES	ES1 port A FIFO overflow
Path Alarm 040106	ES	ES1 port B FIFO overflow
Path Alarm 060004	D/I	Header conversion table parity error
Diagnosis NG 040007	ES	ES0 diagnosis NG
Diagnosis NG 040107	ES	ES1 diagnosis NG
Diagnosis NG 020004	SC	SC diagnosis NG
Diagnosis NG 030004	BF	BF diagnosis NG
Diagnosis NG 060010	D/I	DI diagnosis NG

Alarm Error Number (Line Buffer)

Alarm Type, Number		Part	Nature of Error
Control Alarm	000001	BUFF	Illegal interruption
Path Alarm	040001	BUFF	Received cell parity error
Control Alarm	040007	BUFF	Illegal cell transmission error
Path Alarm	050001	BUFF	HT SGRAM test error
Path Alarm	050002	BUFF	RIRO SGRAM test error
Path Alarm	050003	BUFF	RIRO SRAM test error
Diagnosis NG	040008	IBC	IBC diagnosis NG
Diagnosis NG	040009	IBC	IBC RIRO SGRAM diagnosis NG
Diagnosis NG	040010	IBC	IBC HT SGRAM diagnosis NG
Diagnosis NG	040011	IBC	IBC RIRO SRAM diagnosis NG
Diagnosis NG	040012	OBC	OBC diagnosis NG
Diagnosis NG	040013	OBC	OBC Cell Buff diagnosis NG
Diagnosis NG	040014	OBC	OBC HTM diagnosis NG
Diagnosis NG	040015	OBC	OBC BCT/BMT diagnosis NG

Alarm Error Number (Line Card: OC-3c/STM-1)

Alarm Type, Number		Part	Nature of Error
Path Alarm	010001	PHY	PHY0 reception FIFO overflow
Path Alarm	010101	PHY	PHY1 reception FIFO overflow
Path Alarm	010201	PHY	PHY2 reception FIFO overflow
Path Alarm	010301	PHY	PHY3 reception FIFO overflow
Clock Alarm	020002	MUX	50 MHz clock interruption
Path Alarm	030001	MUX	UTOPIA parity error
Diagnosis NG	640000	MUX	MUX diagnosis NG
Diagnosis NG	010002	PHY	PHY0 diagnosis NG
Diagnosis NG	010102	PHY	PHY1 diagnosis NG
Diagnosis NG	010202	PHY	PHY2 diagnosis NG
Diagnosis NG	010302	PHY	PHY3 diagnosis NG

Alarm Error Number (Line Card: TAXI)

Alarm type, No.		Part	Nature of error
Path Alarm	020001	MUX	UTOPIA level 2 parity error
Clock Alarm	020002	MUX	50 MHz clock interruption
Clock Alarm	020003	MUX	12.5 MHz clock interruption
Clock Alarm	020004	MUX	Input 8 KHz clock interruption
Diagnosis NG	130001	TAC	TAC0 diagnosis NG
Diagnosis NG	130101	TAC	TAC1 diagnosis NG
Diagnosis NG	130201	TAC	TAC2 diagnosis NG
Diagnosis NG	130301	TAC	TAC3 diagnosis NG

Alarm Error Number (Line Card: 6.3M-J2)

Alarm Type, Number		Part	Nature of Error
Path Alarm	020001	MUX	TX UTOPIA level 2 parity error
Clock Alarm	020002	MUX	TX UTOPIA level 2 operation clock interruption
Clock Alarm	020005	MUX	Transmission clock interruption
Clock Alarm	020006	MUX	PLO transmission clock interruption
Path Alarm	030001	CFAD	UCFAD reception FIFO overflow
Path Alarm	030002	CFAD	UCFAD transmission FIFO overflow
Diagnosis NG	150001	LCA	LCA Common diagnosis NG
Diagnosis NG	150002	LCA	LCA Separate diagnosis NG
Diagnosis NG	160001	CFAD	UCFAD2 diagnosis NG

Alarm Error Number (Line Card: DS3 and E3)

Alarm Type, Number		Part	Nature of Error
Path Alarm	020001	MUX	UTOPIA level 2 parity error
Clock Alarm	020002	MUX	50 MHz clock interruption
Path Alarm	060007	MUX	UTOPIA level 1 parity error #0
Path Alarm	060008	MUX	UTOPIA level 1 parity error #1
Clock Alarm	060001	MUX	Input 8KHz clock interruption
Path Alarm	080001	FRAMER	FRAMER#0 reception FIFO underflow
Path Alarm	080002	FRAMER	FRAMER#0 reception FIFO overflow
Path Alarm	080003	FRAMER	FRAMER#0 transmission FIFO overflow
Path Alarm	080101	FRAMER	FRAMER#1 reception FIFO underflow
Path Alarm	080102	FRAMER	FRAMER#1 reception FIFO overflow
Path Alarm	080103	FRAMER	FRAMER#1 transmission FIFO overflow
Diagnosis NG	060003	PLD	PLD diagnosis NG
Diagnosis NG	080004	FRAMER	FRM0 diagnosis NG
Diagnosis NG	080104	FRAMER	FRM1 diagnosis NG

When RCV/INS is Lighted (Line Error)

The RCV/INS LED is available for each line to indicate the status of that line. Refer to "Line Error Definition" on page 11-12 for lighting patterns.

When the RCV/INS LED indicates an alarm for that line during the operation of the ATM Switch, follow the instructions below:

1. Connect the MAT to the ATM Switch. (See "Physical Connection of MAT" on page 9-3.)
2. Turn on the MAT's power and set its communication parameters. (See "Setting the MAT" on page 9-6.)
3. Enter the line interface display command, **`DISPLAY line`** from the MAT. The command should be entered as follows:

   `DISPLAY line[RETURN]`
4. Response will be output. Determine the error and take the necessary action. (See "Error Messages" on page 11-11.)
5. Disconnect the MAT from the ATM Switch.

Example of Responses

```
Line   Line status          Hardware status   Loop back
00     GOOD                 normal            local
01     GOOD                 normal            local
02     Loss of Signal       failure           local
20     AIS_Path             failure           normal
30     Loss of Pointer      failure           normal
```

Error Messages

Message	Meaning
GOOD	Functioning properly
Loss of Signal	Signal interruption occurred
Loss of Frame	Frame is out of sync
Out of Frame	Frame end can not be detected
AIS_Section	Section layer AIS received
AIS_Path	Path layer AIS received
Yellow_Section	Section layer remote alarm received
Yellow_Path	Path layer remote alarm received
Loss of Cell Delineation	Cell is out of sync
Loss of Pointer	STS frame pointer error
Alarm Indication Signal	AIS received
Remote Alarm Indication	Remote alarm received
Payload All One	Payload in transmission frame is all “1” (main signal all “1”)
IDLE	IDLE signal is being received
Yellow Alarm	Yellow alarm signal is being received
PLCP_Yellow	PLCP layer yellow signal is being received
PLCP_LOF	PLCP layer frame is out of sync
PLCP_OOF	PLCP layer frame end can not be detected
Admin down	This port has been put out of service by "set line status" command

Line Error Definition

Line Type	Nature of Error	LED Pattern
OC3	Loss of Signal	INS off, RCV on
OC3	Loss of Frame	INS off, RCV on
OC3	Section AIS	INS off, RCV on
OC3	Path AIS	INS off, RCV on
OC3	Loss of Pointer	INS off, RCV on
OC3	Loss of Cell Delineation	INS off, RCV on
OC3	Yellow Section	INS flashing, RCV off
OC3	Yellow Path	INS flashing, RCV off
TAXI	Loss of Signal	INS off, RCV on
TAXI	Loss of Cell Delineation	INS off, RCV on
6.3M	Loss of Signal	INS off, RCV on
6.3M	Alarm Indication Signal	INS off, RCV on
6.3M	Loss of Frame	INS off, RCV on
6.3M	Payload All One	INS off, RCV on
6.3M	Loss of Cell Delineation	INS off, RCV on
6.3M	Remote Alarm Indication	INS flashing, RCV off
DS3/E3	Loss of Signal	INS off, RCV on
DS3/E3	Loss of Frame	INS off, RCV on
DS3/E3	Out of Frame	INS off, RCV on
DS3/E3	Alarm Indication Signal	INS off, RCV on
DS3/E3	IDLE	INS off, RCV on
DS3/E3	Loss of Cell Delineation	INS off, RCV on
DS3/E3	Yellow Alarm	INS flashing, RCV off
DS3/E3	PLCP_LOF	INS off, RCV on
DS3/E3	PLCP_OOF	INS off, RCV on
DS3/E3	PLCP_Yellow	INS flashing, RCV off

A

Specifications and Standards

Specifications

The Centillion 1200N is a 2.5 Gbps Switch.

Switch

Switch Configuration

- Input-output buffer type

Switch Capacity

- 2.5 Gbps = 622 Mbps × 4 (155 Mbps × 16)

Buffer

- Input buffer: 32K cells/line card
- Output buffer: 32K cells/line card

Cell Delay

- 40μsec (excluding cell delay upon cell competition in the buffer)

Control System

Control Processor

- Built-in 64-bit RISC processor (VR4300/100 MHz)

VPI/VCI Bits

- VPI+VCI total of 14 bits/line

Simultaneously Established Channels

- P-to-P PVC: 8K connection (including multipoint PVC)/hardware
- Multipoint PVC: 1K endpoint/hardware
- P-to-P SVC: 1K connection (including multipoint SVC)/hardware
- Multipoint SVC: 1K endpoint/hardware

PVC Setting Method

- Established according to the fixed path information in the PCMCIA ATA card (or downloaded from external source)

SVC Signaling Method

- ATM Forum UNI 3.0, 3.1, 4.0, Ver. 1.0

NMS Interface

- SNMP

OAM Cell

- Loopback cell control
- RDI/AIS cell control

Traffic Control

Policing Control

- Dual Leaky Bucket method UPC (1K connection/line)

Congestion Control

- ABR
- EPD

Priority Control

- Cell loss priority control: 2 classes
- Cell delay priority control: 5 classes

Traffic/Performance Monitoring

- Counts passing/error cells for each line.

Line

Maximum Line Speed

- 622 Mbps/line

Number of ATM Line Slots

- 4 slots (hot-swappable; can be inserted or removed live)

Types of Lines Accommodated

- 622M OC-12c STM4 (SMF)
  - SC connector 1 line/card
- 155M OC-3c/STM-1 (MMF)
  - SC connector 1 line/card
- 155M OC-3c/STM-1 (SMF-SR)
  - SC connector 4 lines/card
- 155M OC-3c/STM-1 (SMF-LR)
  - SC connector 1 line/card
- 155M STS-3/STM-1 (UTP-5)
  - RJ connector 4 lines/card
- 155M STS-3/STM-1 (COAX)
  - BNC connector 2 lines/card
- 100M TAXI (MMF)
  - SC connector 4 lines/card
- 6.3M J2
  - BNC connector 1 line/card
- 45M DS3
  - BNC connector 2 lines/card
- 34M E3
  - BNC connector 2 lines/card
- 1.5M Primary
  - RJ connector 1 line/card
- 1.5M DS1
  - RJ connector 4 lines/card
- 2M E1
  - RJ connector 4 lines/card
- 1.5M CE-DS1
  - RJ connector 4 lines/card

Server

- LANE/ARP

Mounting

External Dimensions (width × depth × height)

- 17.3 in. (440 mm) × 16.1 in. (410 mm) × 6.1 in. (154 mm, including rubber footing
- Can be mounted on a standard 19-inch rack

Weight

- 44.2 lb. (20 Kg)

Power Supply

- Input: DC -40 to -58V

Power Consumption

- Maximum 6.0A (DC -48V)

Operating Noise

- Less than 50dB

Cooling Method

- Forced air cooling

Environmental Conditions

- Operating temperature: 41~104°F (5~40°C)
- Operating humidity: 10~80%

Standards - Operational

Safety Standards	
UL1950	(United States)
CSA-C22.2 No.950	(Canada)
EN60950	(Europe)
AS3260, AUSTEL TS001	(Australia)
EMI	
FCC Part15, Class A	(United States)
EN55022, Class A and B	(Europe)
VCCI Type 1	(Japan)
EMS	
EN61000-2, ESD up to 8kV	
EN61000-3, RFI 3V/m	
EN61000-4, Electrical Fast Transients, level 2	
Power, Environmental Conditions	
IEC555-2, Power Factor Correction	
IEC555-3, AC Input Transients	
Audible noise IS07779 paragraph 7, max. 50dBA	

Standards - Functional

The Centillion 1200N is a 2.5 Gbps Switch. It conforms to the standards and recommendations listed below:

(ATM Forum “ATM User-Network Interface Specification” Version3.0/3.1/4.0.)

ITU-T (formerly CCITT) Broadband	ISDN-related Recommendations
G.703a	Physical layer / electrical interface characteristics
G.707	SDH Speed
G.708	Basic Structure of SDH Frame
G.709	Detailed Structure of SDH Frame
G.782	Types and General Characteristics of SDH Multiplexing Device
G.783	Characteristics of SDH Multiplexing Device
G.804	ATM Cell Mapping to PDH
G.803	Transmission Network Architecture
I.113	B-ISDN Terminology
I.121	Basic Principles of B-ISDN
I.150	Characteristics of B-ISDN ATM Functions
I.211	B-ISDN Services
I.311	Signaling Principles of the Network Side of B-ISDN
I.321	B-ISDN Protocol Referral Model and its Application
I.327	Functional Structure of B-ISDN
I.35B	ATM Layer Cell Transfer Function of B-ISDN
I.361	ATM Layer Specifications of B-ISDN
I.362	AAL Layer Functions of B-ISDN
I.363	AAL Layer Specifications of B-ISDN
I.364	B-ISDN Broadband Connectionless Service
I.371	Traffic Control and Congestion Control in B-ISDN
I.413	B-ISDN User-Network Interface
I.414	Concept of Recommendation on B-ISDN and on Layer 1 in User Access of B-ISDN
I.432	Specifications of User Interface Layer 1 of B-ISDN
I.610	OAM Principles of B-ISDN
Q.2931	B-ISDN Signaling Layer 3
Q.2100 (formerly Q.SAAL0)	Outline of AAL Layer for B-ISDN Signaling
Q.2110 (formerly Q.SAAL1)	AAL Layer SSCOP for B-ISDN Signaling
Q.2130 (formerly Q.SAAL2)	AAL Layer SSCF for Signaling in UNI of B-ISDN

Glossary

B

A

AAC

Actual Allocated Capacity

AAL

ATM Adaptation Layer: The standards layer that allows multiple applications to have data converted to and from the ATM cell. A protocol used that translates higher layer services into the size and format of an ATM cell.

AAL Connection

Association established by the AAL between two or more next higher layer entities.

AAL-1

ATM Adaptation Layer Type 1: AAL functions in support of constant bit rate, time-dependent traffic such as voice and video.

AAL-2

ATM Adaptation Layer Type 2: This AAL is still undefined by the International Standards bodies. It is a placeholder for variable bit rate video transmission.

AAL-3/4

ATM Adaptation Layer Type 3/4: AAL functions in support of variable bit rate, delay-tolerant data traffic requiring some sequencing and/or error detection support. Originally two AAL types, i.e. connection-oriented and connectionless, which have been combined.

AAL-5

ATM Adaptation Layer Type 5: AAL functions in support of variable bit rate, delay-tolerant connection-oriented data traffic requiring minimal sequencing or error detection support.

AALP

Audible Alarm Panel

ABR

Available Bit Rate: ABR is an ATM layer service category for which the limiting ATM layer transfer characteristics provided by the network may change subsequent to connection establishment. A flow control mechanism is specified which supports several types of feedback to control the source rate in response to changing ATM layer transfer characteristics. It is expected that an end-system that adapts its traffic in accordance with the feedback will experience a low cell loss ratio and obtain a fair share of the available bandwidth according to a network specific allocation policy. Cell delay variation is not controlled in this service, although admitted cells are not delayed unnecessarily.

AC

Alternating Current

ACH

Act Change

ACI

Active Cell Indication

ACK

Acknowledgmen

ACM

Address Complete Message: A BISUP call control message from the receiving exchange to sending exchange indicating the completion of address information.

ACR

Attenuation to Crosstalk Ratio: One of the factors that limits the distance a signal may be sent through a given media. ACR is the ratio of the power of the received signal, attenuated by the media, over the power of the NEXT crosstalk from the local transmitter, usually expressed in decibels (db). To achieve a desired bit error rate, the received signal power must usually be several times larger than the NEXT power or plus several db. Increasing a marginal ACR may decrease the bit error rate.

ACR

Allowed Cell Rate: An ABR service parameter, ACR is the current rate in cells/sec at which a source is allowed to send.

ACSE

Association Control Service Element

ACT

Applied Computer Technologies: A Hewlett Packard's program that is a strategy and set of open architecture commands and interfaces for integrating voice and database technologies. The idea is that with ACT a call will arrive at the telephone simultaneously with the database record of the caller.

Address Filter

Address Prefix

A string of 0 or more bits up to a maximum of 152 bits that is the lead portion of one or more ATM addresses.

Address Resolution

Address Resolution is the procedure by which a client associates a LAN destination with the ATM address of another client or the BUS.

Adjacency

The relationship between two communicating neighboring peer nodes.

Administrative Domain

A collection of managed entities grouped for administrative reasons.

ADPCM

Adaptive Differential Pulse Code Modulation: A reduced bit rate variant of PCM audio encoding (see also PCM). This algorithm encodes the difference between an actual audio sample amplitude and a predicted amplitude and adapts the resolution based on recent differential values.

ADTF

ACR Decrease Time Factor: This is the time permitted between sending RM-cells before the rate is decreased to ICR (Initial Cell Rate). The ADTF range is 0.01 to 10.23 sec. with granularity of 10 ms.

AFI

Authority and Format Identifier: This identifier is part of the network level address header.

Agent

Acts on behalf of another person or thing, with delegated authority. The agents goals are those of the entity that created it.

Aggregation Token

A number assigned to an outside link by the border nodes at the ends of the outside link. The same number is associated with all uplinks and induced uplinks associated with the outside link. In the parent and all higher-level peer group, all uplinks with the same aggregation token are aggregated.

AHFG

ATM-attached Host Functional Group: The group of functions performed by an ATM-attached host that is participating in the MPOA service.

AI

Artificial Intelligence: Perhaps the next phase of computing. The present form of IA in computer software are called Expert or Knowledge Based systems.

AI

Signaling ID assigned by Exchange A.

AIM

ATM Inverse Multiplexer: A term discontinued because of conflict with an established product. Refer to AIMUX.

AIMUX

ATM Inverse Multiplexing: A device that allows multiple T1 or E1 communications facilities to be combined into a single broadband facility for the transmission of ATM cells.

AIR

Additive Increase Rate: An ABR service parameter, AIR controls the rate at which the cell transmission rate increases. It is signaled as AIRF, where AIRF = AIR*Nrm/PCR.

AIRF

Additive Increase Rate Factor: Refer to AIR.

AIS

Alarm Indication Signal: An all ones signal sent down or up stream by a device when it detects an error condition or receives an error condition or receives an error notification from another unit in the transmission path.

Alternate Routing

A mechanism that supports the use of a new path after an attempt to set up a connection along a previously selected path fails.

ALT

Alternative Access Providers to the local telephone network i.e., Teleport.

AMI

Alternative Mark Inversion: The line-coding format in T-1 transmission systems whereby successive tones (marks) are alternately inverted (sent with polarity opposite that of the preceding mark).

Ancestor Node

A logical group node that has a direct parent relationship to a given node (i.e., it is the parent of that node, or the parent's parent...).

ANI

Automatic Number Identification: A charge number parameter that is normally included in the Initial Address Message to the succeeding carrier for billing purposes.

ANM

Answer Message: A BISUP call control message from the receiving exchange to the sending exchange indicating answer and that a through connection should be completed in both directions.

ANSI

American National Standards Institute: A U.S. standards body.

API

Application Program Interface: A programming interface used for interprogram communications or for interfacing between protocol layers.

API_connection

Native ATM Application Program Interface Connection: API_connection is a relationship between an API_endpoint and other ATM devices that has the following characteristics:

- Data communication may occur between the API_endpoint and the other ATM devices comprising the API_connection
- Each API_connection may occur over a duration of time only once; the same set of communicating ATM devices may form a new connection after a prior connection is released
- The API_connection may be presently active (able to transfer data), or merely anticipated for the future

APPN

Advanced Peer to Peer Network: IBM network architecture for building dynamic routing across arbitrary network topologies. Intended as an eventual replacement for SNA, IBM's static routed, hierarchical network architecture.

ARE

All Routes Explorer: A specific frame initiated by a source which is sent on all possible routes in Source Route Bridging.

ARP

Address Resolution Protocol: The procedures and messages in a communications protocol which determines which physical network address (MAC) corresponds to the IP address in the packet.

ARPANet

Advanced Research Projects Agency NETwork: A Department of Defense data network, developed by ARPA, which ties together many users and computers in universities, government, and businesses. ARPANET has been the forerunner of many developments in commercial data communications, including packet switching, which was first tested on a large scale on the network. ARPANET is a predcessor of the Internet. It was started in 1969 with funds for the Defense Department's Advanced Projects Research Agency.[1]

ASP

Abstract Service Primitive: An implementation-independent description of an interaction between a service-user and a service-provider at a particular service boundary, as defined by Open Systems Interconnection (OSI).

Assigned Cell

Cell that provides a service to an upper layer entity or ATM Layer Management entity (ATMM-entity).

ASW

Cell switching control (point-to-point connection, point-to-multipoint connection)

Asynchronous

Not occurring at the same time; beginning each operation only after finishing the preceding one.

Asynchronous Time Division Multiplexing

A multiplexing technique in which a transmission capability is organized in a prior unassigned time slots. The time slots are assigned to cells upon request of each application's instantaneous real need.

ATM

Asynchronous Transfer Mode: 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 is a high bandwidth, low-delay, connection-oriented, packet-like switching and multiplexing technique which will form the basis for future offering of Broadband ISDN(B-ISDN).Usable capacity is segmented into 53-byte fixed-size cells, consisting of header and information fields, allocated to services on demand.

1.Newton's Telecom Dictionary

ATM Address

Defined in the UNI Specification as 3 formats, each having 20 bytes in length including country, area and end-system identifiers.

ATM Layer Link

A section of an ATM Layer connection between two adjacent active ATM Layer entities (ATM-entities).

ATM Link

A virtual path link (VPL) or a virtual channel link (VCL).

ATM-NIC

ATM Network Interface Card: Electronic circuitry connecting a workstation to a network.Usually a card that fits into one of the expansion slots inside a personal computer.It works with the network software and computer operating system to transmit and receive messages on the network.

ATM Peer-to-Peer Connection

A virtual channel connection (VCC) or a virtual path connection (VPC).

ATM Switch

A generic term usually referring to an ATM switching system rather than a switching element. ATM switches are generally hardware based, self-routing, and high speed (up to Gbit/s).

ATM-TA

ATM Terminal Adapter: The terminal adapter is a protocol converter (little black box) that adapts PCs, workstations and other equipment to the peculiar world of ISDN.

ATM Traffic Descriptor

A generic list of traffic parameters that can be used to capture the intrinsic traffic characteristics of a requested ATM connection.

ATM User-User Connection

An association established by the ATM Layer to support communication between two or more ATM service users (i.e., between two or more next higher entities or between two or more ATM-entities). The communications over an ATM Layer connection may be either bidirectional or unidirectional. The same Virtual Channel Identifier (VCI) issued for both directions of a connection at an interface.

ATS

Abstract Test Suite: A set of abstract test cases for testing a particular protocol. An "executable" test suite may be derived from an abstract test suite.

Attenuation

The process of the reduction of the power of a signal as it passes through most media. Usually proportional to distance, attenuation is sometimes the factor that limits the distance a signal may be transmitted through a media before it can no longer be received.

AUSTEL

Australian Telecommunications Authority: This organization is responsible for regulating telecommunications and radio communications, including promoting industry self-regulation and managing the rediofrequency spectrum. It also has significant consumer protection responsibilities.[1]

Autonomous

Not subject to the rule or authority of another.

B

BBC

Broadband Bearer Capability: A bearer class field that is part of the initial address message.

BCD

Binary Coded Decimal: A form of coding of each octet within a cell where each bit has one of two allowable states, 1 or 0.

BCI

Broadcast Channel Identifier.

BCOB

Broadband Connection Oriented Bearer: Information in the SETUP message that indicates the type of service requested by the calling user.

1.ACA Home Page. 7 January 2000
http://www.aca.gov.au/authority/aca.htm

BCOB-A

Bearer Class A: Indicated by ATM end user in SETUP message for connection-oriented, constant bit rate service. The network may perform internetworking based on AAL information element (IE).

BCOB-C

Bearer Class C: Indicated by ATM end user in SETUP message for connection-oriented, variable bit rate service. The network may perform internetworking based on AAL information element (IE).

BCOB-X

Bearer Class X: Indicated by ATM end user in SETUP message for ATM transport service where AAL, traffic type and timing requirements are transparent to the network.

BECN

Backward Explicit Congestion Notification: A Resource Management (RM) cell type generated by the network or the destination, indicating congestion or approaching congestion for traffic flowing in the direction opposite that of the BECN cell.

BER

Bit Error Rate: A measure of transmission quality. It is generally shown as a negative exponent, (e.g., 10-7 which means 1 out of 107 bits are in error or 1 out of 10,000,000 bits are in error).

BHLI

Broadband High Layer Information: This is a Q.2931 information element that identifies an application (or session layer protocol of an application).

Bi

Signaling ID assigned by Exchange B.

B-ICI

B-ISDN Inter-Carrier Interface: An ATM Forum defined specification for the interface between public ATM networks to support user services across multiple public carriers.

B-ICI SAAL

B-ICI Signaling ATM Adaptation Layer: A signaling layer that permits the transfer of connection control signaling and ensures reliable delivery of the protocol message. The SAAL is divided into a Service Specific part and a Common part (AAL5).

BIP

Bit Interleaved Parity: A method used at the PHY layer to monitor the error performance of the link. A check bit or word is sent in the link overhead covering the previous block or frame. Bit errors in the payload will be detected and may be reported as maintenance information.

BIS

Border Intermediate System.

B-ISDN

Broadband ISDN: A high-speed network standard (above 1.544 Mbps) that evolved Narrowband ISDN with existing and new services with voice, data and video in the same network.

BISUP

Broadband ISDN User's Part: A SS7 protocol which defines the signaling messages to control connections and services.

B-LLI

Broadband Low Layer Information: This is a Q.2931 information element that identifies a layer 2 and a layer 3 protocol used by the application.

BMT

Basic Mode Transmission

BN

Bridge Number: A locally administered bridge ID used in Source Route Bridging to uniquely identify a route between two LANs.

BN

BECN Cell: A Resource Management (RM) cell type indicator. A Backwards Explicit Congestion Notification (BECN) RM-cell may be generated by the network or the destination. To do so, BN=1 is set, to indicate the cell is not source-generated, and DIR=1 to indicate the backward flow. Source generated RM-cells are initialized with BN=0.

BNC

Bayonet-Neill-Concelman: A bayonet-locking connector for slim coaxial cables, like those used with Ethernet.

BOM

Beginning of Message: An indicator contained in the first cell of an ATM segmented packet.

Border Node

A logical node that is in a specified peer group, and has at least one link that crosses the peer group boundary.

BP

Back Pressure: Propagation effects in a communications network of hop-by-hop flow control to upstream nodes.

BPDU

Bridge Protocol Data Unit: A message type used by bridges to exchange management and control information.

BPP

Bridge Port Pair (Source Routing Descriptor): Frame header information identifying a bridge/LAN pair of a Source route segment.

Broadband

A generic term referring to any network, traffic type or device providing or requiring a large amount of bandwidth. A service or system requiring transmission channels capable of supporting rates greater than the Integrated Services Digital Network (ISDN) primary rate.

Broadband Access

An ISDN access capable of supporting one or more broadband services.

Broadcast

Data transmission to all addresses or functions.

BT

Burst Tolerance: BT applies to ATM connections supporting VBR services and is the limit parameter of the GCRA.

Btag

Beginning Tag: A one octet field of the CPCS_PDU used in conjunction with the Etag octet to form an association between the beginning of message and end of message.

B-TE

Broadband Terminal Equipment: An equipment category for B-ISDN which includes terminal adapters and terminals.

BUS

Broadcast and Unknown Server: This server handles data sent by an LE Client to the broadcast MAC address ('FFFFFFFFFFFF'), all multicast traffic, and initial unicast frames which are sent by a LAN Emulation Client.

BW

Bandwidth: A numerical measurement of throughput of a system or network.

C

CAC

Connection Admission Control: Connection Admission Control is defined as the set of actions taken by the network during the call set- up phase (or during call re-negotiation phase) in order to determine whether a connection request can be accepted or should be rejected (or whether a request for re-allocation can be accommodated).

Call

A call is an association between two or more users or between a user and a network entity that is established by the use of network capabilities. This association may have zero or more connections.

CAS

Channel Associated Signaling: A form of circuit state signaling in which the circuit state is indicated by one or more bits of signaling status sent repetitively and associated with that specific circuit.

CBDS

Connectionless Broadband Data Service: A connectionless service similar to Bellcore's SMDS defined by European Telecommunications Standards Institute (ETSI).

CBR

Constant Bit Rate: An ATM service category which supports a constant or guaranteed rate to transport services such as video or voice as well as circuit emulation which requires rigorous timing control and performance parameters.

CCITT

Comite Consutarif International Telegraphique at Telephonique: The Consultive Committee on International Telegraph and Telephony.The CCIT is known as the ITU-T (International Telecommunications Union Telecommunications Services Sector), based in Geneva Switzerland.The scope of its work is now much broader than just telegraphy and telephony.It now also includes telematics, data, new services, systems and networks (like ISDN).

CCR

Current Cell Rate: The Current Cell Rate is an RM-cell field set by the source to its current ACR when it generates a forward RM-cell. This field may be used to facilitate the calculation of ER, and may not be changed by network elements. CCR is formatted as a rate.

CCS

Common Channel Signaling: A form signaling in which a group of circuits share a signaling channel. Refer to SS7.

CDF

Cutoff Decrease Factor: CDF controls the decrease in ACR (Allowed Cell Rate) associated with CRM.

CD-ROM

Compact Disk-Read Only Memory: Used by a computer to store large amounts of data. Commonly used for interactive video games.

CDV

Cell Delay Variation: CDV is a component of cell transfer delay, induced by buffering and cell scheduling. Peak-to-peak CDV is a QoS delay parameter associated with CBR and VBR services. The peak-to- peak CDV is the ((1-a) quantile of the CTD) minus the fixed CTD that could be experienced by any delivered cell on a connection during the entire connection holding time. The parameter "a" is the probability of a cell arriving late. See CDVT.

CDVT

Cell Delay Variation Tolerance-ATM layer functions may alter the traffic characteristics of ATM connections by introducing Cell Delay Variation. When cells from two or more ATM connections are multiplexed, cells of a given ATM connection may be delayed while cells of another ATM connection are being inserted at the output of the multiplexer. Similarly, some cells may be delayed while physical layer overhead or OAM cells are inserted. Consequently, some randomness may affect the inter-arrival time between consecutive cells of a connection as monitored at the UNI. The upper bound on the "clumping" measure is the CDVT.

CE

Connection endpoint: A terminator at one end of a layer connection within a SAP.

CEI

Connection endpoint Identifier: Identifier of a CE that can be used to identify the connection at a SAP.

Cell

A unit of transmission in ATM. A fixed-size frame consisting of a 5-octet header and a 48-octet payload.

Cell Header

ATM Layer protocol control information.

CER

Cell Error Ratio: The ratio of errored cells in a transmission in relation to the total cells sent in a transmission. The measurement is taken over a time interval and is desirable to be measured on an in-service circuit.

CES

Circuit Emulation Service: The ATM Forum circuit emulation service interoperability specification specifies interoperability agreements for supporting Constant Bit Rate (CBR) traffic over ATM networks that comply with the other ATM Forum interoperability agreements. Specifically, this specification supports emulation of existing TDM circuits over ATM networks.

CFAD

Cell Frame Assembly/Disassembly

Child Node

A node at the next lower level of the hierarchy which is contained in the peer group represented by the logical group node currently referenced. This could be a logical group node, or a physical node.

Child Peer Group

A child peer group of a peer group is any one containing a child node of a logical group node in that peer group. A child peer group of a logical group node is the one containing the child node of that logical group node.

CI

Congestion Indicator: This is a field in a RM-cell, and is used to cause the source to decrease its ACR. The source sets CI=0 when it sends an RM-cell. Setting CI=1 is typically how destinations indicate that EFCI has been received on a previous data cell.

CIF

Cells In Flight: An ABR service parameter, CIF is the negotiated number of cells that the network would like to limit the source to sending during idle startup period, before the first RM-cell returns. Range: 0-16,777,215

CIP

Carrier Identification Parameter: A 3 or 4 digit code in the initial address message identifying the carrier to be used for the connection.

CIR

Committed Information Rate: CIR is the information transfer rate which a network offering Frame Relay Services (FRS) is committed to transfer under normal conditions. The rate is averaged over a minimum increment of time.

CISPR

Comite International Special des Perturbations Radioelectriques

CL

Connectionless service: A service which allows the transfer of information among service subscribers without the need for end-to- end establishment procedures.

CLK

Clock: Generates system clock

CLP

Cell Loss Priority: This bit in the ATM cell header indicates two levels of priority for ATM cells. CLP=0 cells are higher priority than CLP=1 cells. CLP=1 cells may be discarded during periods of congestion to preserve the CLR of CLP=0 cells.

CLR

Cell Loss Ratio: CLR is a negotiated QoS parameter and acceptable values are network specific. The objective is to minimize CLR provided the end-system adapts the traffic to the changing ATM layer transfer characteristics. The Cell Loss Ratio is defined for a connection as: Lost Cells/Total Transmitted Cells. The CLR parameter is the value of CLR that the network agrees to offer as an objective over the lifetime of the connection. It is expressed as an order of magnitude, having a range of 10-1 to 10-15 and unspecified.

CMIP

Common Management Interface Protocol: An ITU-TSS standard for the message formats and procedures used to exchange management information in order to operate, administer maintain and provision a network.

CMR

Cell Misinsertion Rate: The ratio of cells received at an endpoint that were not originally transmitted by the source end in relation to the total number of cells properly transmitted.

CNR

Complex Node Representation: A collection of nodal state parameters that provide detailed state information associated with a logical node.

COD

Connection Oriented Data: Data requiring sequential delivery of its component PDUs to assure correct functioning of its supported application, (e.g., voice or video).

COM

Continuation of Message: An indicator used by the ATM Adaptation Layer to indicate that a particular ATM cell is a continuation of a higher layer information packet which has been segmented.

Common Peer Group

The lowest level peer group in which a set of nodes is represented. A node is represented in a peer group either directly or through one of its ancestors.

Communication endpoint

An object associated with a set of attributes which are specified at the communication creation time.

Concatenation

Joining several fibers together end-to-end.

Configuration

The phase in which the LE Client discovers the LE Service.

Connection

An ATM connection consists of concatenation of ATM Layer links in order to provide an end-to-end information transfer capability to access points.

Connection

In switched virtual connection (SVC) environments the LAN Emulation Management entities set up connections between each other using UNI signaling.

Connectionless

Refers to ability of existing LANs to send data without previously establishing connections.

Control Connections

A Control VCC links the LEC to the LECS. Control VCCs also link the LEC to the LES and carry LE_ARP traffic and control frames. The control VCCs never carry data frames.

Corresponding Entities

Peer entities with a lower layer connection among them.

CP

Control Panel

CPAD

Character Packet Assembly/Disassembly

CPCS

Common Part Convergence Sublayer: The portion of the convergence sublayer of an AAL that remains the same regardless of the traffic type.

CPCS-SDU

Common Part Convergence Sublayer-Service Data Unit: Protocol data unit to be delivered to the receiving AAL layer by the destination CP convergence sublayer.

CPE

Customer Premises Equipment: End user equipment that resides on the customer's premise which may not be owned by the local exchange carrier.

CPN

Calling Party Number: A parameter of the initial address message that identifies the calling number and is sent to the destination carrier.

CPU

Central Processing Center: The "brian" of the computer.It manipulates data and processes instructions coming from software or a human operator.

Crankback

A mechanism for partially releasing a connection setup in progress which has encountered a failure. This mechanism allows PNNI to perform alternate routing.

CRC

Cyclic Redundancy Check: A mathematical algorithm that computes a numerical value based on the bits in a block of data. This number is transmitted with the data and the receiver uses this information and the same algorithm to insure the accurate delivery of data by comparing the results of algorithm and the number received. If a mismatch occurs, an error in transmission is presumed.

CRF

Cell Relay Function: This is the basic function that an ATM network performs in order to provide a cell relay service to ATM end-stations.

CRF

Connection Related Function: A term used by Traffic Management to reference a point in a network or a network element where per connection functions are occurring. This is the point where policing at the VCC or VPC level may occur.

CRM

Missing RM-cell count: CRM limits the number of forward RM-cells which may be sent in the absence of received backward RM-cells.

CRM

Cell Rate Margin: This is a measure of the difference between the effective bandwidth allocation and the allocation for sustainable rate in cells per second.

CRS

Cell Relay Service: A carrier service which supports the receipt and transmission of ATM cells between end users in compliance with ATM standards and implementation specifications.

CS

Convergence Sublayer: The general procedures and functions that convert between ATM and non-ATM formats. This describes the functions of the upper half of the AAL layer. This is also used to describe the conversion functions between non-ATM protocols such as frame relay or SMDS and ATM protocols above the AAL layer.

CSA

Canadian Standard Association: A non-profit, independent organization which operates a listing service for electrical and electronic materials and equipment.

CSU

Channel Service Unit: An interface for digital leased lines which performs loopback testing and line conditioning.

CT

Conformance Test: Testing to determine whether an implementation complies with the specifications of a standard and exhibits the behaviors mandated by that standard.

CTD

Cell Transfer Delay: This is defined as the elapsed time between a cell exit event at the measurement point 1 (e.g., at the source UNI) and the corresponding cell entry event at measurement point 2 (e.g., the destination UNI) for a particular connection. The cell transfer delay between two measurement points is the sum of the total inter-ATM node transmission delay and the total ATM node processing delay.

D

DA

Destination Address: Information sent in the forward direction indicating the address of the called station or customer.

DA

Destination MAC Address: A six octet value uniquely identifying an endpoint and which is sent in IEEE LAN frame headers to indicate frame destination.

Data Connections

Data VCCs connect the LECs to each other and to the Broadcast and Unknown Server. These carry Ethernet/IEEE 802.3 or IEEE 802.5 data frames as well as flush messages.

DCC

Data Country Code: This specifies the country in which an address is registered. The codes are given in ISO 3166. The length of this field is two octets. The digits of the data country code are encoded in Binary Coded Decimal (BCD) syntax. The codes will be left justified and padded on the right with the hexadecimal value "F" to fill the two octets.

DCE

Data Communication Equipment: A generic definition of computing equipment that attaches to a network via a DTE.

Default Node Representation

A single value for each nodal state parameter giving the presumed value between any entry or exit to the logical node and the nucleus.

Demultiplexing

A function performed by a layer entity that identifies and separates SDUs from a single connection to more than one connection.

DES

Destination End Station: An ATM termination point which is the destination for ATM messages of a connection and is used as a reference point for ABR services. See SES.

Dijkstra's Algorithm

An algorithm that is sometimes used to calculate routes given a link and nodal state topology database.

DIR

This is a field in an RM-cell which indicates the direction of the RM- cell with respect to the data flow with which it is associated. The source sets DIR=0 and the destination sets DIR=1.

Direct Set

A set of host interfaces which can establish direct layer two communications for unicast (not needed in MPOA).

DLPI

UNIX International, Data Link Provider Interface (DLPI) Specification: Revision 2.0.0, OSI Work Group, August 1991.

DMA

Direct Memory Access: A fast method of moving data from a storage device or LAN interface card directly to RAM which speeds processing.

Domain

Refer to Administrative Domain.

DS

Distributed Single Layer Test Method: An abstract test method in which the upper tester is located within the system under test and the point of control and observation (PCO) is located at the upper service boundary of the Implementation Under Test (IUT) - for testing one protocol layer. Test events are specified in terms of the abstract service primitives (ASP) at the upper tester above the IUT and ASPs and/or protocol data units (PDU) at the lower tester PCO.

DS-0

Digital Signal, Level 0: The 64 kbps rate that is the basic building block for both the North American and European digital hierarchies.

DS-1

Digital Signal, Level 1: The North American Digital Hierarchy signaling standard for transmission at 1.544 Mbps. This standard supports 24 simultaneous DS-0 signals. The term is often used interchangeably with T1 carrier although DS-1 signals may be exchanged over other transmission systems.

DS-2

Digital Signal, Level 2: The North American Digital Hierarchy signaling standard for transmission of 6.312 Mbps that is used by T2 carrier which supports 96 calls.

DS-3

Digital Signal, Level 3: The North American Digital Hierarchy signaling standard for transmission at 44.736 Mbps that is used by T3 carrier. DS-3 supports 28 DS-1s plus overhead.

DS3 PLCP

Physical Layer Convergence Protocol: An alternate method used by older T carrier equipment to locate ATM cell boundaries. This method has recently been moved to an informative appendix of the ATM DS3 specification and has been replaced by the HEC method.

DSE

Distributed Single-Layer Embedded (Test Method): An abstract test method in which the upper tester is located within the system under test and there is a point of control and observation at the upper service boundary of the Implementation Under Test (IUT) for testing a protocol layer, or sublayer, which is part of a multi-protocol IUT.

DSS2 Setup

Digital Subscriber Signaling #2: ATM Broadband signaling.

DSU

Data Service Unit: Equipment used to attach users' computing equipment to a public network. Converts RS-232-C or other terminal interface to DSX-1 interface.Also called Digital Service Unit.

DTE

Data Terminal Equipment: A generic definition of external networking interface equipment such as a modem.

DTL

Designated Transit List: A list of nodes and optional link IDs that completely specify a path across a single PNNI peer group.

DTL Originator

The first switching system within the entire PNNI routing domain to build the initial DTL stack for a given connection.

DTL

Terminator The last switching system within the entire PNNI routing domain to process the connection and thus the connection's DTL.

DXI

Data Exchange Interface: A variable length frame-based ATM interface between a DTE and a special ATM CSU/DSU. The ATM CSU/DSU converts between the variable-length DXI frames and the fixed-length ATM cells.

E

E.164

A public network addressing standard utilizing up to a maximum of 15 digits. ATM uses E.164 addressing for public network addressing.

E1

Also known as CEPT1, the 2.048 Mbps rate used by European CEPT carrier to transmit 30 64 kbps digital channels for voice or data calls, plus a 64 kbps signaling channel and a 64 kbps channel for framing and maintenance.

E3

Also known as CEPT3, the 34.368 Mbps rate used by European CEPT carrier to transmit 16 CEPT1s plus overhead.

Edge Device

A physical device which is capable of forwarding packets between legacy interworking interfaces (e.g., Ethernet, Token Ring, etc.) and ATM interfaces based on data-link and network layer information but which does not participate in the running of any network layer routing protocol. An Edge Device obtains forwarding descriptions using the route distribution protocol.

EFCI

Explicit Forward Congestion Indication: EFCI is an indication in the ATM cell header. A network element in an impending-congested state or a congested state may set EFCI so that this indication may be examined by the destination end-system. For example, the end- system may use this indication to implement a protocol that adaptively lowers the cell rate of the connection during congestion or impending congestion. A network element that is not in a congestion state or an impending congestion state will not modify the value of this indication. Impending congestion is the state when a network equipment is operating around its engineered capacity level.

EFS

Error Free Seconds: A unit used to specify the error performance of T carrier systems, usually expressed as EFS per hour, day, or week. This method gives a better indication of the distribution of bit errors than a simple bit error rate (BER). Also refer to SES.

ELAN

Emulated Local Area Network: A logical network initiated by using the mechanisms defined by LAN Emulation. This could include ATM and legacy attached end stations.

EMA

Emergency Controller

EMI

Electromagnetic Interference: Equipment used in high speed data systems, including ATM, that generate and transmit many signals in the radio frequency portion of the electromagnetic spectrum. Interference to other equipment or radio services may result if sufficient power from these signals escape the equipment enclosures or transmission media. National and international regulatory agencies (FCC, CISPR, etc.) set limits for these emissions. Class A is for industrial use and Class B is for residential use.

EMI/RFI

ElectroMagnetic Interface/Radio Frequency Interface: A circuit or device containing series inductive (load bearing) and parallel capacitive (non-load bearing) components, which provide a low impedance path for high-frequency noise around a protected circuit.

EML

Element Management Layer: An abstraction of the functions provided by systems that manage each network element on an individual basis.

EMS

Element Management System: A management system that provides functions at the element Management Layer.

EOM

End of Message: An indicator used in the AAL that identifies the last ATM cell containing information from a data packet that has been segmented.

EN

European Norm

End Station

These devices (e.g., hosts or PCs) enable the communication between ATM end stations and end stations on "legacy" LAN or among ATM end stations.

Entry Border Node

The node which receives a call over an outside link. This is the first node within a peer group to see this call.

EPD

Early Packet Discard: A congestion control technique that selectively drops all but the last ATM cell in a Classical IP over ATM packet.When congestion occurs, EPD discards cells at the beginning of an IP packet, leaving the rest intact.The last cell is preserved because it alerts the switch and the destination station of the beginning of a new packet.Because IP packets from cells have been discarded receive no acknowledgment from the source. Most vendors expect EPD to be used in conjunction with unspecified bit rate (UBR) service. Switches simply junk UBR cells when congestion occurs, without regard for application traffic.By discarding ceiling selectively. so that whole IP packets are resent, EPD makes UBR a safer option.

ER

Explicit Rate: The Explicit Rate is an RM-cell field used to limit the source ACR to a specific value. It is initially set by the source to a requested rate (such as PCR). It may be subsequently reduced by any network element in the path to a value that the element can sustain. ER is formatted as a rate.

ES

End System: A system where an ATM connection is terminated or initiated. An originating end system initiates the ATM connection, and terminating end system terminates the ATM connection. OAM cells may be generated and received.

ESD

Elastic Discharge

ESF

Extended Superframe: A DS1 framing format in which 24 DS0 times lots plus a coded framing bit are organized into a frame which is repeated 24 times to form a superframe.

ESI

End System Identifier: This identifier distinguishes multiple nodes at the same level in case the lower level peer group is partitioned.

ETSI

European Telecommunications Standards Institute: The primary telecommunications standards organization.

Exception

A connectivity advertisement in a PNNI complex node representation that represents something other than the default node representation.

Exit Border Node

The node that will progress a call over an outside link. This is the last node within a peer group to see this call.

Exterior

Denotes that an item (e.g., link, node, or reachable address) is outside of a PNNI routing domain.

Exterior Link

A link which crosses the boundary of the PNNI routing domain. The PNNI protocol does not run over an exterior link.

Exterior Reachable Address

An address that can be reached through a PNNI routing domain, but which is not located in that PNNI routing domain.

Exterior Route

A route which traverses an exterior link.

F

Fairness

As related to Generic Flow Control (GFC), fairness is defined as meeting all the agreed quality of service (QOS) requirements, by controlling the order of service for all active connections.

FC

Feedback Control: Feedback controls are defined as the set of actions taken by the network and by the end-systems to regulate the traffic submitted on ATM connections according to the state of network elements.

FCC

Federal Communications Commission: The federal organization in Washington D.C. set up by the Communications Act of 1934. It has the authority to regulate all interstate (but not intrastate) communications originating in the United States. The FCC is the U.S. federal regulatory agency responsible for the regulation of interstate and international communications by radio, television, wire, satellite and cable.

FCS

Frame Check Sequence: Any mathematical formula which derives a numeric value based on the bit pattern of a transmitted block of information and uses that value at the receiving end to determine the existence of any transmission errors.

FDDI

Fiber Distributed Data Interface: A 100 Mbps Local Area Network standard that was developed by ANSI that is designed to work on fiber-optic cables, using techniques similar to token-ring.

FDDI-PMD

FDDI Physical Medium Dependant: This sublayer defines the parameters at the lowest level, such as speed of bits on the media.The half of BISDN Layer 1.

FEBE

Far End Block Error: A maintenance signal transmitted in the PHY overhead that a bit error(s) has been detected at the PHY layer at the far end of the link. This is used to monitor bit error performance of the link.

FEC

Forward Error Correction: A technique for detection and correction of errors in a digital data stream.

FECN

Forward Explicit Congestion Notification: This bit notifies the user that congestion-avoidance procedures should be initiated were applicable for traffic in the same direction as the received frame. This bit notifies the user that congestion-avoidance procedures should be initiated were applicable for traffic in the same direction as the received frame. It indicates that this frame, on this logical connection, has encountered congested resources.

FERF

Far End Receive Failure

FG

Functional Group: A collection of functions related in such a way that they will be provided by a single logical component. Examples include the Route Server Functional Group (RSFG), the IASG (Internetwork Address Sub-Group), Coordination Functional Group (ICFG), the Edge Device Functional Group (EDFG) and the ATM attached host Behavior Functional Group (AHFG).

FIFO

First-in First-out: All telephone networks are a trade-off. It’s simply to expensive to build a phone network which will be ready to give everyone dial tone and a circuit if everyone picked up the phone simultaneously and tried to make a call. There are basically two ways of handling calls which cannot be sent on their way-i.e. for which there’s no present available capacity. First, you can "block" the call. This means giving the caller a busy or a "nothing" (also called "high and dry"). Second, you can put the call into a queue. Now you have people waiting in queue, how do you handle them? The most equitable-the way most queues work-is to handle the calls on the basis of First In, First Out.(First call to come in is handled first.) There are other ways of handling calls in a queue-including First In, Last Out, by priority (e.g. which line you came in on and how much it cost, or how high you are in the corporation, etc.)

Flush Protocol

The flush protocol is provided to ensure the correct order of delivery of unicast data frames.

Foreign Address

An address that does not match any of a given node's summary addresses.

Forwarding Description

The resolved mapping of an MPOA Target to a set of parameters used to set up an ATM connection on which to forward packets.

FPGA

Field Programmable Gate Array: A specialized microprocessor manufactured without physical connections between its logic gates, but with potential connections that can be firmed up in the field. *(paraphrased from Newton)*

FRS

Frame-Relay Service: A connection oriented service that is capable of carrying up to 4096 bytes per frame.

FRTT

Fixed Round-Trip Time: This is the sum of the fixed and propagation delays from the source to the furthest destination and back.

G

G.703

ITU-T Recommendation G.703, "Physical/Electrical Characteristics of Hierarchical Digital Interfaces".

G.704

ITU-T Recommendation G.704, "Synchronous Frame Structures Used at Primary and Secondary Hierarchy Levels".

G.804

ITU-T Recommendation G.804, "ATM Cell Mapping into Plesiochronous Digital Hierarchy (PDH)".

GCAC

Generic Connection Admission Control: This is a process to determine if a link has potentially enough resources to support a connection.

GCRA

Generic Cell Rate Algorithm: The GCRA is used to define conformance with respect to the traffic contract of the connection. For each cell arrival the GCRA determines whether the cell conforms to the traffic contract. The UPC function may implement the GCRA, or one or more equivalent algorithms to enforce conformance. The GCRA is defined with two parameters: the Increment (I) and the Limit (L).

GFC

Generic Flow Control: GFC is a field in the ATM header which can be used to provide local functions (e.g., flow control). It has local significance only and the value encoded in the field is not carried end-to-end.

GWPAD

GateWay Packet Assembler and Disassembler : A functional unit that interconnects two computer networks with different network architectures and enables data terminal equipment (DTE) not equipped for packet switching to access a packet switched network.[1]

H

H-Channel

H-Channels are ISDN bearer services that have pre-defined speeds, starting and stopping locations on a PRI and are contiguously transported from one PRI site through networks to another PRI site.

H0 Channel

A 384 kbps channel that consists of six contiguous DS0s (64 kbps) of a T1 line.

H10 Channel

The North American 1472 kbps channel from a T1 or primary rate carrier. This is equivalent to twenty-three (23) 64 kbps channels.

H11 Channel

The North American primary rate used as a single 1536 kbps channel. This channel uses 24 contiguous DS0s or the entire T1 line except for the 8 kbps framing pattern.

H12

The European primary rate used as a single 1920 kbps channel (30 64 kbps channels or the entire E1 line except for the 64 kbps framing and maintenance channel.

Host Apparent Address

A set of internetwork layer addresses which a host will directly resolve to lower layer addresses.

1.IBM Dictionary of Computing

HBFG

Host Behavior Functional Group: The group of functions performed by an ATM-attached host that is participating in the MPOA service.

HDLC

High Level Data Link Control: An ITU-TSS link layer protocol standard for point-to-point and multi-point communications.

Header

Protocol control information located at the beginning of a protocol data unit.

HEC

Header Error Control: Using the fifth octet in the ATM cell header, ATM equipment may check for an error and corrects the contents of the header. The check character is calculated using a CRC algorithm allowing a single bit error in the header to be corrected or multiple errors to be detected.

Hello Packet

A type of PNNI Routing packet that is exchanged between neighboring logical nodes.

Hierarchically Complete Source Route

A stack of DTLs representing a route across a PNNI routing domain such that a DTL is included for each hierarchical level between and including the current level and the lowest visible level in which the source and destination are reachable.

Hop-by-Hop Route

A route that is created by having each switch along the path use its own routing knowledge to determine the next hop of the route, with the expectation that all switches will choose consistent hops such that the call will reach the desired destination. PNNI does not use hop-by-hop routing.

Horizontal Link

A link between two logical nodes that belong to the same peer group.

I

IASG

Internetwork Address Sub-Group: A range of internetwork layer addresses summarized in an internetwork layer routing protocol.

ICD

International Code Designator: This identifies an international organization. The registration authority for the International Code Designator is maintained by the British Standards Institute. The length of this field is two octets.

ICR

Initial Cell Rate: An ABR service parameter, in cells/sec, that is the rate at which a source should send initially and after an idle period.

IDU

Interface Data Unit: The unit of information transferred to/from the upper layer in a single interaction across the SAP. Each IDU contains interface control information and may also contain the whole or part of the SDU.

IEC

International Electrotechnical Commission: Founded in 1906, this world organization prepares and publishes internation standards for all elictrical, electronic, and related technologies. The IEC was founded as a result of a resolution passed at the International Electrical Congress held in St. Louis (USA) in 1904. The membership consists of more than 50 participating companies, including all the world's major trading nations and a growing number of industrializing countries.[1]

Inter-exchange Carrier:

A long distance telephone company.

IEEE

Institute of Electrical and Electronics Engineers: A worldwide engineering publishing and standards-making body for the electronics industry.

IEEE 802.3

A Local Area Network protocol suite commonly known as Ethernet. Ethernet has either a 10 Mbps or 100 Mbps throughput and uses Carrier Sense Multiple Access bus with Collision Detection CSMA/CD. This method allows users to share the network cable. However, only one station can use the cable at a time. A variety of physical medium dependent protocols are supported.

1.International Electrotechnical Commission Home Page 3 January 2000 http://www/iec.ch/gnote1-e.htm

IEEE 802.5

A Local Area Network protocol suite commonly known as Token Ring. A standard originated by IBM for a token passing ring network that can be configured in a star topology. Versions supported are 4 Mbps and 16 Mbps.

IEEE 802.6

A Metropolitan Area Network (MAN) standard, using DQDN (Dual Bus Distributed Queue) technology. Provides up to 45 Mbit/s data rate on each bus today (and may provide up to 150 Mbit/son each bus in the future), for distances up to about 100 km. Popular in some parts of Australia and Europe.

IETF

Internet Engineering Task Force: The organization that provides the coordination of standards and specification development for TCP/IP networking.

IISP

Interim Inter Switch Protocol: A call routing scheme used in STM networks. Formerly known as PNNI Phase 0. IISP is an interim technology meant to be used pending completion of ONNI Phase 1. IISP uses static routing tables established by the network administrator to route connections around link failures.[1]

ILMI

Interim Link Management Interface: An ATM Forum defined interim specification for network management functions between an end user and a public or private network and between a public network and a private network. This is based on a limited subset of SNMP capabilities.

Induced Uplink

An uplink "A" that is created due to the existence of an uplink "B" in the child peer group represented by the node that created uplink "A". Both "A" and "B" share the same upnode, which is higher in the PNNI hierarchy than the peer group in which uplink "A" is seen.

Inside Link

Synonymous with horizontal link.

Instance ID

A subset of an object's attributes which serve to uniquely identify a MIB instance.

1.Newton’s Telecom Dictionary

Interior

Denotes that an item (e.g., link, node, or reachable address) is inside of a PNNI routing domain.

Internal Reachable Address

An address of a destination that is directly attached to the logical node advertising the address.

IOP

Interoperability: The ability of equipment from different manufacturers (or different implementations) to operate together.

IP

Internet Protocol: Originally developed by the Department of Defense to support interworking of dissimilar computers across a network. This protocol works in conjunction with TCP and is usually identified as TCP/IP. A connectionless protocol that operates at the network layer (layer 3) of the OSI model.

IPOA

IP Over ATM

IPX

Novell Internetwork Packet Exchange: A built-in networking protocol for Novell Netware. It was derived from the Xerox Network System protocol and operates at the network layer of the OSI protocol model.

IS

Intermediate System: A system that provides forwarding functions or relaying functions or both for a specific ATM connection. OAM cells may be generated and received.

ISDN

Integrated Services Digital Network: A switched network providing end-to-end digital connections where voice, data, video and image services are provided over the same transmission facilities. ISDN comes today in two basic flavors-BRI, which is 144,000 bits per second and design for the desk top, and PRI which is 1,544,000 bits per second and design for telephone switches, computer telephony and voice processing systems.Neither ISDN BRI or ISPN PRI is a standard service, though there are several "standard" configurations.ISDN BRI is a wonderful service in your home or office because it can give you video conferencing, and ultrafast data communications.But it is not an easy service to get up and running.

ISO

International Standards Organization: An international organization for standardization, based in Geneva, Switzerland, that establishes voluntary standards and promotes global trade of 90 member countries.

ITU-T Specifications for Traffic Measurement.

I.361

B-ISDN ATM Layer Specification.

I.362

B-ISDN ATM Layer (AAL) Functional Description.

I.363

B-ISDN ATM Layer (AAL) Specification.

I.432

ITU-T Recommendation for B-ISDN User-network Interface.

ITU-T

International Telecommunications Union Telecommunications: ITU-T is an international body of member countries whose task is to define recommendations and standards relating to the international telecommunications industry. The fundamental standards for ATM have been defined and published by the ITU-T (Previously CCITT).

ITU H.222

An ITU-T Study Group 15 standard that addresses the multiplexing of multimedia data on an ATM network.

ITU Q.2100

B-ISDN Signaling ATM Adaptation Layer Overview.

ITU Q.2110

B-ISDN Adaptation Layer -- Service Specific Connection Oriented Protocol.

ITU Q.2130

B-ISDN Adaptation Layer -- Service Specific Connection Oriented Function for Support of Signaling at the UNI.

ITU Q.2931

The signaling standard for ATM to support Switched Virtual Connections. This is based on the signaling standard for ISDN.

ITU Q.931

The signaling standard for ISDN to support SVCs. The basis for the signaling standard developed for Frame Relay and ATM.

ITU Q.933

The signaling standard for Frame Relay to support SVCs. This is based on the signaling standard for ISDN.

IUT

Implementation Under Test: The particular portion of equipment which is to be studied for testing. The implementation may include one or more protocols.

IXB

Input eXpandable Buffer

J,K

Joining

The phase in which the LE Client establishes its control connections to the LE Server.

JPEG

Joint Photographic Experts Group: An ISO Standards group that defines how to compress still pictures.

L

LAN

Local Area Network: A short distance data communications network (typically within a building or campus) used to link together computers and peripheral devices (such as printers) under some form of standard control.

LANE

LAN Emulation: The set of services, functional groups and protocols which provide for the emulation of LANs utilizing ATM as a backbone to allow connectivity among LAN and ATM attached end stations.

LAPD

Link Access Procedure D: A layer 2 protocol defined by CCITT (original name of ITU-T). This protocol reliably transfers blocks of information across a single Layer 1 link and supports multiplexing of different connections at Layer 2.

Layer Entity

An active element within a layer.

Layer Function

A part of the activity of the layer entities.

Layer Service

A capability of a layer and the layers beneath it that is provided to the upper layer entities at the boundary between that layer and the next higher layer.

Layer User Data

Data transferred between corresponding entities on behalf of the upper layer or layer management entities for which they are providing services.

LB

Leaky Bucket: Leaky Bucket is the term used as an analogous description of the algorithm used for conformance checking of cell flows from a user or network. See GCRA, UPC and NPC. The "leaking hole in the bucket" applies to the sustained rate at which cells can be accommodated, while the "bucket depth" applies to the tolerance to cell bursting over a given time period.

LE

LAN Emulation. Refer to LANE.

LED

Light Emitting Diode: A semiconductor diode that emits light when a current passes through it. LEDs are often used for alarm and power indication lights on equipment.

Leadership Priority

The priority with which a logical node wishes to be elected peer group leader of its peer group. Generally, of all nodes in a peer group, the one with the highest leadership priority will be elected as peer group leader.

Leaf Node

Any node in a tree structure that is at the farthest distance from the root (primary node), no matter which path is followed. In any tree, a leaf is a node at the end of the branch, one that has no descendants.[1]

Leaky Bucket

An informal term for the Generic Cell Rate Algorithm.

LE_ARP

LAN Emulation Address Resolution Protocol: A message issued by a LE client to solicit the ATM address of another function.

LEC

Local Exchange Carrier: A telephone company affiliate of a Regional Bell Operating Company or an Independent Telephone Company.

LEC

LAN Emulation Client: The entity in end systems which performs data forwarding, address resolution, and other control functions.

LECID

LAN Emulation Client Identifier: This identifier, contained in the LAN Emulation header, indicates the ID of the ATM host or ATM-LAN bridge. It is unique for every ATM Client.

LECS

LAN Emulation Configuration Server: This implements the policy controlled assignment of individual LE clients to different emulated LANs by providing the LES ATM addresses.

LED

Light Emitting Diode: A semiconductor diode that emits light when a current passes through it. LEDs are often used for alarm and power indication lights on equipment.

1.Microsoft Computer Dictionary

LES

LAN Emulation Server: This implements the control coordination function for the Emulated LAN, examples are enabling a LEC to join an ELAN, resolving MAC to ATM addresses.

LGN

Logical Group Node: LGN is a single node that represents the lowest level peer groups in the respective higher level peer group.

LIJP

Leaf Initiated Joint Parameter: Root screening options and Information Element (IE) instructions carried in SETUP message.

Line Card

A plug-in electronic printed circuit (PC) card that operates lamps, ringing, holding and other features one or several telephone lines or telephones in a telephone system.

LINF

Line Interface

Link

An entity that defines a topological relationship (including available transport capacity) between two nodes in different subnetworks. Multiple links may exist between a pair of subnetworks. Synonymous with logical link.

Link Aggregation Token

Refer to Aggregation Token.

Link Attribute

A link state parameter that is considered individually to determine whether a given link is acceptable and/or desirable for carrying a given connection.

Link Connection

A link connection (e.g., at the VP-level) is a connection capable of transferring information transparently across a link without adding any overhead, such as cells for purposes for monitoring. It is delineated by connection points at the boundary of the subnetwork.

Link Constraint

A restriction on the use of links for path selection for a specific connection.

Link Metric

A link parameter that requires the values of the parameter for all links along a given path to be combined to determine whether the path is acceptable and/or desirable for carrying a given connection.

Link State Parameter

Information that captures an aspect or property of a link.

LLC

Logic Link Control: A protocol developed by the IEEE 802.2 committee for data-link level transmission control. It is the upper sublayer of the IEEE Layer 2(OSI) protocol that compliments the MAC protocol. IEEE standard 802.2 includes end-system addressing and error checking. It also provides a common access control standard and governs the assembly of data packets and their exchange between data stations independent of how the packets are transmitted on the LAN.

LNNI

LANE NNI: The standardized interface between two LAN servers (LES-LES, BUS-BUS, LECS-LECS and LECS-LES).

LOC

Loss of Cell Delineation: A condition at the receiver or a maintenance signal transmitted in the PHY overhead indicating that the receiving equipment has lost cell delineation. Used to monitor the performance of the PHY layer.

LOF

Loss of Frame: A condition at the receiver or a maintenance signal transmitted in the PHY overhead indicating that the receiving equipment has lost frame delineation. This is used to monitor the performance of the PHY layer.

Logical Group Node

A logical node that represents a lower level peer group as a single point for purposes of operating at one level of the PNNI routing hierarchy.

Logical Link

An abstract representation of the connectivity between two logical nodes. This includes individual physical links, individual virtual path connections, and parallel physical links and/or virtual path connections.

Logical Node

An abstract representation of a peer group or a switching system as a single point.

Logical Node ID

A string of bits that unambiguously identifies a logical node within a routing domain.

LOP

Loss of Pointer: A condition at the receiver or a maintenance signal transmitted in the PHY overhead indicating that the receiving equipment has lost the pointer to the start of cell in the payload. This is used to monitor the performance of the PHY layer.

LOS

Loss of Signal: A condition at the receiver or a maintenance signal transmitted in the PHY overhead indicating that the receiving equipment has lost the received signal. This is used to monitor the performance of the PHY layer.

LPF

Low Pass Filter: In an MPEG-2 clock recovery circuit, it is a technique for smoothing or averaging changes to the system clock.

LSAP

Link Service Access Point: Logical address of boundary between layer 3 and LLC sublayer 2.

LSB

Least Significant Bit: The lowest order bit in the binary representation of a numerical value.

LSR

Leaf Setup Request: A setup message type used when a leaf node requests connection to existing point-to-multipoint connection or requests creation of a new multipoint connection.

LT

Lower Tester: The representation in ISO/IEC 9646 of the means of providing, during test execution, indirect control and observation of the lower service boundary of the IUT using the underlying service provider.

LTE

SONET Lite Terminating Equipment: ATM equipment terminating a communications facility using a SONET Lite Transmission Convergence (TC) layer. This is usually reserved for end user or LAN equipment. The SONET Lite TC does not implement some of the maintenance functions used in long haul networks such as termination of path, line and section overhead.

LUNI

LANE UNI: The standardized interface between a LE client and a LE Server (LES,LECS and BUS).

M

M1

Management Interface 1: The management of ATM end devices.

M2

Management Interface 2: The management of Private ATM networks or switches.

M3

Management Interface 3: The management of links between public and private networks.

M4

Management Interface 4: The management of public ATM networks.

M5

Management Interface 5: The management of links between two public networks.

MAC

Media Access Control: IEEE specifications for the lower half of the data link layer (layer 2) that defines topology dependent access control protocols for IEEE LAN specifications.

MAC Address

The address for a device as it is identified at the Media Access Control layer in the network architecture.

MAN

Metropolitan Area Network: A network designed to carry data over an area larger than a campus such as an entire city and its outlying area.

Managed System

An entity that is managed by one or more management systems, which can be either Element Management Systems, Subnetwork or Network Management Systems, or any other management systems.

Management Domain

An entity used here to define the scope of naming.

Management System

An entity that manages a set of managed systems, which can be either NEs, subnetworks or other management systems.

MAT

Maintenance and Administration Terminal

MaxCR

Maximum Cell Rate: This is the maximum capacity usable by connections belonging to the specified service category.

Mbps

Mega *Bits* Per Second: Million *bits* per second

MBps

Mega *Bytes* Per Second: Million *bytes* per second

MBS

Maximum Burst Size: In the signaling message, the Burst Tolerance (BT) is conveyed through the MBS which is coded as a number of cells. The BT together with the SCR and the GCRA determine the MBS that may be transmitted at the peak rate and still be in conformance with the GCRA.

MCDV

Maximum Cell Delay Variance: This is the maximum two-point CDV objective across a link or node for the specified service category.

MCLR

Maximum Cell Loss Ratio: This is the maximum ratio of the number of cells that do not make it across the link or node to the total number of cells arriving at the link or node.

MCR

Minimum Cell Rate: An ABR service traffic descriptor, in cells/sec, that is the rate at which the source is always allowed to send.

MCTD

Maximum Cell Transfer Delay: This is the sum of the fixed delay component across the link or node and MCDV.

Metasignaling

ATM Layer Management (LM) process that manages different types of signaling and possibly semipermanent virtual channels (VCs), including the assignment, removal and checking of VCs.

Metasignaling VCs

The standardized VCs that convey metasignaling information across a User-Network Interface (UNI).

MIB

Management Information Base: A definition of management items for some network component that can be accessed by a network manager. A MIB includes the names of objects it contains and the type of information retained.

MIB Attribute

A single piece of configuration, management, or statistical information which pertains to a specific part of the PNNI protocol operation.

MIB Instance

An incarnation of a MIB object that applies to a specific part, piece, or aspect of the PNNI protocol's operation.

MIB Object

A collection of attributes that can be used to configure, manage, or analyze an aspect of the PNNI protocol's operation.

MID

Message Identifier: The message identifer is used to associate ATM cells that carry segments from the same higher layer packet.

MIR

Maximum Information Rate: Refer to PCR.

Mrm

An ABR service parameter that controls allocation of bandwidth between forward RM-cells, backward RM-cells, and data cells.

MMF

Multimode Fiberoptic Cable: Fiberoptic cable in which the signal or light propagates in multiple modes or paths. Since these paths may have varying lengths, a transmitted pulse of light may be received at different times and smeared to the point that pulses may interfere with surrounding pulses. This may cause the signal to be difficult or impossible to receive. This pulse dispersion sometimes limits the distance over which a MMF link can operate.

MPEG

Motion Picture Experts Group: An ISO Standards group dealing with video and audio compression techniques and mechanisms for multiplexing and synchronizing various media streams.

MPOA

Multiprotocol over ATM: An effort taking place in the ATM Forum to standardize protocols for the purpose of running multiple network layer protocols over ATM.

MPOA Client

A device which implements the client side of one or more of the MPOA protocols, (i.e., is a SCP client and/or an RDP client. An MPOA Client is either an Edge Device Functional Group (EDFG) or a Host Behavior Functional Group (HBFG).

MPOA Server

An MPOA Server is any one of an ICFG or RSFG.

MPOA Service Area

The collection of server functions and their clients. A collection of physical devices consisting of an MPOA server plus the set of clients served by that server.

MPOA Target

A set of protocol address, path attributes, (e.g., internetwork layer QoS, other information derivable from received packet) describing the intended destination and its path attributes that MPOA devices may use as lookup keys.

MSB

Most Significant Bit: The highest order bit in the binary representation of a numerical value.

MT

Message Type: The field containing the bit flags of a RM-cell. These flags are as follows:

- DIR = 0 for forward RM-cells = 1 for backward;
- RM-cells BN = 1 for Non-Source Generated (BECN)
- RM-cells = 0 for Source Generated RM-cells
- Congestion Indicator (CI) = 1 to indicate congestion = 0 otherwise NI = 1 to indicate no additive increase allowed = 0 otherwise
- RA -- Not used for ATM Forum Available Bit Rate (ABR).

MTBF

Mean Time Between Failures: The length of time a user may reasonably expect a device or system to work before an incapacitating fault occurs.

MTP

Message Transfer Part: Level 1 through 3 protocols of the SS7 protocol stack. MTP 3 (Level 3) is used to support BISUP.

Multicasting

The transmit operation of a single PDU by a source interface where the PDU reaches a group of one or more destinations.

Multiplexing

A function within a layer that interleaves the information from multiple connections into one connection.

Multipoint Access

User access in which more than one terminal equipment (TE) is supported by a single network termination.

Multipoint-to-Multipoint Connection

A Multipoint-to-Multipoint Connection is a collection of associated ATM VC or VP links, and their associated nodes, with the following properties:

- All Nodes in the connection, called endpoints, serve as a Root Node in a Point-to-Multipoint connection to all of the (N-1) remaining endpoints.
- Each of the endpoints on the connection can send information directly to any other endpoint, but the receiving endpoint cannot distinguish which of the endpoints is sending information without additional (e.g., higher layer) information.

Multipoint-to-Point Connection

A Point-to-Multipoint Connection may have zero bandwidth from the Root node to the Leaf Nodes, and non-zero return bandwidth from the Leaf Nodes to the Root Node. Such a connection is also known as a Multipoint-to-Point Connection. Note that UNI 4.0 does not support this connection type.

MUX

Multiplexer: Electronic equipment which allows two or more signals to pass over one communications circuit. That (circuit) may be a phone line, a microwave circuit, a through-the-air TV signal. That circuit may be analog or digital. There are many multiplexing techniques to accommodate both.

N

Native Address

An address that matches one of a given node's summary addresses.

NC

Network Connection

NDIS

Network Driver Interface Specification: Refer to 3COM/Microsoft, LAN Manager: Network Driver Interface Specification, October 8, 1990.

NE

Network Element: A system that supports at least NEFs and may also support Operation System Functions/Mediation Functions. An ATM NE may be realized as either a standalone device or a geographically distributed system. It cannot be further decomposed into managed elements in the context of a given management function.

NEF

Network Element Function: A function within an ATM entity that supports the ATM based network transport services, (e.g., multiplexing, cross-connection).

Neighbor Node

A node that is directly connected to a particular node via a logical link.

NEL

Network Element Layer: An abstraction of functions related specifically to the technology, vendor, and the network resources or network elements that provide basic communications services.

NEXT

Near End Crosstalk: Equipment that must concurrently receive on one wire pair and transmit on another wire pair in the same cable bundle must accommodate NEXT interference. NEXT is the portion of the transmitted signal that leaks into the receive pair. Since at this point on the link the transmitted signal is at maximum and the receive signal has been attenuated, it may be difficult to maintain an acceptable ACR with the received signal if the cable media allows large amounts of crosstalk leakage to occur. Foiled or shielded cables generally have less crosstalk than unshielded varieties.

NIC

Network Interface Card: The attachment that connects a device to a network. The NIC, usually a PC expansion board, executes the code needed by the connected device to share a cable or some other media with other stations.

N-ISDN

Narrowband Integrated Services Digital Network: Services include basic rate interface (2B+D or BRI) and primary rate interface (23B+D or PRI). Supports narrowband speeds at/or below 1.5 Mbps.

NM

Network Management Entity: The body of software in a switching system that provides the ability to manage the PNNI protocol. NM interacts with the PNNI protocol through the MIB.

Nrm

An ABR service parameter, Nrm is the maximum number of cells a source may send for each forward RM-cell.

NMS

Network Management System: The system responsible for managing a portion of a network. The NMS talks to network management agents, which reside in the managed nodes, via a network management protocol. The NMS is the entity that implements functions at the Network Management Layer. It may also include Element Management Layer functions. A Network Management System may manage one or more other Network Management Systems.

NML

Network Management Layer: An abstraction of the functions provided by systems which manage network elements on a collective basis, so as to monitor and control the network end-to-end.

NMS

Network Management System: An entity that implements functions at the Network Management Layer. It may also include Element Management Layer functions. A Network Management System may manage one or more other Network Management Systems.

NMS Environment

A set of NMS which cooperate to manage one or more subnetworks.

NNI

Network Node Interface: An interface between ATM switches defined as the interface between two network nodes.

Nodal Attribute

A nodal state parameter that is considered individually to determine whether a given node is acceptable and/or desirable for carrying a given connection.

Nodal Constraint

A restriction on the use of nodes for path selection for a specific connection.

Nodal Metric

A nodal parameter that requires the values of the parameter for all nodes along a given path to be combined to determine whether the path is acceptable and/or desirable for carrying a given connection.

Nodal State Parameter

Information that captures an aspect or property of a node.

Node

Synonymous with logical node.

Novell Internetwork Packet Exchange

Netware's native LAN communications protocol, used to move data between server and/or workstation programs, running on different network nodes. IPX packets are encapsulated and carried by the packets used in Ethernet and the similiar frames used in Token-Ring networks. IPX supports packet sizes up to 64 bytes.[1]

NPC

Network Parameter Control: Network Parameter Control is defined as the set of actions taken by the network to monitor and control traffic from the NNI. Its main purpose is to protect network resources from malicious as well as unintentional misbehavior which can affect the QoS of other already established connections by detecting violations of negotiated parameters and taking appropriate actions. Refer to UPC.

nrt-VBR

Non-real-time VBR

NRZ

Non-Return to Zero: A binary encoding scheme in which ones and zeroes are represented by opposite and alternating high and low voltages and where there is no return to a zero (reference) voltage between encoded bits.NRZ is now used as an encryption scheme for getting data onto and off hard disk fast.It eliminates the need for clock pulses and yields up to 18.5 kilobytes per track and high read/write speeds.

NSAP

Network Service Access Point: OSI generic standard for a network address consisting of 20 octets. ATM has specified E.164 for public network addressing and the NSAP address structure for private network addresses.

NSR

Non-Source Routed: Frame forwarding through a mechanism other than Source Route Bridging.

1.Newton's Telecom Dictionary

NT

Network Termination: Network Termination represents the termination point of a Virtual Channel, Virtual Path, or Virtual Path/Virtual Channel at the UNI.

NTSC

National Television System Committee: An industry group that defines how television signals are encoded and transmitted in the US.

Nucleus

The interior reference point of a logical node in the PNNI complex node representation.

nx64K

This refers to a circuit bandwidth or speed provided by the aggregation of nx64 kbps channels (where n= integer > 1). The 64K or DS0 channel is the basic rate provided by the T Carrier systems.

O

OAM

Operations Administration and Maintenance: A group of network management functions that provide network fault indication, performance information, and data and diagnosis functions.

Octet

A term for eight (8) bits that is sometimes used interchangeably with "byte" to mean the same thing.

ODI

Open Data-Link Interface: This refers to Novell Incorporated, Open Data-Link Interface Developer's Guide, March 20, 1992.

One Hop Set

A set of hosts which are one hop apart in terms of internetwork protocols TTLs (TTL=0 -on the wire+).

OOF

Out of Frame. Refer to LOF.

OSC

Oscillator: A device for generating an analog test signal or an electronic circuit that creates a single frequency signal.

OSI

Open Systems Interconnection: A seven (7) layer architecture model for communications systems developed by the ISO for the interconnection of data communications systems. Each layer uses and builds on the services provided by those below it.

OSI Physical Layer

Usually taken to be SONET/SDH (which itself has 4 layers...) but can be other things as well. The PHY deals with medium-related issues.[1]

OSPF

Open Shortest Path First: A link-state routing algorithm that is used to calculate routes based on the number of routers, transmission speed, delays and route cost.

OUI

Organizationally Unique Identifier: The OUI is a three-octet field in the IEEE 802.1a defined SubNetwork Attachment Point (SNAP) header, identifying an organization which administers the meaning of the following two octet Protocol Identifier (PID) field in the SNAP header. Together they identify a distinct routed or bridged protocol.

Outlier

A node whose exclusion from its containing peer group would significantly improve the accuracy and simplicity of the aggregation of the remainder of the peer group topology.

Outside Link

A link to an outside node.

Outside Node

A node which is participating in PNNI routing, but which is not a member of a particular peer group.

1.ICell Relay Retreat. Indiana University 25 August 1996 http://cell-relay.indiana.edu/cell-relay/

OXB

Output eXpandable Buffer

P

Packet

A device for generating an analog test signal or an electronic circuit that creates a single frequency signal.

Packet Switch

A device that routes and forwards structured messages (packets).

Packet Switching

A data transmission method used in a network where user information is segmented and routed in discreet data envelopes called packets, each with its own appended control information for routing, sequencing, and error checking. Packet switched networks typically employ a full three-layer protocol stack (physical link, data link, network) in every node.

PAD

Packet Assembler and Disassembler: A PAD assembles packets of asynchronous data and emits these buffers in a burst to a packet switch network. The PAD also disassembles packets from the network and emits the data to the non-packet device.

Parent Node

The logical group node that represents the containing peer group of a specific node at the next higher level of the hierarchy.

Parent Peer Group

The parent peer group of a peer group is the one containing the logical group node representing that peer group. The parent peer group of a node is the one containing the parent node of that node.

Path Constraint

A bound on the combined value of a topology metric along a path for a specific connection.

PBX

Private Branch eXchange: PBX is the term given to a device which provides private local voice switching and voice-related services within the private network. A PBX could have an ATM API to utilize ATM services, for example Circuit Emulation Service.

PC

Protocol Control: Protocol Control is a mechanism which a given application protocol may employ to determine or control the performance and health of the application. Example, protocol liveness may require that protocol control information be sent at some minimum rate; some applications may become intolerable to users if they are unable to send at least at some minimum rate. For such applications, the concept of MCR is defined. Refer to MCR.

PCM

Pulse Code Modulation: An audio encoding algorithm which encodes the amplitude of a repetitive series of audio samples. This encoding algorithm converts analog voice samples into a digital bit stream.

PCMCIA

Personal Computer Memory Card International Association (an awful mouthful) standardizes credit-card size packages for memory and input/output (modems, LAN cards etc.) for computers, laptops, palmtops, etc. There are three physical standard for PCMCIA cards-Type 1,2,3 and undefined standard called type 4, which only Toshiba has at this moment.

PCO

Point of Control and Observation: A place (point) within a testing environment where the occurrence of test events is to be controlled and observed as defined by the particular abstract test method used.

PCR

Program Clock Reference: A timestamp that is inserted by the MPEG-2 encoder into the Transport Stream to aid the decoder in the recovering and tracking the encoder clock.

PCR

Peak Cell Rate: The Peak Cell Rate, in cells/sec, is the cell rate which the source may never exceed.

PDH

Plesiochronous Digital Hierarchy: PDH (plesiochronous means nearly synchronous), was developed to carry digitized voice over twisted pair cabling more efficiently. This evolved into the North American, European, and Japanese Digital Hierarchies where only a discrete set of fixed rates is available, namely, nxDS0 (DS0 is a 64 kbps rate) and then the next levels in the respective multiplex hierarchies.

PDU

Protocol Data Unit: A PDU is a message of a given protocol comprising payload and protocol-specific control information, typically contained in a header. PDUs pass over the protocol interfaces which exist between the layers of protocols (per OSI model).

Peer Entities

Entities within the same layer.

Peer Group Level

The number of significant bits in the peer group identifier of a particular peer group.

Peer Node

A node that is a member of the same peer group as a given node.

PES

Packetized Elementary Stream: In MPEG-2, after the media stream has been digitized and compressed, it is formatted into packets before it is multiplexed into either a Program Stream or Transport Stream.

PG

Peer Group: A set of logical nodes which are grouped for purposes of creating a routing hierarchy. PTSEs are exchanged among all members of the group.

PGI

Peer Group Identifier: A string of bits that is used to unambiguously identify a peer group.

PGL

Peer Group Leader: A node which has been elected to perform some of the functions associated with a logical group node.

PHY

OSI Physical Layer: The physical layer provides for transmission of cells over a physical medium connecting two ATM devices. This physical layer is comprised of two sublayers: the PMD Physical Medium Dependent sublayer, and the TC Transmission Convergence sublayer. Refer PMD and TC.

Physical Layer (PHY) Connection

An association established by the PHY between two or more ATM entities. A PHY connection consists of the concatenation of PHY links in order to provide an end-to-end transfer capability to PHY SAPs.

Physical Link

A real link which attaches two switching systems.

PICS

Protocol Implementation Conformance Statement: A statement made by the supplier of an implementation or system stating which capabilities have been implemented for a given protocol.

PID

Protocol Identification. Refer to OUI.

PIXIT

Protocol Implementation eXtra Information for Testing: A statement made by a supplier or implementer of an IUT which contains information about the IUT and its testing environment which will enable a test laboratory to run an appropriate test suite against the IUT.

Plastic Fiber Optics

An optical fiber where the core transmission media is plastic in contrast to glass or silica cores. Proposed plastic fibers generally have larger attenuation and dispersion than glass fiber but may have applications where the distance is limited. Plastic systems may also offer lower cost connectors that may be installed with simple tools and a limited amount of training.

PLCP

Physical Layer Convergence Protocol: The PLCP is defined by the IEEE 802.6. It is used for DS3 transmission of ATM. ATM cells are encapsulated in a 125microsecond frame defined by the PLCP which is defined inside the DS3 M-frame.

PLL

Phase Lock Loop: Phase Lock Loop is a mechanism whereby timing information is transferred within a data stream and the receiver derives the signal element timing by locking its local clock source to the received timing information.

PLO

Phase Locked Oscillator

PM

Physical Medium: Physical Medium refers to the actual physical interfaces. Several interfaces are defined including STS-1, STS-3c, STS-12c, STM-1, STM-4, DS1, E1, DS2, E3, DS3, E4, FDDI-based, Fiber Channel-based, and STP. These range in speeds from 1.544Mbps through 622.08 Mbps.

PMD

Physical Media Dependent: This sublayer defines the parameters at the lowest level, such as speed of the bits on the media.

PNI

Permit Next Increase: An ABR service parameter, PNI is a flag controlling the increase of ACR upon reception of the next backward RM-cell. PNI=0 inhibits increase. The range is 0 or 1.

PNNI

Private Network-Network Interface: A routing information protocol that enables extremely scalable, full function, dynamic multi-vendor ATM switches to be integrated in the same network.

PNNI Protocol Entity

The body of software in a switching system that executes the PNNI protocol and provides the routing service.

PNNI Routing Control Channel

VCCs used for the exchange of PNNI routing protocol messages.

PNNI Routing Domain

A group of topologically contiguous systems which are running one instance of PNNI routing.

PNNI Routing Hierarchy

The hierarchy of peer groups used for PNNI routing.

PNNI Topology State Packet

A type of PNNI Routing packet that is used for flooding PTSEs among logical nodes within a peer group.

POH

Path Overhead: A maintenance channel transmitted in the SONET overhead following the path from the beginning multiplexer to the ending demultiplexer. This is not implemented in SONET Lite.

Point-to-Multipoint Connection

A Point-to-Multipoint Connection is a collection of associated ATM VC or VP links, with associated endpoint nodes, with the following properties:

- One ATM link, called the Root Link, serves as the root in a simple tree topology. When the Root Node sends information, all of the remaining nodes on the connection, called Leaf Nodes, receive copies of the information.
- Each of the Leaf Nodes on the connection can send information directly to the Root Node. The Root Node cannot distinguish which Leaf is sending information without additional (higher layer) information. (See note below for User Network Interface (UNI) 4.0 support)
- The Leaf Nodes cannot communicate directly to each other with this connection type.

Note: UNI 4.0 does not support traffic sent from a Leaf to the Root.

Point-to-Point Connection

A connection with only two endpoints.

Port Identifier

The identifier assigned by a logical node to represent the point of attachment of a link to that node.

Partial Packet Discard (PPD)

Partial Packet Discard (PPD) is a congestion control technique that drops all of the ATM cells in a Classical IP over ATM packet. When congestion occurs and any one cell of a particular frame is dropped, PPD discards the rest of the cells (since the frame is errored and will need to be sent again anyway).

PRI

Primary Rate Interface: An ISDN standard for provisioning of 1.544 Mbps (DS1) ISDN services. The standard supports 23 "B" channels of 64 kbps each and one "D" channel of 64 kbps.

Primitive

An abstract, implementation independent, interaction between a layer service user and a layer service provider.

Private ATM Address

A twenty-byte address used to identify an ATM connection termination point.

Protocol

A set of rules and formats (semantic and syntactic) that determines the communication behavior of layer entities in the performance of the layer functions.

Protocol Control Information

Information exchanged between corresponding entities, using a lower layer connection, to coordinate their joint operation.

PT

Payload Type: Payload Type is a 3-bit field in the ATM cell header that discriminates between a cell carrying management information or one which is carrying user information.

PTI

Payload Type Indicator: Payload Type Indicator is the Payload Type field value distinguishing the various management cells and user cells. Example: Resource Management cell has PTI=110, end-to-end OAM F5 Flow cell has PTI=101.

PTMPT

Point-To-Multipoint: A main source to many destination connections.

PTS

Presentation Time Stamp: A timestamp that is inserted by the MPEG-2 encoder into the packetized elementary stream to allow the decoder to synchronize different elementary streams (i.e. lip sync).

PTSE

PNNI Topology State Element: A collection of PNNI information that is flooded among all logical nodes within a peer group.

PTSP

PNNI Topology State Packet: A type of PNNI Routing packet that is used for flooding PTSEs among logical nodes within a peer group.

PVC

Permanent Virtual Circuit: This is a link with static route defined in advance, usually by manual setup.

PVCC

Permanent Virtual Channel Connection: A Virtual Channel Connection (VCC) is an ATM connection where switching is performed on the VPI/VCI fields of each cell. A Permanent VCC is one which is provisioned through some network management function and left up indefinitely.

PVPC

Permanent Virtual Path Connection: A Virtual Path Connection (VPC) is an ATM connection where switching is performed on the VPI field only of each cell. A Permanent VPC is one which is provisioned through some network management function and left up indefinitely.

Q

QD

Queuing Delay: Queuing delay refers to the delay imposed on a cell by its having to be buffered because of unavailability of resources to pass the cell onto the next network function or element. This buffering could be a result of oversubscription of a physical link, or due to a connection of higher priority or tighter service constraints getting the resource of the physical link.

QoS

Quality of Service: Quality of Service is defined on an end-to-end basis in terms of the following attributes of the end-to-end ATM connection:

- Cell Loss Ratio
- Cell Transfer Delay
- Cell Delay Variation

R

RBOC

Regional Bell Operating Company: Seven companies formed to manage the local exchanges originally owned by AT&T. These companies were created as a result of an agreement between AT&T and the United States Department of Justice.

RD

Routing Domain: A group of topologically contiguous systems which are running one instance of routing.

RDF

Rate Decrease Factor: An ABR service parameter, RDF controls the decrease in the cell transmission rate. RDF is a power of 2 from 1/32,768 to 1.

Registration

The address registration function is the mechanism by which Clients provide address information to the LAN Emulation Server.

Relaying

A function of a layer by means of which a layer entity receives data from a corresponding entity and transmits it to another corresponding entity.

RFC

Request For Comment: The development of TCP/IP standards, procedures and specifications is done via this mechanism. RFCs are documents that progress through several development stages, under the control of IETF, until they are finalized or discarded.

RFC1695

Definitions of Managed Objects for ATM Management or AToM MIB.

RFI

Radio Frequent Interface: All computer equipment generates radio frequency signals. The FCC regulates the amount of RFI a computing device can leak past its shielding. A Class A device is sufficient for office use. A Class B is a more stringent classification for home equipment use.

RICE

RIsc Core Engine

RIF

Rate Increase Factor: This controls the amount by which the cell transmission rate may increase upon receipt of an RM-cell. The additive increase rate AIR=PCR*RIF. RIF is a power of 2, ranging from 1/32768 to 1.

RISC

Reduced Instruction Set Computing: A computer processing technology in which a microprocessor understands a few simple instructions thereby providing fast, predictable instruction flow.

RM

Resource Management: Resource Management is the management of critical resources in an ATM network. Two critical resources are buffer space and trunk bandwidth. Provisioning may be used to allocate network resources in order to separate traffic flows according to service characteristics. VPCs play a key role in resource management. By reserving capacity on VPCs, the processing required to establish individual VCCs is reduced. Refer to RM-cell.

RM-Cell

Resource Management Cell: Information about the state of the net work like bandwidth availability, state of congestion, and impending congestion, is conveyed to the source through special control cells called Resource Management Cells (RM-cells).

RO

Read-Only: Attributes which are read-only can not be written by Network Management. Only the PNNI Protocol entity may change the value of a read-only attribute. Network Management entities are restricted to only reading such read-only attributes. Read-only attributes are typically for statistical information, including reporting result of actions taken by auto-configuration.

ROM

Read Only Memory: Computer memory which can only be read from.New data cannot be entered and the existing data is non-volatile.This means it stays there even when power is turned off.

Root Node

A node of a tree stucture that has no parent nodes.[1]

1.IBM Dictionary of Computing

Route Server

A physical device that runs one or more network layer routing protocols, and which uses a route query protocol in order to provide network layer routing forwarding descriptions to clients.

Router

A physical device that is capable of forwarding packets based on network layer information and that also participates in running one or more network layer routing protocols.

Routing Computation

The process of applying a mathematical algorithm to a topology database to compute routes. There are many types of routing computations that may be used. The Djikstra algorithm is one particular example of a possible routing computation.

Routing Constraint

A generic term that refers to either a topology constraint or a path constraint.

Routing Information Protocol

Based on distance-vector algorithms that measure the shortest path between two points on a network, based on the addresses of the originating and destiantion devices. The shortest path is determined by the number of “hops” between those points. Each router maintains a routing table, or routing database, of known addresses and routes; each router periodically broadcasts the contents of its table to neighboring routers in order that the entire network can maintain a synchronized database.[1]

Routing Protocol

A general term indicating a protocol run between routers and/or route servers in order to exchange information used to allow computation of routes. The result of the routing computation will be one or more forwarding descriptions.

RS

Remote single-layer (Test Method): An abstract test method in which the upper tester is within the system under test and there is a point of control and observation at the upper service boundary of the Implementation Under Test (IUT) for testing one protocol layer. Test events are specified in terms of the abstract service primitives (ASP) and/or protocol data units at the lower tester PCO.

1.Newton’s Telecom Dictionary

RS-232C

A set of standards specifying various electrical and mechanical characteristics for interfaces between computers, terminals and modems.The RS-232-C standard, which was developed by the EIA (Electrical Industries Association), defines the mechanical and electrical characteristics for connecting DTE and DCE data communications devices. It defines what the interface does, circuit functions and their corresponding connector pin assignments.The standard applies to both synchronous and asynchronous binary data transmission.

RSE

Remote Single-layer Embedded (Test Method): An abstract test method in which the upper tester is within the system under test and there is a point of control and observation at the upper service boundary of the Implementation Under Test (IUT) for testing a protocol layer or sublayer which is part of a multi-protocol IUT.

RSFG

Route Server Functional Group: The group of functions performed to provide internetworking level functions in an MPOA System. This includes running conventional interworking Routing Protocols and providing inter-IASG destination resolution.

RTC

Runtime Control: An SCSA definition. The mechanism by which one Resource Object can influence the behavior of another. Typically used for things such as terminating consitions an speed/volume control.[1]

rt-VBR

Real-Time VBR

RW

Read-Write: Attributes which are read-write can not be written by the PNNI protocol entity. Only the Network Management Entity may change the value of a read-write attribute. The PNNI Protocol Entity is restricted to only reading such read-write attributes. Read-write attributes are typically used to provide the ability for Network Management to configure, control, and manage a PNNI Protocol Entity's behavior.

1.Newton’s Telecom Dictionary

S

SA

Source Address: The address from which the message or data originated.

SA

Source MAC Address: A six octet value uniquely identifying an end point and which is sent in an IEEE LAN frame header to indicate source of frame.

SAAL

Signaling ATM Adaptation Layer: This resides between the ATM layer and the Q.2931 function. The SAAL provides reliable transport of Q.2931 messages between Q.2931 entities (e.g., ATM switch and host) over the ATM layer; two sublayers: common part and service specific part.

SAP

Service Access Point: A SAP is used for the following purposes:

- When the application initiates an outgoing call to a remote ATM device, a destination_SAP specifies the ATM address of the remote device, plus further addressing that identifies the target software entity within the remote device.
- When the application prepares to respond to incoming calls from remote ATM devices, a local_SAP specifies the ATM address of the device housing the application, plus further addressing that identifies the application within the local device. There are several groups of SAPs that are specified as valid for Native ATM Services.

SAR

Segmentation and Reassembly: Method of breaking up arbitrarily sized packets.

SC

Subscriber loop system optical fiber Connector: It’s a system that allows one pair of wires, that would normally provide one phone line, to carry multiple conversations. Various models are available, with capacity ranging from 2 to 96 lines. A SC or (SLCC) is used between phone company central offices and areas where there are too many customers for the cable that is in place. It’s much less expensive to install SLCCs than new cable, but the SLCC provides lower-than-normal line voltage, which may cause some phones to malfunction.

SCCP

Signaling Connection and Control Part: A SS7 protocol that provides additional functions to the Message Transfer Part (MTP). It typically supports Transaction Capabilities Application Part (TCAP).

Scope

Defines the level of advertisement for an address. The level is a level of a peer group in the PNNI routing hierarchy.

SCP

Service Control Point: A computer and database system which executes service logic programs to provide customer services through a switching system. Messages are exchanged with the SSP through the SS7 network.

SCR

Sustainable Cell Rate: An upper bound on the conforming average rate of an ATM connection over time scales which are long relative to those for which the PCR is defined. Enforcement of this bound by the UPC could allow the network to allocate sufficient resources, but less than those based on the PCR, and still ensure that the performance objectives (e.g., for Cell Loss Ratio) can be achieved.

SDH

Synchronous Digital Hierarchy: The ITU-TSS International standard for transmitting information over optical fiber.

SDT

Structured Data Transfer: An AAL1 data transfer mode in which data is structured into blocks which are then segmented into cells for transfer.

SDU

Service Data Unit: A unit of interface information whose identity is preserved from one end of a layer connection to the other.

SE

Switching Element: Switching Element refers to the device or network node which performs ATM switching functions based on the VPI or VPI/VCI pair.

SEAL

Simple and Efficient Adaptation Layer: An earlier name for AAL5.

Segment

A single ATM link or group of interconnected ATM links of an ATM connection.

SEL

Selector: A subfield carried in SETUP message part of ATM endpoint address Domain specific Part (DSP) defined by ISO 10589, not used for ATM network routing, used by ATM end systems only.

Semipermanent Connection

A connection established via a service order or via network management.

SES

Severely Errored Seconds: A unit used to specify the error performance of T carrier systems. This indicates a second containing ten or more errors, usually expressed as SES per hour, day, or week. This method gives a better indication of the distribution of bit errors than a simple Bit Error Rate (BER). Refer also to EFS.

SES

Source End Station: An ATM termination point, which is the source of ATM messages of a connection, and is used as a reference point for ABR services. Refer to DES.

SF

SuperFrame: A DS1 framing format in which 24 DS0 timeslots plus a coded framing bit are organized into a frame which is repeated 12 times to form the superframe.

SFIT

SDH Frame Interface Termination

Shaping Descriptor

Signal: An electrical wave used to convey information.N ordered pairs of GCRA parameters (I,L) used to define the negotiated traffic shape of a connection.

SIO

Scientific or Industrial Organization

SIPP

SMDS Interface Protocol: Protocol where layer 2 is based on ATM, AAL and DQDB. Layer 1 is DS1 and DS3.

SMDS

Switched Multi-Megabit Data Services: A connectionless service used to connect LANs, MANs and WANs to exchange data.

SMF

Single Mode Fiber: Fiber optic cable in which the signal or light propagates in a single mode or path. Since all light follows the same path or travels the same distance, a transmitted pulse is not dispersed and does not interfere with adjacent pulses. SMF fibers can support longer distances and are limited mainly by the amount of attenuation. Refer to MMF.

SN

Sequence Number: A 4 octet field in a Resource Management cell defined by the ITU-T in recommendation I.371 to sequence such cells. It is not used for ATM Forum ABR. An ATM switch will either preserve this field or set it in accordance with I.371.

SN cell

Sequence Number Cell: A cell sent periodically on each link of an AIMUX to indicate how many cells have been transmitted since the previous SN cell. These cells are used to verify the sequence of payload cells reassembled at the receiver.

SNA

Systems Network Architecture: IBM's seven layer, vendor specific architecture for data communications

SNAP

Standard Network Access Protocol: A version of the IEEE local area network logical link control frame similar to the more traditional data link level transmission frame that lets you use nonstandard higher-level protocols. The Subnet Access Protocol is an Internet protocol that operates between a network entity in the subnet and a network entity in the end system and specifies a standard method of encapsulating IP datagrams and ARP messages on IEEE networks.The SNAP entity in the end system makes use of the services of the subnet and performs three key functions: data transfer, connection management, and quality of services selection.

SNC

Subnetwork Connection: In the context of ATM, an entity that passes ATM cells transparently, (i.e., without adding any overhead). A SNC may be either a stand-alone SNC, or a concatenation of SNCs and link connections.

SNMP

Simple Network Management Protocol: Originally designed for the Department of Defense network to support TCP/IP network management. It has been widely implemented to support the management of a broad range of network products and functions. SNMP is the IETF standard management protocol for TCP/IP networks.

Start of Header

A transmission control character used as the first character in the heading of an information message. *(from Newton's Telecom Dictionary)*

SONET

Synchronous Optical Network: An ANSI standard for transmitting information over optical fiber. This standard is used or accepted in the United States and Canada and is a variation of the SDH International standard.

Source Route

As used in this document, a hierarchically complete source route.

Source Traffic

A set of traffic parameters belonging to the ATM Traffic Descriptor used during the connection set-up to capture the intrinsic traffic characteristics of the connection requested by the source.

Spanning Tree Algorithm

An algorithm, the original version of whcih was invented by Digital Equipment Corporation, used to prevent logic loops in a bridged network by creating a spanning tree. The algorithm is now documented in the IEEE 802.1d specifications, although the Digital algorithm and the IEEE 802.1d algorithm are not the same, nor are they compatible. When multiple paths exist, says PC Magazine's Frank Derfler, STA lets a bridge use only the most efficient one. If that path fails, STA automatically reconfigures the network to make another path become active, sustaining network operations. This algorithm is used mostly by local bridges; it is not economical for use over leased telephone circuits connecting remote bridges.[1]

SPE

SONET Synchronous Payload Envelope. The SONET frame format is divided into two main areas: Synchronous Payload Envelope (SPE) and Transport Overhead (TOH). The SPE contains the information being transported by the frame.

1.Newton's Telecom Dictionary

Split System

A switching system which implements the functions of more than one logical node.

SPTS

Single Program Transport Stream: An MPEG-2 Transport Stream that consists of only one program.

SR

Source Routing: A bridged method whereby the source at a data exchange determines the route that subsequent frames will use.

SRF

Specifically Routed Frame: A Source Routing Bridging Frame which uses a specific route between the source and destination.

SRT

Source Routing Transparent: An IETF Bridging Standard combining Transparent Bridging and Source Route Bridging.

SRTS

Synchronous residual Time Stamp: A clock recovery technique in which difference signals between source timing and a network reference timing signal are transmitted to allow reconstruction of the source timing at the destination.

SSCF

Service Specific Coordination Function: SSCF is a function defined in Q.2130, B-ISDN Signaling ATM Adaptation Layer-Service Specific Coordination Function for Support of Signaling at the User-to- Network Interface.

SSCOP

Service Specific Connection Oriented Protocol: An adaptation layer protocol defined in ITU-T Specification: Q.2110.

SSCS

Service Specific Convergence Sublayer: The portion of the convergence sublayer that is dependent upon the type of traffic that is being converted.

SSO

Switch Specific Overhead

SS7

Signal System Number 7: A family of signaling protocols originating from narrowband telephony. They are used to set-up, manage and tear down connections as well as to exchange non-connection associated information. Refer to BISUP, MTP, SCCP and TCAP.

STC

System Time Clock: The master clock in an MPEG-2 encoder or decoder system.

STE

Spanning Tree Explorer: A Source Route Bridging frame which uses the Spanning Tree algorithm in determining a route.

STE

SONET Section Terminating Equipment: SONET equipment that terminates a section of a link between a transmitter and repeater, repeater and repeater, or repeater and receiver. This is usually implemented in wide area facilities and not implemented by SONET Lite.

STM

Synchronous Transfer Module: STM is a basic building block used for a synchronous multiplexing hierarchy defined by the CCITT/ITU-T. STM-1 operates at a rate of 155.52 Mbps (same as STS-3).

STM-1

Synchronous Transport Module 1: SDH standard for transmission over OC-3 optical fiber at 155.52 Mbps.

STM-n

Synchronous Transport Module “n:” (where n is an integer) SDH standards for transmission over optical fiber (OC-'n x 3) by multiplexing "n" STM-1 frames, (e.g., STM-4 at 622.08 Mbps and STM-16 at 2.488 Gbps).

STM-nc

Synchronous Transport Module "n" concatenated: (where n is an integer) SDH standards for transmission over optical fiber (OC-'n x 3) by multiplexing "n" STM-1 frames, (e.g., STM-4 at 622.08 Mbps and STM-16 at 2.488 Gbps, but treating the information fields as a single concatenated payload).

STP

Signaling Transfer Point: A high speed, reliable, special purpose packet switch for signaling messages in the SS7 network.

STP

Shielded Twisted Pair: A cable containing one or more twisted pair wires with each pair having a shield of foil wrap.

STS

Start Synchronous

STS-1

Synchronous Transport Signal 1: SONET standard for transmission over OC-1 optical fiber at 51.84 Mbps.

STS-n

Synchronous Transport Signal “n:” (where n is an integer) SONET standards for transmission over OC-n optical fiber by multiplexing "n" STS-1 frames, (e.g., STS-3 at 155.52 Mbps STS-12 at 622.08 Mbps and STS-48 at 2.488 Gbps).

STS-nc

Synchronous Transport Signal "n" concatenated: (where n is an integer) SONET standards for transmission over OC-n optical fiber by multiplexing "n" STS-1 frames, (e.g., STS-3 at 155.52 Mbps STS-12 at 622.08 Mbps and STS-48 at 2.488 Gbps but treating the information fields as a single concatenated payload).

Sublayer

A logical sub-division of a layer.

Subnet

The use of the term subnet to mean a LAN technology is a historical use and is not specific enough in the MPOA work. Refer to Internetwork Address Sub-Group, Direct Set, Host Apparent Address Sub-Group and One Hop Set for more specific definitions.

Subnetwork

A collection of managed entities grouped together from a connectivity perspective, according to their ability to transport ATM cells.

subNMS

Subnetwork Management System: A Network Management System that is managing one or more subnetworks and that is managed by one or more Network Management Systems.

Summary Address

An address prefix that tells a node how to summarize reachability information.

SUT

System Under Test: The real open system in which the Implementation Under Test (IUT) resides.

SVC

Switched Virtual Circuit: A connection established via signaling. The user defines the endpoints when the call is initiated.

SVCC

Switched Virtual Channel Connection: A Switched VCC is one which is established and taken down dynamically through control signaling. A Virtual Channel Connection (VCC) is an ATM connection where switching is performed on the VPI/VCI fields of each cell.

SVE

SAP Vector Element: The SAP address may be expressed as a vector, (ATM_addr, ATM_selector, BLLI_id2, BLLI_id3, BHLI_id), where:

- ATM_addr corresponds to the 19 most significant octets of a device's 20-octet ATM address (private ATM address structure) or the entire E.164 address (E.164 address structure)
- ATM_selector corresponds to the least significant octet of a device's 20-octet ATM address (private ATM address structure only)
- BLLI_id2 corresponds to an octet in the Q.2931 BLLI information element that identifies a layer 2 protocol •BLLI_id3 corresponds to a set of octets in the Q.2931 BLLI information element that identify a layer 3 protocol
- BHLI_id corresponds to a set of octets in the Q.2931 BHLI information element that identify an application (or session layer protocol of an application)

Each element of the SAP vector is called a SAP Vector Element, or SVE. Each SVE consists of a tag, length, and value field.

SVPC

Switched Virtual Path Connection: A Switched Virtual Path Connection is one which is established and taken down dynamically through control signaling. A Virtual Path Connection (VPC) is an ATM connection where switching is performed on the VPI field only of each cell.

Switched Connection

A connection established via signaling.

Switching System

A set of one or more systems that act together and appear as a single switch for the purposes of PNNI routing.

Symmetric Connection

A connection with the same bandwidth value specified for both directions.

T

TA

Terminal Adapter: Allows existing non-ISDN terminals to operate on ISDN lines. It provides conversion between a non-ISDN terminal device and the ISDN user/network interfaced.

TAXI

Transparent Asynchronous Transmitter/Receiver Interface 100-Mbps ATM physical interface specification based on the FDDI PHY.

Telnet

A program that lets you connect to other computers on the Internet. The process by which a person using one computer can sign of to a computer in another city, state or country. Telnet is the terminal-remote host protocol developed for ARPAnet.Using Telnet you can work from PC as if it were a terminal attached to anther machine by a hard wired line.

T1E1

An ANSI standards sub-committee dealing with Network Interfaces.

T1M1

An ANSI standards sub-committee dealing with Inter-Network Operations, Administration and Maintenance.

T1Q1

An ANSI standards sub-committee dealing with performance.

T1S1

An ANSI standards sub-committee dealing with services, architecture and signaling.

T1X1

An ANSI standards sub-committee dealing with digital hierarchy and synchronization.

TB

Transparent Bridging: An IETF bridging standard where bridge behavior is transparent to the data traffic. To avoid ambiguous routes or loops, a Spanning Tree algorithm is utilized.

TBE

Transient Buffer Exposure: A negotiated number of cells that the network would like to limit the source to sending during startup periods, before the first RM-cell returns.

TC

Transaction Capabilities: TCAP (see below) plus supporting Presentation, Session and Transport protocol layers.

TC

Transmission Convergence: The TC sublayer transforms the flow of cells into a steady flow of bits and bytes for transmission over the physical medium. On transmit, the TC sublayer maps the cells to the frame format, generates the Header Error Check (HEC), sends idle cells when the ATM layer has none to send. On reception, the TC sublayer delineates individual cells in the received bit stream, and uses the HEC to detect and correct received errors.

TCAP

Transaction Capabilities Applications Part: A connectionless SS7 protocol for the exchange of information outside the context of a call or connection. It typically runs over SCCP and MTP 3.

TCP

Transmission Control Protocol: Originally developed by the Department of Defense to support interworking of dissimilar computers across a network. A protocol which provides end-to-end, connection-oriented, reliable transport layer (layer 4) functions over IP controlled networks. TCP performs the following functions: flow control between two systems, acknowledgements of packets received and end-to-end sequencing of packets.

TCP

Test Coordination Procedure: A set of rules to coordinate the test process between the lower tester and the upper tester. The purpose is to enable the lower tester to control the operation of the upper tester. These procedures may, or may not, be specified in an abstract test suite.

TCR

Tagged Cell Rate: An ABR service parameter, TCR limits the rate at which a source may send out-of-rate forward RM-cells. TCR is a constant fixed at 10 cells/second.

TCS

Transmission Convergence Sublayer: This is part of the ATM physical layer that defines how cells will be transmitted by the actual physical layer.

TDF

An ABR service parameter, TDF controls the decrease in ACR associated with TOF. TDF is signaled as TDFF, where TDF = TDFF/RDF times the smallest power of 2 greater or equal to PCR. TDF is in units of 1/seconds.

TDFF

Refer to TDF. TDFF is either zero or a power of two in the range 1/64 to 1 in units of 1/cells.

TDM

Time Division Multiplexing: A method in which a transmission facility is multiplexed among a number of channels by allocating the facility to the channels on the basis of time slots.

TE

Terminal Equipment: Terminal equipment represents the endpoint of ATM connection(s) and termination of the various protocols within the connection(s).

TFTPserver

Trivial File Transfer Protocol: A simplified version of FTP that transfers files but does not provide password protection or user-directory capability.It is associated with the TCP/IP family of protocols.TFTP depends on the connectionless datagram delivery service, UDP.

TLV

Type / Length / Value: A coding methodology which provides a flexible and extensible means of coding parameters within a frame. Type indicates parameter type. Length indicates parameter's value length. Value indicates the actual parameter value.

TM

Traffic Management: Traffic Management is the aspects of the traffic control and congestion control procedures for ATM. ATM layer traffic control refers to the set of actions taken by the network to avoid congestion conditions. ATM layer congestion control refers to the set of actions taken by the network to minimize the intensity, spread and duration of congestion. The following functions form a framework for managing and controlling traffic and congestion in ATM networks and may be used in appropriate combinations.

- Connection Admission Control
- Feedback Control
- Usage Parameter Control
- Priority Control
- Traffic Shaping
- Network Resource Management
- Frame Discard

Available Bit Rate (ABR) Flow Control

TMP

Test Management Protocol: A protocol which is used in the test coordination procedures for a particular test suite.

TNS

Transit Network Selection: A signaling element that identifies a public carrier to which a connection setup should be routed.

TOF

Time Out Factor: An ABR service parameter, TOF controls the maximum time permitted between sending forward RM-cells before a rate decrease is required. It is signaled as TOFF where TOF=TOFF+1. TOFF is a power of 2 in the range: 1/8 to 4,096.

TOFF

Time Out Factor: Refer to TOF.

Topology Aggregation

The process of summarizing and compressing topology information at a hierarchical level to be advertised at the level above.

Topology Attribute

A generic term that refers to either a link attribute or a nodal attribute.

Topology Constraint

A topology constraint is a generic term that refers to either a link constraint or a nodal constraint.

Topology Database

The database that describes the topology of the entire PNNI routing domain as seen by a node.

Topology Metric

A generic term that refers to either a link metric or a nodal metric.

Topology State Parameter

A generic term that refers to either a link parameter or a nodal parameter.

TP-MIC

Twisted-Pair Media Interface Connector: This refers to the connector jack at the end user or network equipment that receives the twisted pair plug.

TPCC

Third Party Call Control: A connection setup and management function that is executed from a third party that is not involved in the data flow.

Trail

An entity that transfers information provided by a client layer network between access points in a server layer network. The transported information is monitored at the termination points.

Trailer

Protocol control information located at the end of a PDU.

Transit Delay

The time difference between the instant at which the first bit of a PDU crosses one designated boundary and the instant at which the last bit of the same PDU crosses a second designated boundary.

Trap

A function performed by switch software to catch or trap errors, changes, failures, or problems with the switch software or hardware. The trap information is sent to a network management station.

Trm

An ABR service parameter that provides an upper bound on the time between forward RM-cells for an active source. It is 100 times a power of two with a range of 100*2-7 to 100*20

TS

Transport Stream: One of two types of streams produced by the MPEG-2 Systems layer. The Transport Stream consists of 188 byte packets and can contain multiple programs.

TS

Traffic Shaping: Traffic shaping is a mechanism that alters the traffic characteristics of a stream of cells on a connection to achieve better network efficiency, while meeting the QoS objectives, or to ensure conformance at a subsequent interface. Traffic shaping must maintain cell sequence integrity on a connection. Shaping modifies traffic characteristics of a cell flow with the consequence of increasing the mean Cell Transfer Delay.

TS

Time Stamp: Time Stamping is used on OAM cells to compare time of entry of cell to time of exit of cell to be used to determine the cell transfer delay of the connection.

TSI

Telecommunications Standards Institute: The primary telecommunications standards organization

TTC

Telecommunications Technology Council: A Japanese standards committee.

TTCN

Tree and Tabular Combined Notation: The internationally standardized test script notation for specifying abstract test suites. TTCN provides a notation which is independent of test methods, layers and protocol.

TTL

Transitor transitor logic

U

UBR

Unspecified Bit Rate: An ATM service category which does not specify traffic related service guarantees. Specifically, UBR does not include the notion of a per-connection negotiated bandwidth. No numerical commitments are made with respect to the cell loss ratio experienced by a UBR connection, or as to the cell transfer delay experienced by cells on the connection.

UCFAD

Universal Cell Frame Assembly/Disassembly

UDP

User Datagram Protocol: This protocol is part of the TCP/IP protocol suite and provides a means for applications to access the connectionless features of IP. UDP operates at layer 4 of the OSI reference model and provides for the exchange of data grams without acknowledgements or guaranteed delivery.

UL

Underwriting Laboratory: A privately owned company that charges manufacturers a stiff tee to make sure their products meet the safety standards which UL itself develops. A UL label on a product has a very specific message. It says the product conforms to the safety standards UL has developed, nothing more. It does not affirm that the product will work.

UME

UNI Management Entity: The software residing in the ATM devices at each end of the UNI circuit that implements the management interface to the ATM network.

Unassigned Cells

A cell identified by a standardized virtual path identifier (VPI) and virtual channel identifier (VCI) value, which has been generated and does not carry information from an application using the ATM Layer service.

UNI

User-Network Interface: An interface point between ATM end users and a private ATM switch, or between a private ATM switch and the public carrier ATM network; defined by physical and protocol specifications per ATM Forum UNI documents. The standard adopted by the ATM Forum to define connections between users or end stations and a local switch.

Unicasting

The transmit operation of a single PDU by a source interface where the PDU reaches a single destination.

UPC

Usage Parameter Control: Usage Parameter Control is defined as the set of actions taken by the network to monitor and control traffic, in terms of traffic offered and validity of the ATM connection, at the end-system access. Its main purpose is to protect network resources from malicious as well as unintentional misbehavior, which can affect the QoS of other already established connections, by detecting violations of negotiated parameters and taking appropriate actions.

Uplink

Represents the connectivity from a border node to an up node.

Upnode

The node that represents a border node's outside neighbor in the common peer group. The upnode must be a neighboring peer of one of the border node's ancestors.

UT

Upper Tester: The representation in ISO/IEC 9646 of the means of providing, during test execution, control and observation of the upper service boundary of the IUT, as defined by the chosen Abstract Test Method.

UTOPIA

Universal Test & Operations Interface for ATM: Refers to an electrical interface between the TC and PMD sublayers of the PHY layer.

UTP

Unshielded Twisted Pair: A cable having one or more twisted pairs, but with no shield per pair.

V

VBR

Variable Bit Rate: An ATM Forum defined service category which supports variable bit rate data traffic with average and peak traffic parameters.

VC

Virtual Channel: Existing with a Virtual Tributary, in the terminology of SONET it is equivalent to a traditional TDM channel. It's just a fancier for a channel, but maintaining the (virtual nomenclature of SONET).

A communications channel that provides for the sequential unidirectional transport of ATM cells.

VCC

Virtual Channel Connection: A concatenation of VCLs that extends between the points where the ATM service users access the ATM layer. The points at which the ATM cell payload is passed to, or received from, the users of the ATM Layer (i.e., a higher layer or ATM-entity) for processing signify the endpoints of a VCC. VCCs are unidirectional.

VCCI

Voluntary Control Council for Interference

VCI

Virtual Channel Identifier: A unique numerical tag as defined by a 16 bit field in the ATM cell header that identifies a virtual channel, over which the cell is to travel.

VCL

Virtual Channel Link: A means of unidirectional transport of ATM cells between the point where a VCI value is assigned and the point where that value is translated or removed.

VCO

Voltage Controlled Oscillator: An oscillator whose clock frequency is determined by the magnitude of the voltage presented at its input. The frequency changes when the voltage changes.

VD

Virtual Destination. Refer to VS/VD.

VF

Variance Factor: VF is a relative measure of cell rate margin normalized by the variance of the aggregate cell rate on the link

Virtual Channel Switch

A network element that connects VCLs. It terminates VPCs and translates VCI values. It is directed by Control Plane functions and relays the cells of a VC.

Virtual Path Switch

A network element that connects VPLs. It translates VPI (not VCI) values and is directed by Control Plane functions. It relays the cell of the VP.

VLAN

Virtual Local Area Network: Work stations connected to an intelligent device which provides the capabilities to define LAN membership.

VMEBUS

VEASA Module European Bus: A 32-bit bus developed by Motorola, Signetics, Mostek, and Thompson CSF. Used widely in industrial, commercial, and military applications with over 300 manufacturers of VMEbus products worldwide.[1]

VP

Virtual Path: A unidirectional logical association or bundle of VCs.

VPC

Virtual Path Connection: A concatenation of VPLs between Virtual Path Terminators (VPTs). VPCs are unidirectional.

1.Newton’s Telecom Dictionary

VPI

Virtual Path Identifier: An eight bit field in the ATM cell header which indicates the virtual path over which the cell should be routed.

VPL

Virtual Path Link: A means of unidirectional transport of ATM cells between the point where a VPI value is assigned and the point where that value is translated or removed.

VPT

Virtual Path Terminator: A system that unbundles the VCS of a VP for independent processing of each VC.

VS

Virtual Scheduling: Virtual Scheduling is a method to determine the conformance of an arriving cell. The virtual scheduling algorithm updates a Theoretical Arrival Time (TAT), which is the "nominal" arrival time of the cell assuming that the active source sends equally spaced cells. If the actual arrival time of a cell is not "too" early relative to the TAT, then the cell is conforming. Otherwise the cell is non-conforming.

VS

Virtual Source. Refer to VS/VD.

VS/VD

Virtual Source/Virtual Destination: An ABR connection may be divided into two or more separately controlled ABR segments. Each ABR control segment, except the first, is sourced by a virtual source. A virtual source implements the behavior of an ABR source endpoint. Backwards RM-cells received by a virtual source are removed from the connection. Each ABR control segment, except the last, is terminated by a virtual destination. A virtual destination assumes the behavior of an ABR destination endpoint. Forward RM-cells received by a virtual destination are turned around and not forwarded to the next segment of the connection.

W

WAN

Wide Area Network: A network which spans a large geographic area relative to office and campus environment of LAN (Local Area Network). WAN is characterized by having much greater transfer delays due to laws of physics.

X, Y, Z

XATOM

Expandable ATM Output Modular Switch

XDF

Xrm Decrease Factor: An ABR service parameter, XDF controls the decrease in ACR associated with Xrm. It is a power of two in range: [0, 1].

Xrm

An ABR service parameter, Xrm limits the number of forward RM-cells which may be sent in the absence of received backward RM-cells. The range is 0-255.

C

Worksheets

2.5 Gbps Switch Configuration Worksheet

The Centillion 1200N is a 2.5 Gbps Switch.

Each ATM switch has unique and definitive configuration requirements that must be met prior to activation. Items such as Hostname, IP Address, and ATM address are required for each switch.

The configuration worksheets in this section are intended to provide a template for these switch requirements. Each configuration worksheet outlines both the switch and individual port configurations, allowing quick look-up during installation and configuration.

These worksheets, although optional, can provide a common source for configuration as well as for future reference.

Switch Configuration

Parameter	Value Setting
Host Name	
NSAP Address (If using PNNI v1.0, see *PNNI Configuration*.)	
ATM IP Address/Subnet Mask	
Ethernet IP Address/Subnet Mask (if applicable)	
Software Version	
Enable Password	
Telnet Password	
Location	
Contact and Phone Number	
Clock Mode (Master/Slave, Port #s)	
Switch PNNI Method (hop-by-hop or source)	
Serial #	

Slot Configuration

Slot	Interface Type (OC-12, OC-3, TAXI, DS-3, etc.)	Serial #
0		
1		
2		
3		

PNNI Version 1.0 Configuration

	Hierarchy Level 1	Hierarchy Level 2	Hierarchy Level 3
Peer Group Leader (Y/N)			
Hierarchy Level (0-104)			
Peer Group Leader Priority (0-255)			

NMS Configuration (if applicable)

NMS Host Name	IP Address/Subnet Mask	MIB Access (Public or Private)	Read-only or Write Access
0			
1			
2			
3			

Port Configuration Worksheet

Port Configurations

Parameter	Port 00	Port 01	Port 02	Port 03
Interface Type (MMF, SMF, UTP5, TAXI)				
Port Name				
UNI or NNI				
Network or User				
VPI - # of bits				
VCI - # of bits				
UNI Version (3.0/3.1/4.0)				
SVC Signaling (Y/N)				
ILMI (Y/N)				
ILMI Address Registration (Y/N)				
ELAN Name (if applicable)				
PNNI or IISP (if applicable)				
Possible Clock Source? (Y/N)				
Internal or External Reachable Address				

Parameter	Port 10	Port 11	Port 12	Port 13
Interface Type (MMF, SMF, UTP5, TAXI)				
Port Name				
UNI or NNI				
Network or User				
VPI - # of bits				
VCI - # of bits				
UNI Version (3.0/3.1/4.0)				
SVC Signaling (Y/N)				
ILMI (Y/N)				
ILMI Address Registration (Y/N)				
ELAN Name (if applicable)				
PNNI or IISP (if applicable)				
Possible Clock Source? (Y/N)				
Internal or External Reachable Address				

Parameter	Port 20	Port 21	Port 22	Port 23
Interface Type (MMF, SMF,UTP5, TAXI)				
Port Name				
UNI or NNI				
Network or User				
VPI - # of bits				
VCI - # of bits				
UNI Version (3.0/3.1/4.0)				
SVC Signaling (Y/N)				
ILMI (Y/N)				
ILMI Address Registration (Y/N)				
ELAN Name (if applicable)				
PNNI or IISP (if applicable)				
Internal or External Reachable Address				

Parameter	Port 30	Port 31	Port 32	Port 33
Interface Type (MMF, SMF, UTP5, TAXI)				
Port Name				
UNI or NNI				
Network or User				
VPI - # of bits				
VCI - # of bits				
UNI Version (3.0/3.1/4.0)				
SVC Signaling (Y/N)				
ILMI (Y/N)				
ILMI Address Registration (Y/N)				
ELAN Name (if applicable)				
PNNI or IISP (if applicable)				
Internal or External Reachable Address				

ELAN Configurations

ELAN Name	LECS Address	LES Address	# of Clients

PVC Configuration Worksheet

Profile Configurations

Profile Name	Traffic Type	PCR	SCR	MBS

Shaper Configurations

Port	Shaper Number (1-8)	Traffic Type	PCR	SCR	MBS

PVC Configurations

Profile Name	Bi or Uni Direc-tional	Input Port	Input VPI	Input VCI	Output Port	Output VPI	Output VCI	Early Packet Discard (Y/N)	UPC Mode (Y/N) - (1-5)

This page is for your notes.