STDX 6000 Hardware Installation Guide

Ascend Communications, Inc.

Product Code: 80006
Revision 04
December 1996

ASCEND COMMUNICATIONS, INC. LIMITED WARRANTY ON HARDWARE

Ascend Communications, Inc. warrants the STDX 6000 against defects in materials and workmanship for a period of one year from the date of shipment. During the warranty period, Ascend will, at its option, repair, replace, or refund the purchase price of any defective product at no additional cost, provided you return it during the warranty period, transportation charges prepaid, to Ascend. You must attach your name, address and telephone number, a description of the problem(s), and a dated proof-of-purchase bearing the serial number of each product returned for warranty service.

This warranty is limited to the original purchaser of the product and is not transferable unless otherwise agreed by Ascend in writing. This warranty does not apply if the product: has been damaged by accident, abuse, misuse or misapplication; has been modified without written permission by Ascend; or if any Ascend serial number has been removed or defaced.

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warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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Ascend Communications Inc. also warrants that the media on which the Software is distributed and the Documentation are free from defects in materials and workmanship. Ascend will replace defective media or documentation, provided you return the item with dated proof of purchase to Ascend within 90 days of the date of delivery.

FEDERAL COMMUNICATIONS COMMISSION WARNING

This device complies with Part 15 of the FCC Rules and Regulations. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must withstand any interference received, including interference that may cause undesired operation.

The STDX 6000 has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules and Regulations. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio and television communications. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at his or her own expense.

Shielded cables must be used with this unit to ensure compliance with the FCC Class A limits.

Do not attempt to repair or modify this equipment. Any repairs to the unit must be performed by Ascend Communications Inc. or a Ascend-authorized representative.

Maintenance Agreements

Ascend offers a comprehensive program to provide hardware support, a 24-hour emergency hotline, overnight parts replacement, and an escalation procedure. Non-contract maintenance services are provided at current time-and-materials rates. For more information, contact Ascend Technical Response Center at 1-800-DIAL-WAN (in the U.S. or Canada) or 0-800-96-2229 (U.K.) or 1-978-952-7299 (all other areas).

Ascend has adopted a maintenance strategy based on customer-initiated requests to the Ascend Technical Response Center. The Ascend Technical Response Center coordinates all customer services, including hardware and software technical support, on-site service requirements, and module exchange and repair.

If the Product Is Damaged

If any portion of the switch is damaged, forward an immediate request to the delivering carrier to perform an inspection of the product and to prepare a damage report. Save the container and all packing materials until the contents are verified.

Concurrently, report the nature and extent of the damage to the Ascend Technical Response Center so that action can be initiated, either to repair or replace the damaged items.

Do not return any items to Ascend until you obtain instructions from a Ascend Technical Response Center representative. Report the problem or deficiency to the Ascend Technical Response Center representative, along with the model, type, and serial number. Upon receipt of this information, the Ascend Technical Response Center will provide you with service instructions, or a Return Authorization Number and shipping information. All items returned under warranty must be shipped to the manufacturer with the charges prepaid.

If Problems Arise

If any of your telephone equipment is not operating properly, you should immediately remove it from your telephone line, as it may cause harm to the telephone network. If the telephone company notes a problem, they may temporarily discontinue service. When practical, they notify you in advance of this disconnection. If advance notice is not feasible, you will be notified as soon as possible. When you are notified, you will be given the opportunity to correct the problem and informed of your right to file a complaint with the FCC.

In the event that repairs are ever needed on this equipment, they should be performed by Ascend Communications Corporation or an authorized Ascend representative. For information contact the Ascend Technical Response Center at 1-800-DIAL-WAN or 1-508-692-2600

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About This Guide

The *Ascend STDX 6000 Hardware Installation Guide* contains all of the procedures you need to successfully set up, install, and test the STDX 6000 hardware configuration. This guide also provides basic troubleshooting solutions for resolving potential problems. The *Ascend STDX 6000 Hardware Installation Guide* is intended for systems integrators and other implementation personnel who are responsible for the installation of the STDX 6000 switch.

What You Need To Know

The procedures in this guide dictate that you understand and follow the safety practices at your site, as well as those identified in this guide.

Before you can configure the switch using the CascadeView NMS software, you must complete all of the hardware installation procedures outlined in this guide. After you finish the hardware installation, refer to the *Ascend Networking Services Technology Overview* if you need information on Ascend's networking services and the technologies used by these services. Then, if you are managing the switch from DOS,

refer to the *Ascend Network Administrator's Guide for CascadeView/DOS* for network configuration instructions. If you are managing the switch from UNIX, refer to the *CascadeView/UX Network Configuration Guide* (for UNIX) for network configuration instructions.

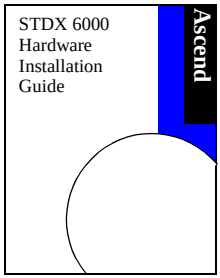
You should work closely with the NMS operator and other systems integration personnel to assure a function installation.

Customer Comments

Customer comments are welcome. Please fill out the Customer Comment form located in the back of this guide and return it to us.

Document Reading Path

The following Hardware Installation and Software Configuration Path outlines the Ascend documentation sequence to follow when installing the STDX hardware and the Network Management System (NMS) software, and for performing various configuration and monitoring tasks.

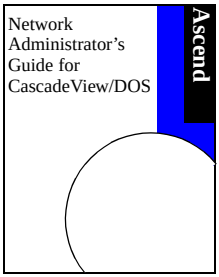


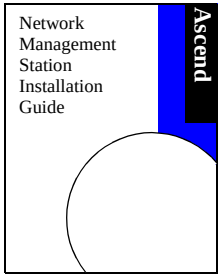
Describes how to install, test, and troubleshoot the hardware of the STDX 6000 switch.

Provides technical information on Ascend's networking services and on the technologies employed by those services.

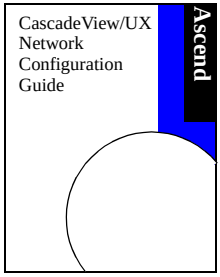
DOS **UNIX**

Explains the DOS version of CascadeView software that's used to monitor and maintain a network.





Explains how to install the UNIX version of CascadeView and its' supporting software packages.



Explains the UNIX version of CascadeView software that's used to monitor and maintain a network.

How To Use This Guide

The following list summarizes the information contained in this guide.

Table 1. Chapter Contents

Read	To Learn About
Chapter 1	Introduces the STDX 6000, and describes the interface, features, and typical applications for this switch.
Chapter 2	Lists the product specifications for the STDX 6000, including environmental and electrical considerations. This chapter also lists the Safety Warnings related to the use of the STDX hardware.
Chapter 3	Describes the prerequisites for installing the hardware, such as unpacking the unit, taking an inventory, gathering the necessary installation items, and verifying the hardware configuration.
Chapter 4	Explains, in a step-by-step format, how to set up and install the STDX 6000.
Chapter 5	Describes how to complete the installation of the STDX 6000 and determine its operating status by viewing the LEDs on the front panel of the Packet Processor and I/O modules.
Chapter 6	Explains the steps involved in installing new modules or replacing existing modules in the STDX 6000, including the Packet Processor, I/O modules, power supply, and cooling fan modules.
Chapter 7	Describes redundancy and explains how to set up and install a redundant partner for the STDX 6000.
Chapter 8	Explains how to determine the operational status of the hardware and, where appropriate, provides general troubleshooting solutions. This chapter also provides information about how to contact the Ascend Technical Response Center for assistance.

Table 1. Chapter Contents

Read	To Learn About
Appendix A	Contains a description of each of the hardware I/O modules that are available for the STDX 6000.
Appendix B	Shows the various forms of cables and details the pin-out assignments for each type of cable.
Appendix C	Contains country-specific regulatory information, including recommended and mandatory requirements of certification authorities. It also contains information on environmental standards compliance for the STDX 6000, as well as an example of the affidavit that has to be filed with the Telco.
Appendix D	Contains the console commands for the STDX 6000, as well as sample screen outputs for each command
Appendix E	Defines the terminology associated with the installation and operation of the STDX 6000.

Related Documents

- *Networking Services Technology Overview*, Product Code: 80001
- *Network Administrator's Guide for CascadeView/DOS*, Product Code: 80004
- *CascadeView/UX Network Management Station Installation Guide*, Product Code: 80014
- *CascadeView/UX Network Configuration Guide*, Product Code: 80017
- *CascadeView/UX Network Diagnostics and Troubleshooting Guide*, Product Code: 80018

To obtain a current product code/price list manual, contact your Ascend Account Manager.

Conventions

This guide uses the following conventions to emphasize certain information, such as user input, screen prompts and output, and menu selections. For example:

Convention	Indicates	Example
`Courier Bold`	User input on a separate line and screen or system output.	`eject cdrom` `Please wait...`
[*bold italics*]	Variable parameters to enter.	**[*your IP address*]**
`<Name of Key>`	A keyboard entry.	`<Return>`
Boldface	User input and screen options in text.	Type **cd install** and ... Select **None** ...
Menu ⇒ Option	Select an option from the menu.	CascadeView ⇒ Logon
Black box surrounding text	Notes and warnings.	See examples below.
Italics	Book titles, new terms, and emphasized text.	*CascadeView/UX Network Management Station Installation Guide*

Provides helpful suggestions or reference to materials not contained in this manual.

Warns the reader to proceed carefully in order to avoid equipment damage or personal harm.

This guide uses many acronyms to describe various networking terms. Use the following list to quickly identify the meaning of the acronyms contained in this guide:

Table 2. Common Acronyms

Acronym	Meaning
ATM	Asynchronous Transfer Mode
CP	Control Processor
CSU	Channel Service Unit
DCE	Data Communications Equipment
DLCI	Data Link Connection Identifier
DSU	Data Service Unit
DTE	Data Terminal Equipment
DXI	Data Exchange Interface
FRAD	Frame Relay Assembler/Disassembler
HDLC	High-Level Data Link Control
IOA	I/O Adapter
IP	Internet Protocol
ISDN	Integrated Services Digital Network
Kbps	Kilobits per Second
LAP	Link Access Protocol
Mbps	Megabits per Second
MIB	Management Information Base
NMS	Network Management Station
NNI	Network-to-Network Interface
OSI	Open Systems Interconnection

Table 2. Common Acronyms (Continued)

Acronym	Meaning
OSPF	Open Shortest Path First
PAD	Packet Assembler/Disassembler
PP	Packet Processor
PPP	Point-to-Point Protocol
PRAM	Parameter RAM
PRI	Primary Rate Interface
PVC	Permanent Virtual Circuit
RFC	Request for Comments
SLIP	Serial Line over Internet Protocol
SMDS	Switched Multimegabit Data Services
SNMP	Simple Network Management Protocol
SVC	Switched Virtual Circuit
UIO	Universal Input/Output
UNI	User-to-Network Interface

1

Overview

This chapter describes the overall architecture of the Ascend STDX Frame Relay/SMDS WAN switches. It also describes the interface, features, and typical applications of these switches.

STDX Product Description

The STDX 6000 is a 6-slot, modular Frame Relay/SMDS WAN platform with various interface modules installed to fit the particular needs of the user. The STDX 6000 also comes with the Operating System already loaded into Flash memory.

Each STDX 6000 consists of a Packet Processor (PP) that interacts with multiple I/O modules to accommodate numerous interface specifications, speeds, and protocols. The hardware platform is based on an 800 Mbps backplane.

The PP provides the background management and static networking functions in support of the real time networking functionality provided by the I/O modules. The I/O modules manage the lowest level of a node's trunk or user interfaces. They perform physical data link (frame) and multiplexing operations on external trunks and user links. All I/O modules are completely interchangeable among the Ascend family of STDX Frame Relay/SMDS WAN switches.

The PP and I/O modules use Intel's i960 RISC processor for high performance packet switching. The STDX uses passive connectors for I/O modules, power supplies, and cooling fan modules to allow for on-line (hot swap) removal and replacement.

The PP module is not hot swappable. removal of the PP module during operation causes the switch to fail and may damage the PP card.

Features

The STDX 6000 provides the following features:

- High performance LAN-WAN internetworking for public and private networks based on industry standards for networking and network management
- Support for broadband technologies, including Frame Relay and SMDS
- Support for a wide spectrum of line speeds ranging from Sub-DS0 to 6 Mbps
- Ease of expansion through modular design
- Permanent Virtual Circuit (PVC) network services
- PVC rate monitoring for usage statistics, network accounting, and design

- Congestion management, based on Open Shortest Path First (OSPF) packet routing for large network support
- Protocol translation features, such as the PPP to RFC 1490 Translation FRAD. (Point-to-Point Protocol to Request for Comments 1490 Translation Frame Relay Assembler/Disassembler.)
- Flexibility with DTE, DCE, and NNI interfaces
- Minimal upgrade and repair time with hot swap and live insertion of all I/O cards
- Optional hot standby configurations providing full redundancy and high availability needed for critical applications
- SMDS Access Server
- QuickPath
- Optimum Trunking

I/O Modules

Table 1-1 lists the supported I/O modules for STDX 6000 switches. This table also identifies the port speeds and interfaces for each type, as well as the port capacity of each module. For more information on each I/O module, refer to Appendix A.

Table 1-1. STDX I/O Modules

I/O Module	Port Speeds	Port Capacity	SMDS	Frame Relay
6-Port Universal IO (V.35, X.21, EIA530)	4.096 Mbps	2 V.35, 2 X.21, and 2 EIA 530	yes	yes
V.35	4.096 Mbps	6 V.35	yes	yes
8- or 18-Port Universal IO (V.24, X.21)[a, b]	128 Kbps	8 V.24, 8 X.21, 18 V.24, or 18 X.21	yes	yes
Channelized T1	1.54 Mbps	1 24-bundle T1 (full or fractional)	yes	yes
Channelized E1	1.984 Mbps	1 30-bundle E1	yes	yes

a. The switch can be configured with up to 60 ports. As a result, a maximum of three 18-port UIO modules can be installed in a STDX switch.

b. The 8- and 18-port UIO modules do not support redundancy.

2

Specifications and Safety Warnings

This chapter provides product-specific information about the STDX 6000, as well as safety warnings relating to the use of this equipment. This chapter outlines the following types of specifications:

- Electronic/Electrical Specifications
- Physical Specifications
- Environmental Specifications

Electronic/Electrical Specifications

The STDX power cord is connected via a 3-prong plug that grounds the switch and polarizes the connection. The ground conductor has to be properly grounded. An AC power cord is supplied by Ascend Communications and packaged in the Accessory Kit. Table 2-1 describes the electronic/electrical specifications for the STDX 6000.

Table 2-1. STDX 6000 Electronic/Electrical Specifications

Feature	Specification
120 VAC applications	3.0 amps max, 300 watts max, 50-60 Hz, single phase
240 VAC applications	1.0 amps max, 300 watts max, 50-60 Hz, single phase
-48 VDC applications	-39 to -76 VDC, 300 watts max

Physical Specifications

Table 2-2 describes the STDX 6000 specifications. Optional redundant power supplies and I/O modules can be selected separately.

Table 2-2. STDX 6000 Physical Specifications

Specification	Description
Frame Relay Standards	ANSI T1.606; T1.617; T1.618; RFC1157; RFC1213; RFC1247
Wide Area Network Port	Frame Relay, HDLC FRAD; UNI-DDCE; UNI-DTE; NNI, PP-RFCI1294 FRAD
Network Management	Simple Network Management Protocol (SNMP); Management Information Base-II (MIBII)
WAN Interfaces	V.35, T1, G.703, EIA449, X.21, RS530, RS530A
Management Interfaces	Ethernet, RS-232, RJ-45
Physical Characteristics	Basic switch includes a minimum of one power module, one fan module, and one Packet Processor module. The STDX 6000 has the capacity for five I/O modules.
Size[a]	17.5 in. wide x 8.75 in. high x 11.25 in. deep
Weight	50 lbs. max
Thermal Dissipation	300 watts max, 512 BTU/hr.

a. Depth size does not include cables.

Environmental Specifications

Table 2-3 describes the environmental requirements for selecting an installation site for the STDX 6000.

Table 2-3. STDX 6000 Environmental Specifications

Characteristic	Requirement
Ambient Operating Temperature	0°C to +49°C
Relative Humidity	10% to 95% (non-condensing)
Operating Altitude	to 10,000 feet
Ambient Storage Temperature	-40°C to +65°C, 95% relative humidity
Storage Altitude	-1,000 to +30,000 feet

The STDX 6000 should also be installed in an area that allows the following clearances for the chassis:

- A minimum of 6 in. (15 cm) at the back panel (for cable routing)
- A minimum air flow space of 3 in. (8 cm) on both sides of the chassis

Product Information and Warnings

This equipment is approved only when operated in the following environment:

Temperature Range	0° to 49°C
Humidity	10-90% (noncondensing)
Atmospheric Pressure	10,000 feet (3050 meters)
Power Input Range	100 to 240 VAC, 50/60 Hz, or -48 VDC

A readily accessible disconnect device must be provided in the fixed wiring for a DC power supply. It must be suitable for the rated voltage and current specified.

Safety Warnings

1. This equipment must be connected to a protective ground in accordance with the instructions provided in this guide. Improper grounding may result in an electrical shock.

2. Interconnection directly, or by way of other apparatus, to ports marked “SAFETY WARNING - SEE INSTRUCTIONS FOR USE” with other ports (marked or unmarked) may produce hazardous conditions on the network. Seek advice from a competent engineer before attempting to make such a connection.

3. The ports marked “SAFETY WARNING - SEE INSTRUCTIONS FOR USE” do not provide isolations sufficient to satisfy the requirements of BS6301; therefore, any apparatus connections to these ports should have either been approved to BS6301 or previously evaluated against British Telecommunications PLC (Post Office) Technical Guides 2 or 26, and given the proper permission. Attachment for any other usage will invalidate any approval given to this apparatus.

4. This equipment does not provide safety isolation between any port that is connected to a digital network termination point and any other port to which terminal equipment may be connected.

5. The STDX is designed for Class A use only. Do not attempt to use this equipment in a domestic environment, which requires Class B distinction. The STDX will cause interference with domestic products.

This unit has more than one power supply cord. To avoid electrical shock, disconnect the appropriate power supply cord prior to servicing.

Power Cord Requirements

Table 2-4 outlines the requirements, by country, for the plug type and ratings for power cords. Note that the other end of the power cord must be terminated with an IEC 320 receptacle.

Table 2-4. Power Cord Requirements

Country	Power Cord Type
USA and Canada	NEMA 5-15 15A/125 VAC
U.K.	BS 1363 10A/240 VAC
Australia	AS 3112 10A/240 VAC
Japan	JIS 8303 15A/125 VAC
Switzerland	SEV 1011 10A/220-240 VAC
Germany	AS 3112 10A/240 VAC

The 75Ω G.703 (E1) interface cannot be connected to cabling which would be required by BS6701: Part 1: 1986 to be equipped with over voltage protection. Bit integrity is maintained across the apparatus with 0 dB gain/loss through switch.

Canadian IC CS-03 Requirements

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements documents. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, user 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. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to 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 precaution may be particularly important in rural areas.

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

To contact an authorized Ascend representative in Canada, call: (613) 566-7039.

FCC Part 68 General Information

Read the following FCC Part 68 information before you connect the AX 800/1600 to the public telecommunications network.

- This equipment complies with Part 68 of the FCC rules. On the back of this equipment is a label that contains (among other information) the FCC registration number and ringer equivalence number (REN) for this equipment. If requested, this information must be provided to the telephone company.
- This equipment uses the following USOC jacks as defined in Table 2-5.

Table 2-5. STDX 6000 FCC Information

Type of Interface	USOC Jack Connector	Service Code	Facility Code
1.544 Mbps Superframe format (SF) without line power	RJ-48C	6.0N	04DU9-BN
1.544 Mbp Superframe format (SF) and B8ZF without line power	RJ-48C	6.0N	04DU9-DN
1.544 Mbp ANSI ESF without line power	RJ-48C	6.0N	04DU9-1KN
1.544 Mbp ANSI ESF and B8ZF without line power	RJ-48C	6.0N	04DU9-1SN

- An FCC compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant.
- This equipment cannot be used on telephone company-provided coin service. Connection to Party Line Service is subject to state tariffs.
- If this 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 isn't 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 could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service.
- If trouble is experienced with this equipment, please contact Ascend Communications for repair and warranty information. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.
- It is recommended that the customer install an AC surge arrestor in the AC outlet to which this device is connected. This is to avoid damaging the equipment caused by local lightning strikes and other electrical surges.

FCC and Telephone Company Procedures and Requirements

In order to connect this system to the network, the local operating company must be provided with the registration number of this equipment, and the proper connections must be ordered.

To order the proper service, provide the telephone company with the following information:

- Quantities and USOC numbers of the required jacks
- Sequence in which the trunks are to be connected
- Facility interface codes by position
- Ringer equivalence number or service code, as applicable, by position

Radio Frequency Interference

The AX 800/1600 switch is designed for Class A use only. Do not attempt to use this equipment in a domestic environment, which requires Class B distinction. These switches cause interference with domestic products.

In accordance with FCC Part 15 Subpart B requirements, changes or modifications made to this equipment not expressly approved by Ascend Communications Corporation could void user's authority to operate this equipment.

This equipment produces electromagnetic energy at radio frequencies and, if not installed and operated in accordance with the manufacturer's instructions as contained in this document, could cause interference to radio communications and/or interfere with the operation of other RF devices. The equipment has been tested and found to comply with the limits for a Class A Computing Device pursuant to Subpart B of Part 15 of the FCC Rules, which are designed to provided reasonable protection against

such interference when the equipment is operated in a commercial environment. Operation of the equipment in a residential area may cause interference. Should this occur, the user may be required to discontinue operation of the equipment, or take other such measures as may be adequate to rectify the condition at the user's expense.

If Problems Arise

If any of your telephone equipment is not operating properly, you should immediately remove it from your telephone line, as it may cause harm to the telephone network. The telephone operating company must be notified before removal of equipment connected to 1.544 Mbps digital services. If the telephone company notes a problem, they may temporarily discontinue service. When practical, they will notify you in advance of this disconnection. If advance notice is not feasible, you will be notified as soon as possible. When you are notified, you will be given the opportunity to correct the problem and informed of your right to file a complaint with the FCC.

In the event repairs are ever needed on this equipment, they should be performed by Ascend Communication or an authorized representative of Ascend Communication. You can contact the Technical Response Center 24 hours a day, 7 days a week at:

1-800-DIAL-WAN or **1-508-952-7299**

3

Preparing for the Installation

This chapter describes the components in the STDX 6000 hardware package and corresponding Accessory Kit, and outlines the preparations and prerequisites for installing the switch.

Unpacking the Switch

The STDX switch is delivered in a protective shipping carton. Accessory items are either included in the same carton or shipped in a separate Accessory Kit.

When you open the carton, if the switch or any enclosed items appear to be damaged, refer to “If the Product Is Damaged” on page v.

When you unpack the switch, do the following:

1. Remove and save all enclosed packing materials in case you need to repack the switch for relocation at a later date.
2. Check the contents of the carton against the items listed on the packing slip.

Unpacking the Accessory Kit

Unpack the accessories and check the contents against the items listed on the packing slip. The accessory items vary with each order.

The following *required* items are shipped with each STDX 6000 order:

- RS-232 shielded console cable (RJ-48 to DB-9) for connecting the switch to a PC
- Modem to Serial Interface cable (RJ-48 to DB-25) for connecting the switch to a modem
- DB-9 to DB-25 Adapter for connecting the switch to a SPARCstation, or console terminal that does not have a 9-pin connector
- Power cord (AC only)
- *STDX 6000 Hardware Installation Guide*, Revision 04 (Product Code 80006)
- *Network Administrator's Guide for CascadeView/DOS*, Revision 02 (Product Code 80004)
- (UNIX) CascadeView/UX Documentation Set (Product Code: 80019) includes:
  CascadeView/UX Network Management Installation Guide, 80014
  CascadeView/UX Network Configuration Guide, 80017
  CascadeView/UX Diagnostics and Troubleshooting Guide, 80018
- *Cascade Networking Services and Technology Overview*, Revision 03 (Product Code 80001)

The following *optional* accessory items are shipped as ordered:

- CascadeView/DOS (Network Management software for DOS), or CascadeView/UX (Network Management software for UNIX)
- I/O module-specific cables
- Ethernet Adapter card
- Ethernet cable
- Dial Modem

Selecting the Installation Site

Select the site for your STDX 6000 installation carefully, keeping in mind that the switch requires proper ventilation and all cables attach to the back of the switch. Also, read and follow the environmental and electrical requirements outlined in Chapter 2.

You can rack mount the STDX 6000 in a standard 19- or 23-inch wide equipment cabinet, or place it on a flat surface as a free-standing switch. (Refer to Chapter 4 for the appropriate set up instructions.)

Determining the Setup

The items you need to install in the switch may vary according to the connection method that you use for setup. You can choose from one of these following four connection methods described in Chapter 4:

- "Direct Ethernet Method" on page 4-8
- "Indirect Ethernet Method" on page 4-9
- "Using a SLIP Connection" on page 4-10
- "Using a Management DLCI Connection" on page 4-12

The items needed for setup also depend on which of the following two methods you will use to download the initial software configuration install script:

Using the CascadeView software — Requires you to connect either a direct or asynchronous dial-up link between the NMS serial port and the STDX Serial Management Port on the PP. Using this method, the configuration script is generated within CascadeView and then downloaded from the NMS to the switch.

Using a Terminal Emulator — Requires you to connect an ASCII/VT100 console terminal, or equivalent terminal emulator, to the Serial Management Port on the PP. You can make this connection directly, or you can make the connection remotely using an asynchronous dial-up link. The ASCII/VT100 terminal console can then be used to invoke the install script from the switch, prompting you for all information needed to enable the switch to communicate with the NMS.

Gathering the Setup Items

To install the STDX 6000 hardware configuration, you need the following items:

- (Optional) An ASCII/VT100 console terminal or equivalent that runs at 9600 bps and has the ability to download software using either PROCOMM Plus for Windows or Windows Terminal.exe (on DOS platform), or using TIP (on UNIX platform).
- RS-232 shielded console cable supplied by Ascend, for connecting the console terminal to the switch. (See Appendix B for a diagram of this cable.)
- Modem to Serial Interface cable supplied by Ascend, for connecting the switch to a modem.
- (Optional) An Ethernet transceiver or LAN connection for connecting the switch to the NMS, if the switch is to be used as the gateway to the NMS.
- A flathead screwdriver.
- For UNIX platforms, you need the *CascadeView/UX Network Management Station Installation Guide* and the *CascadeView/UX Network Configuration Guide* (for UNIX). For DOS platforms, you need the *Network Administrator's Guide for CascadeView/DOS.*

Checking the Configuration

The STDX 6000 is delivered to you with the OS already loaded into Flash memory. Before installing the STDX, check the I/O modules in the back of the switch to verify the switch is configured as ordered. Figure 3-1 shows an example of a STDX 6000 configuration.

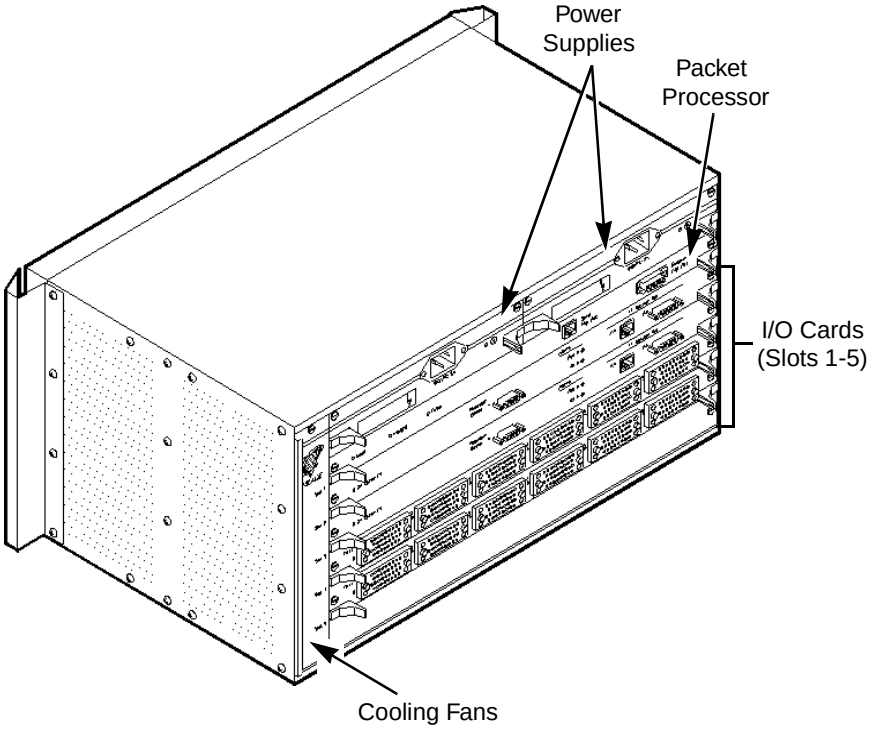


Figure 3-1. Back View of the STDX 6000

The top slot in the switch can only house the Packet Processor. The STDX 6000 has five IO slots available. All slots in the switch require occupation for proper air flow; therefore, unused slots contain blank filler modulees.

The cable connectors and power supply inlets are also located at the back of the switch.

What's Next

Once you finish unpacking the STDX 6000 hardware and accompanying Accessory Kit, have gathered the necessary items, and have checked the hardware configuration, you are ready to begin installing the switch. Proceed to Chapter 4, "Installing the STDX 6000", for detailed step-by-step installation instructions.

4

Installing the STDX 6000

This chapter provides step-by-step instructions for setting up and installing the STDX 6000 either as a free-standing switch or as a rack-mounted switch. Before you use the instructions in this chapter, verify that the following steps are complete:

- ☑ Unpacked the switch
- ☑ Unpacked the Accessory Kit
- ☑ Selected the installation site
- ☑ Determined the setup that you will use
- ☑ Gathered the setup items
- ☑ Checked the hardware configuration

Refer to Chapter 3 for more information about how to perform any of these steps.

Setting Up the Switch

The STDX 6000 can be placed on a flat surface as a free-standing switch, or rack-mounted into a standard 19- or 23-inch wide equipment cabinet.

As a Free-Standing Switch

If you choose to place the switch on a flat surface as a free-standing switch, choose a location that allows for current and future cabling considerations. Keep in mind that all cables attach to the back of the switch. Also, ensure the setup location meets with the ventilation requirements outlined in Chapter 2.

As a Rack-Mounted Switch

If the switch is to be rack-mounted, it must have a mounting bracket installed on each side of the switch. There are three positions available on the switch for installing the mount brackets: front mount, mid-mount, or rear mount. The switch is delivered with mount brackets installed as ordered, but their position can be changed as needed.

The rack-mount spacing meets IEC 297-2 and ANSI/EIA-RS-310C standards.

Figure 4-1 shows the three possible positions to install the mount brackets.

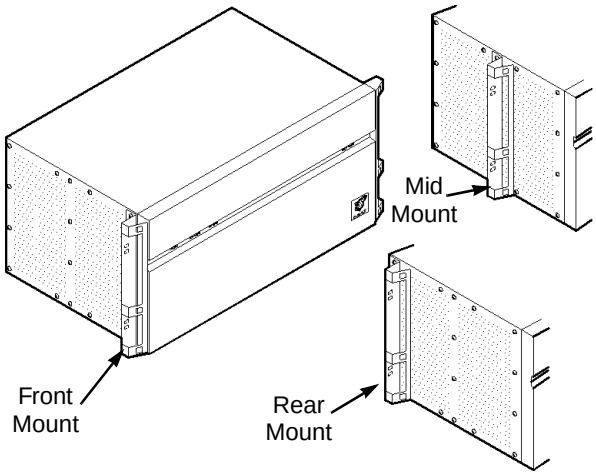


Figure 4-1. Positioning and Installing Mount Brackets

Changing the Position of the Mounting Brackets

To change the position of the mount brackets on the switch:

1. Using a *#2* Phillips screwdriver, remove the screws from each of the mount brackets and remove the brackets from the switch.
2. Set the mount brackets aside and re-install the screws into the switch.
3. Locate the desired position for brackets (front mount, mid-mount, or rear mount), then use a *#2* Phillips screwdriver to remove the screws located in that position.
4. Place the mount bracket onto the switch by lining up the screw holes on the mount bracket with the screw holes on the switch.
5. Use a *#2* Phillips screwdriver to install the screws into the mount bracket and tighten them onto the switch.

Failure to use the proper screws may damage the switch.

Rack Mounting the Switch

Complete the following steps to rack-mount the switch into the standard 19- or 23-in. wide equipment cabinet. Ascend recommends the use of a hand lift or a minimum of two installers for raising and securing the switch into the equipment cabinet.

Installation into a 23-in. cabinet requires the use of optional adapter brackets (Product Code 90009).

1. Carefully raise the switch to the desired installation height in the equipment cabinet.
2. Line up the screw holes on each of the mount brackets with the screw holes on each side of the equipment cabinet.
3. Using a *#2* Phillips screwdriver, install two truss head screws of the appropriate size through each of the mount brackets on the switch into the screw holes on the equipment cabinet.
4. Verify that the switch is securely attached to the equipment cabinet.

Setting Up the Network Management Station

Connect the switch in one of the following ways:

- Connect the switch to a PC or Sun SPARCstation to serve as the gateway to the Network Management Station (NMS).
- Connect the switch to an ASCII/VT100 terminal emulator running either ProComm for Windows or Terminal.exe (DOS platform), or running TIP (UNIX platform), for use in downloading the install script (see Figure 4-2).

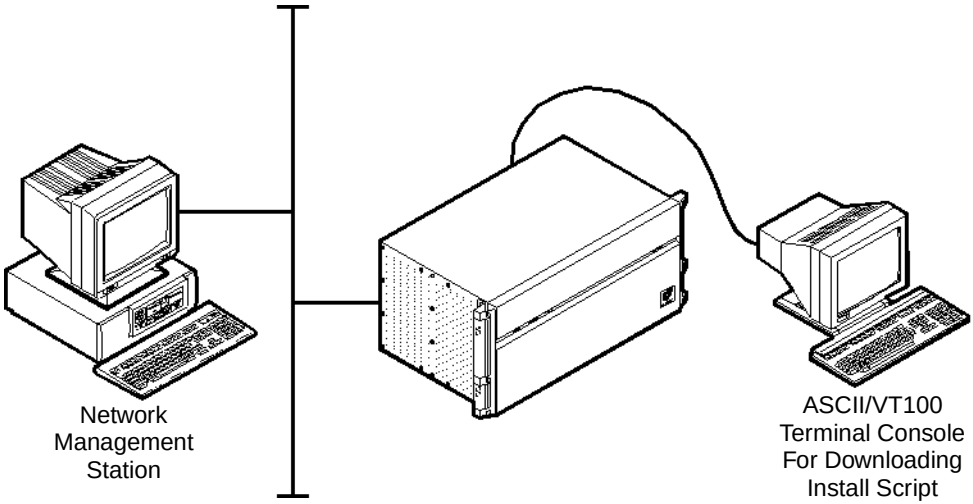


Figure 4-2. STDX Connection to NMS and Console Terminal

For instructions on how to install the operating system software and the network management software for use in configuring, monitoring, and controlling the Ascend network, refer to the Network Administrator's Guide for CascadeView/DOS *or the* CascadeView/UX Network Management Station Installation Guide *(for UNIX).*

If the STDX that you are installing is to be used as the gateway to the NMS, read and follow the instructions in this section, starting with "Choosing a Connection Method"; otherwise, proceed to "Setting up the Console" on page 4-13 for instructions on setting up the terminal for use in downloading the install script.

The PC or SPARCstation(s) you are using for the NMS should be solely dedicated for that purpose. Using the NMS hardware for other tasks may hinder the performance of the network management functions.

Prior to connecting the NMS to the gateway switch, refer to the *CascadeView/UX Network Management Station Installation Guide* (UNIX) or the *Network Administrator's Guide for CascadeView/DOS* for NMS hardware and software requirements.

Choosing the Connection Method

There are four different ways to connect the NMS to the STDX 6000:

- Direct Ethernet
- Indirect Ethernet
- Serial Line Over Internet Protocol (SLIP)
- Management Data Link Connection Identifier (DLCI) Link

Ascend recommends either direct or indirect Ethernet as the primary connection method from the NMS to the switch. Should the primary connection method fail, SLIP configuration is useful as a backup for network management.

Figure 4-3 through Figure 4-6 show the basic structure of the four connection methods. For instructions on how to make the actual connections, refer to "Connecting the NMS" on page 4-7.

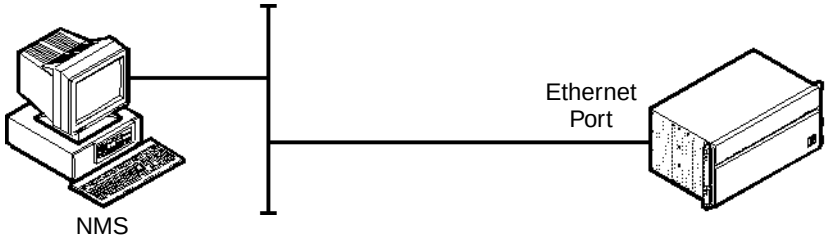


Figure 4-3. Direct Ethernet Method

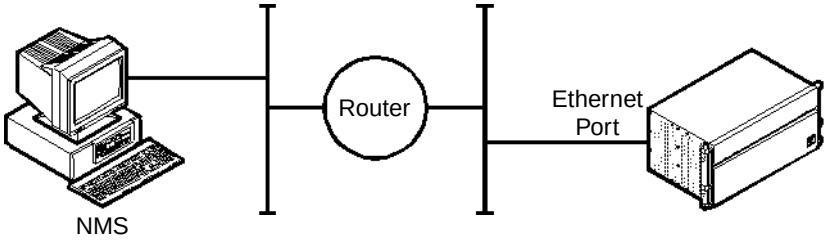


Figure 4-4. Indirect Ethernet Method

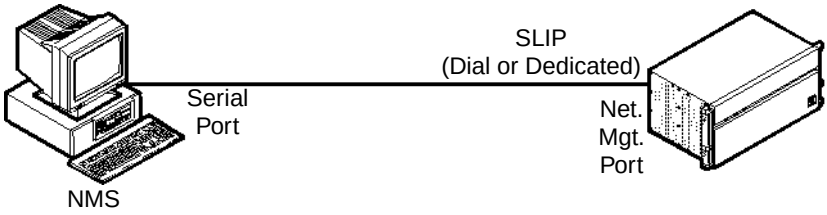


Figure 4-5. Serial Line Over Internet Protocol (SLIP) Method

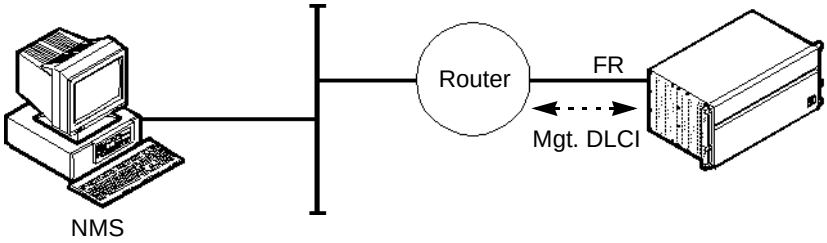


Figure 4-6. Management Data Link Connection Identifier (DLCI) Link Method

Connecting the NMS

The next sections describe how to connect the switch to the NMS using each of the connection methods described in “Choosing the Connection Method” on page 4-6.

Using an Ethernet Connection

There are two ways to make an Ethernet connection from the switch to the NMS

Direct Ethernet — Connecting the switch and the NMS to the same LAN. This setup provides the greatest interface speed and ease-of-use.

Indirect Ethernet — Connecting the switch and the NMS to separate LANs, having connectivity through a router.

In either case, the optional 15-pin Ethernet port must be installed on the PP to make the connection.

Direct Ethernet Method

Figure 4-7 illustrates how to make a direct Ethernet connection from the switch to the NMS.

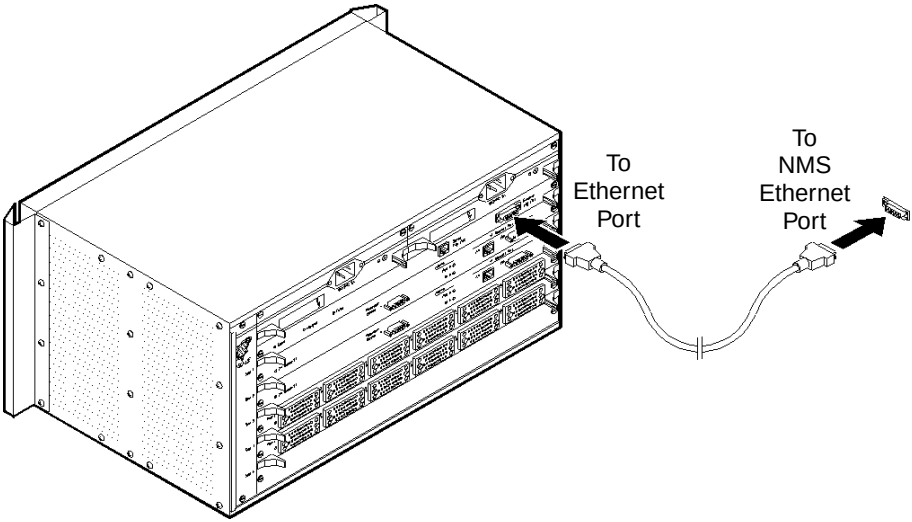


Figure 4-7. Direct Ethernet Connection from the Switch to the NMS

To connect the NMS to the switch using a direct Ethernet connection

1. Connect the Ethernet to the 15-pin Ethernet port on the STDX. The Ethernet port is located on the Packet Processor.
2. Connect the NMS console Ethernet cable to the same LAN.
3. Ensure the Ethernet transceivers are properly connected to the network.

Indirect Ethernet Method

Figure 4-8 illustrates how to make an indirect Ethernet connection from the switch to the NMS.

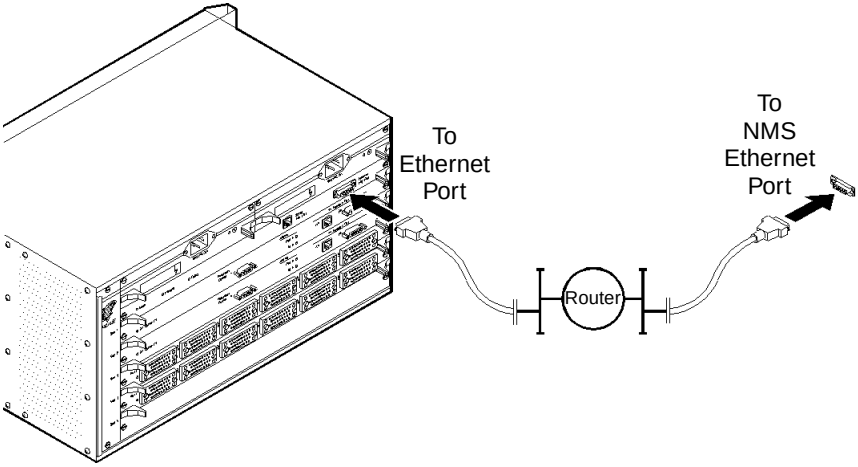


Figure 4-8. Indirect Ethernet Connection from the Switch to the NMS

To connect the NMS to the switch using an indirect Ethernet connection:

1. Connect the Ethernet from the 15-pin Ethernet port on the STDX Packet Processor to the LAN that has connectivity to the NMS LAN via a router.
2. Connect the NMS console Ethernet cable to the local LAN.
3. Ensure the Ethernet transceivers are properly connected to the network.

Using a SLIP Connection

The SLIP method of connection enables the NMS to monitor the network either directly via a serial line to a switch or indirectly from a modem link or asynchronous PAD connection.

There are two ways to make a SLIP connection from the switch to the NMS:

Direct SLIP — Using a DTE crossover cable connection from the switch to the NMS.

Dial SLIP — Using a modem connection with a straight-through cable from the modem to the switch and from the modem to the NMS.

Direct SLIP Method

Figure 4-9 shows how to make the SLIP connection from the switch to the NMS using the direct SLIP method.

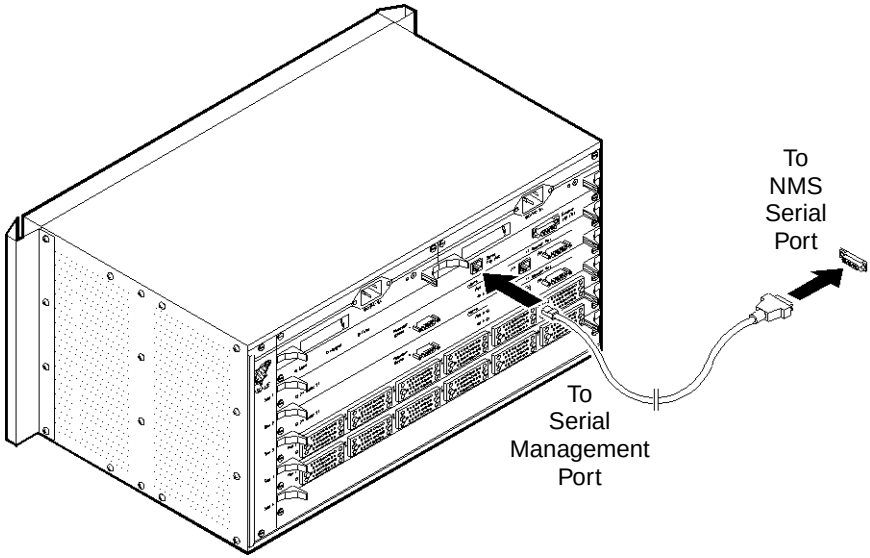


Figure 4-9. Direct SLIP Connection from the Switch to the NMS

To connect the NMS to the switch using a direct SLIP connection:

1. Connect the RJ-48C end of the Serial Interface DTE crossover cable (RS-232 Shielded Console Cable) to the STDX Serial Management Port on the Packet Processor. Refer to Appendix B, Figure B-4 for a diagram of this cable.

2. Connect the DB-9 end of Serial Interface DTE crossover cable to the serial port on the NMS.

Dial SLIP Method

To use a dial SLIP connection, configure the modem for 9600 bps, 8 bit, no parity, with RTS-CTS hardware flow control. *Do not use Xon/Xoff flow control.*

Figure 4-10 shows how to make the SLIP connection from the switch to the NMS using the dial up SLIP method.

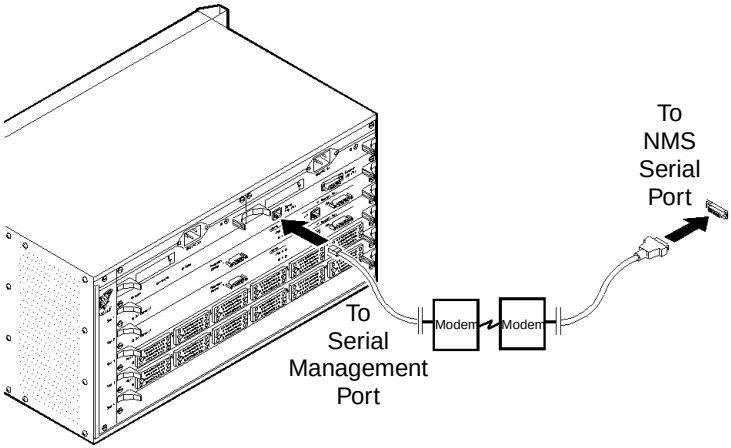


Figure 4-10. Dial SLIP Connection from the Switch to the NMS

To connect the switch to the NMS using a dial up SLIP connection:

1. Connect the DB-25 end of the RS-232 PP1-DCE cable to the modem on the switch side. Refer to Appendix B, Figure B-3 for a diagram of this cable.

2. Connect the RJ-48C end of the RS-232 PP1-DCE cable to the STDX Serial Management Port located on the Packet Processor.

Using a Management DLCI Connection

A Management DLCI connection enables the NMS to manage the network through a Permanent Virtual Circuit (PVC) of a router that is connected to the switch through a Frame Relay UNI-DCE connection.

Figure 4-11 shows how to make a Management DLCI connection from the switch to the NMS.

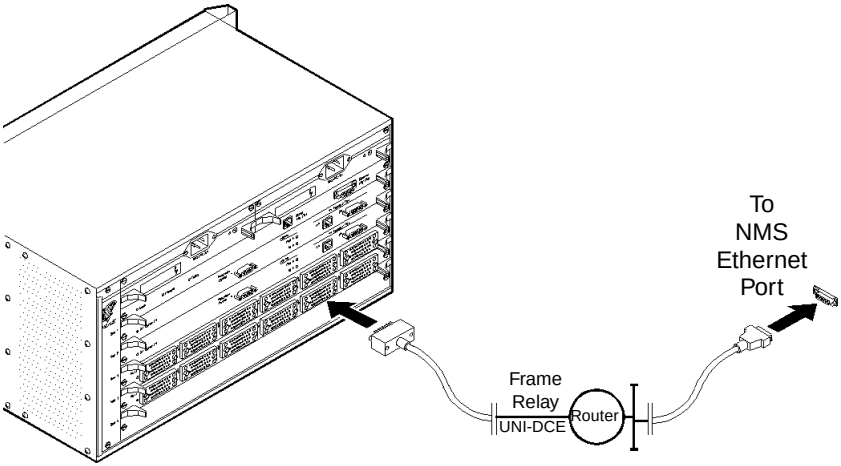


Figure 4-11. Management DLCI Connection from the Switch to the NMS

To connect the switch to the NMS using a Management DLCI connection:

1. Connect the NMS to the LAN that has a router connection to the switch via a Frame Relay UNI connection.
2. Configure the NMS to use a DLCI connection. For instructions, refer to the *Network Administrator's Guide for CascadeView/DOS* or the *CascadeView/UX Network Configuration Guide* (for UNIX).
3. Configure the switch to route management traffic through the designated Management DLCI.
4. Configure the router with a "static route" to the Ascend network.

Setting up the Console

After you connect the NMS to the switch, you must set up the console terminal to download the install script. The install script download enables the switch to communicate with the NMS. The console that you use to download the install script must meet the following minimum configuration requirements:

- An ASCII/VT100 terminal emulator running either PROCOMM for Windows or Terminal.exe (DOS platform), or running TIP (UNIX platform)
- Asynchronous full-duplex transmission/reception
- Configured for 9600 bps, 8 data bits, 1 stop bit, no parity

The Serial Management Port on the switch allows an operator to access the console to perform diagnostics and other management commands via an asynchronous terminal or computer running a terminal emulation program (such as Terminal.exe, PROCOMM Plus for Windows, or TIP). The port is also used for the initial ASCII text configuration download from the PC to the Ascend switch.

Connecting the Console

Figure 4-12 illustrates the connection from the switch to the console terminal.

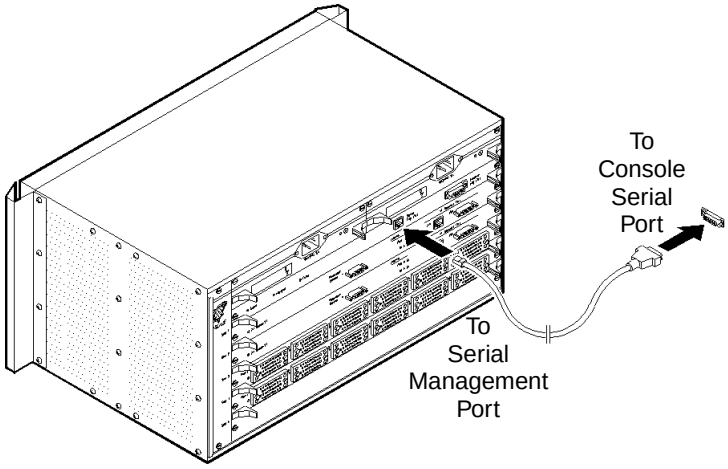


Figure 4-12. Console Connection to the STDX

To connect the console to the switch:

1. Connect the DB-9 end of the Serial Interface DTE (RS-232 Shielded Console) crossover cable to the console's serial port. Refer to Appendix B, Figure B-4 for a diagram of this cable.

2. Connect the RJ-48C end of the DTE crossover cable to the STDX Serial Management Port on the Packet Processor.

For a remote connection from the console to the switch, use a straight through cable.

You can now proceed to Chapter 5 to complete the installation of your STDX 6000.

5

Determining the Operating Status

This chapter describes how to power up the STDX 6000 and determine its operating status. Before you do this, verify that the following steps are complete:

- ☑ Set up the switch hardware (either as a free standing or rack-mounted switch)
- ☑ Set up the Network Management Station (NMS)
- ☑ Connect the switch to the NMS
- ☑ Set up the console terminal
- ☑ Connect the switch to the console terminal

Refer to Chapter 4 for more information about any of these steps.

Completing the Hardware Installation

To complete the installation of your STDX 6000:

1. Verify that the correct power source is available for the power supply. (Refer to Chapter 2 for power supply requirements.)

2. Attach the power cord to the switch as follows:

   AC power supply — Attach the main power cord to the switch by plugging the AC power cord into the receptacle on the power supply (at the back of the switch). If you have a redundant power supply, plug a second power cord into the receptacle on the redundant power supply.

   48 VDC power supply — Attach the power cord as follows:

   a. Using a 12 AWG two-wire cable with two *#8* forked terminals, connect the negative terminal to the -48V connector on the terminal block, and connect the positive terminal to the RET connector on the terminal block (see Figure 5-1).

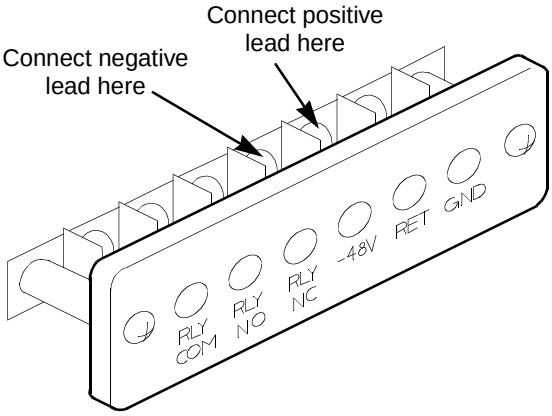


Figure 5-1. -48 VDC Power Supply Terminal Block

   b. Using a *1/8-in.* flathead screwdriver, tighten the connector screws to secure the terminals.

   c. If you have a redundant power supply, repeat these steps for the second power supply.

3. Plug the power cord(s) into the wall outlet.

For -48 VDC power supplies, you must also turn on the power supply switch after plugging in the power cord.

The following events should occur:

- The switch performs a series of self checks and initialization.
- During power up diagnostics, all LEDs (Good, Marginal, Failed) on the front of the switch flash continually. The green Good LED begins to flicker as the Flash Operating System is decompressed into memory.
- After the Flash OS download completes, the Good LEDs on the front of the switch and on the PP card should both remain solid green.
- Each I/O module's LED should also remain solid Green to indicate that the card has a configuration loaded and is operational. (A blinking LED on an I/O module indicates the switch is in power-up diagnostics or is initializing.)

If any other condition exists, refer to Chapter 8, "Troubleshooting" for further instructions.

The STDX is delivered with the OS already loaded into Flash memory. If the OS appears to be lost or damaged, consult a Ascend Technical Response Center representative (see page 8-4) and refer to the Ascend Network Administrator's Guide for CascadeView/DOS *or the* CascadeView/UX Diagnostic and Troubleshooting Guide (*for UNIX) for instructions.*

Displaying the Diagnostic Results

To view the status of power up diagnostics, a console must be connected to the Serial Management Port on the switch and the manual mode jumper must be on. Refer to "Setting up the Console" on page 4-13 for instructions on connecting the console, and refer to the section "Bringing Up the Switch With the Manual Mode Jumper" in the *Cascade Network Administrator's Guide for CascadeView/DOS* or the *CascadeView/UX Diagnostic and Troubleshooting Guide* (for UNIX) for instructions on setting the jumper.

What's Next

After you complete the hardware installation, you must configure the switch so that it can communicate with the NMS. If you are using a DOS console to download the configuration to the switch, either PROCOMM for Windows or Terminal for Windows must be installed on the console in order to enter or download the install script. If you are using a UNIX console, TIP (from Solaris) must be installed on the console in order to enter or download the install script. For instructions, refer to the *Cascade Network Administrator's Guide for CascadeView/DOS* or the *CascadeView/UX Network Configuration Guide* (for UNIX).

6

Installing or Replacing Modules

This chapter describes the considerations and steps involved in inserting additional modules or replacing existing or defective modules in the STDX 6000. In addition, this chapter describes the following hardware modules:

- Packet Processor
- I/O modules
- Power supplies
- Cooling fans

Installation and Replacement Considerations

The STDX enables “hot swap” installation and replacement of most modules without having to power down the switch. However, if the switch is not currently operational, you can power down the switch as an extra precautionary measure.

The PP can never be replaced while the switch is operational. However, all other modules (I/O modules, power supplies, and cooling fan) can be hot swapped. Hot swapping does not adversely affect the operation of other modules in the switch.

> ⚠ *Never attempt to remove or install modules without first using appropriate static guard measures.*

> ⚠ *Never attempt to repair parts or modules yourself. Return all defective modules to Ascend for repair. Only Ascend-qualified service representatives are authorized to repair parts.*

Replacing the Packet Processor

Figure 6-1 shows the procedure for removing the PP from the STDX 6000.

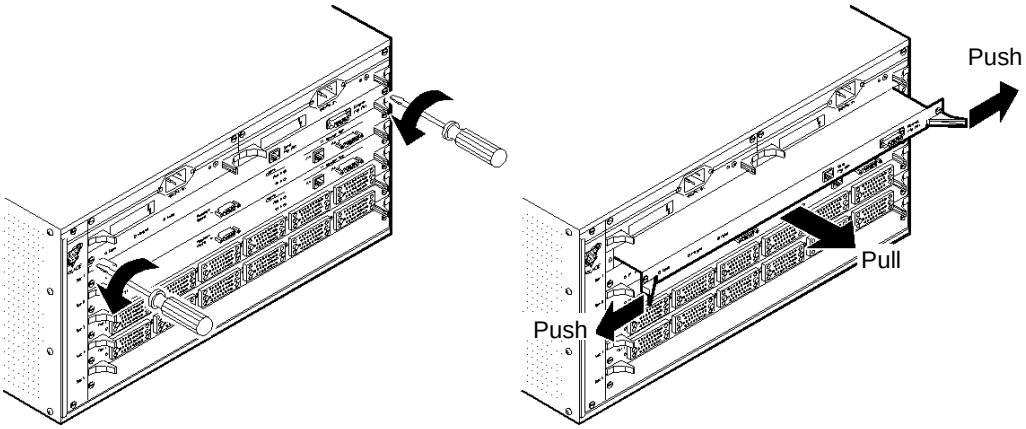


Figure 6-1. Removing the Packet Processor Module

To remove the PP module and replace it with a new PP module:

1. Using the appropriate static guard measures, power off the switch and disconnect all cables from the PP module.
2. Using a flathead screwdriver, remove each of the *#2* flathead screws from the PP module.
3. Simultaneously depress the two ejector tabs to disengage the PP module from the switch.
4. While holding the ejector tabs, carefully slide the PP module out of the switch.
5. Line up the replacement PP module with the card guide in the switch and slide the PP module into the chassis.
6. Line up the screw holes on the switch with the screw holes on the PP card.
7. Install each of the *#2* flathead screws into the PP module using a flathead screwdriver.
8. Reconnect the cables that you removed in Step 1.
9. Power the switch back up. The green Good LED should remain solid on the new PP. If any other condition exists, refer to Chapter 8.

Installing or Replacing I/O Modules

Figure 6-2 shows the procedure for installing or replacing I/O modules from the back of the STDX 6000. Step-by-step instructions follow the illustration.

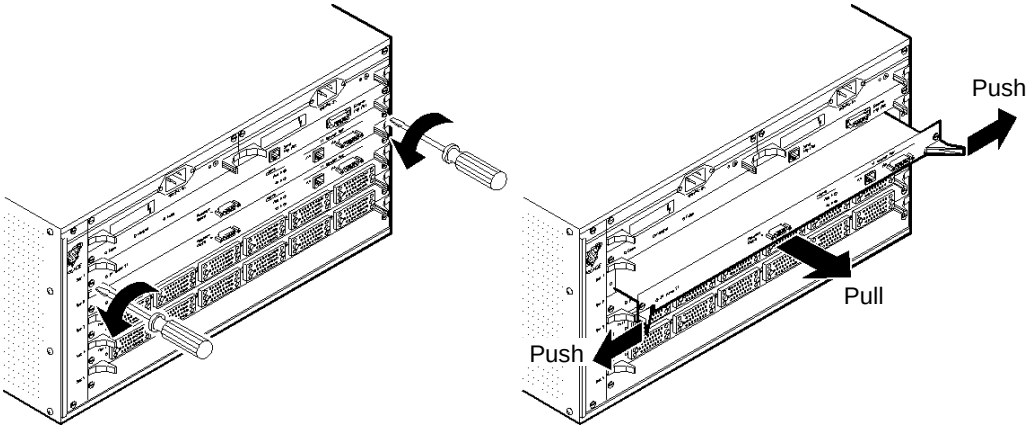


Figure 6-2. Installing or Replacing I/O Modules

To install or replace an I/O module:

1. From the NMS, set the Admin status of each pport on the I/O module to Down. For instructions, refer to the *Cascade Network Administrator's Guide for CascadeView/DOS* or the *CascadeView/UX Network Configuration Guide* (for UNIX).
2. Using the appropriate static guard measures, disconnect all cables from the back of the I/O module to be replaced. Mark the cables for identification and reconnection.
3. Using a flathead screwdriver, remove each of the *#2* flathead screws located on the I/O module.
4. Simultaneously depress the two ejector tabs to disengage the I/O module from the switch.
5. While holding the ejector tabs, carefully slide the I/O module out of the switch.
6. Line up the replacement I/O module with the card guide in the switch and slide the I/O module into the chassis.

7. Line up the screw holes on the switch with the screw holes on the I/O card.
8. Install each of the *#2* flathead screws into the I/O module using a flathead screwdriver.
9. Reconnect the cables that you removed in Step 2.
10. From the NMS, reset the Admin status on the I/O card to Up.
11. The LED on the I/O module should remain solid green. If any other condition exists, refer to Chapter 8.

Installing or Replacing Power Supplies

If the switch has a redundant power supply, you do not have to power down the switch to replace the main power supply.

before installing or replacing a power supply, refer to "Product Information and Warnings" on page 2-5 and "Power Cord Requirements" on page 2-7.

Figure 6-3 and Figure 6-4 show how to remove power supply modules from the switch. Figure 6-3 shows a 120-240 VAC, and Figure 6-4 shows a -48 VDC power supply.

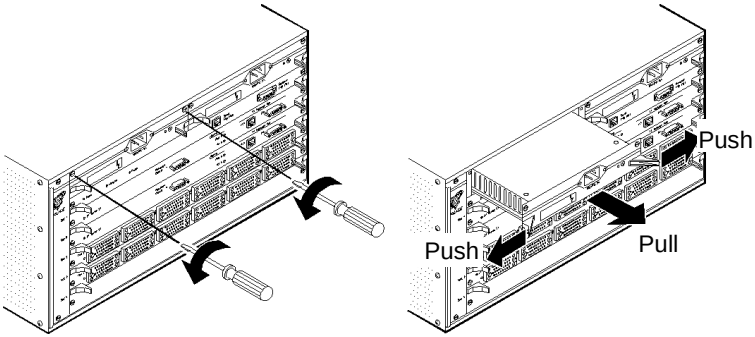


Figure 6-3. Removal of a 120-240 VAC Power Supply Module

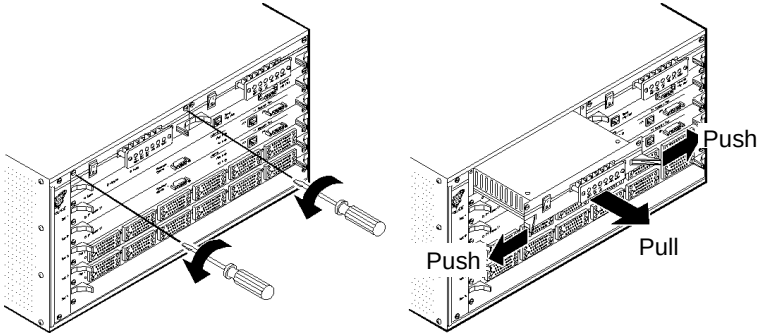


Figure 6-4. Removal of a -48 VDC Power Supply Module

To install or replace a power supply module:

1. If a redundant power supply is installed in the switch, go to Step 2; otherwise, power down the switch before going to Step 2.
2. Using proper static guard measures, disconnect the power cord from the wall outlet, then disconnect the power cord from the back of the power supply.
3. Using a flathead screwdriver, remove each of the *#2* flathead screws from the power supply module.
4. Simultaneously depress the two ejector tabs to disengage the power supply from the switch.
5. While holding the ejector tabs, carefully slide the power supply module out of the switch.
6. Line up the replacement power supply module with the card guide and carefully slide the power supply into the chassis.
7. Line up the screw holes on the switch with the screw holes on the power supply module.
8. Using a flathead screwdriver, install each of the *#2* flathead screws into the power supply module.
9. Reconnect the power cord to the power supply module, then plug the power cord into the wall outlet.
10. If necessary, power the switch back up. The LED on the power supply should remain solid green. If any other condition exists, refer to Chapter 8.

Installing or Replacing the Cooling Fan Module

You do not have to power down the switch to replace the cooling fan module. The switch is capable of running without the cooling fans for a short period of time, and can tolerate the temperatures shown in "Environmental Specifications" on page 2-4.

Do not put your fingers anywhere near the fans when removing the fan module from the switch. the fans may still be running.

Figure 6-5 shows the procedure for removing the cooling fan module from the switch. Step-by-step instructions follow the illustration.

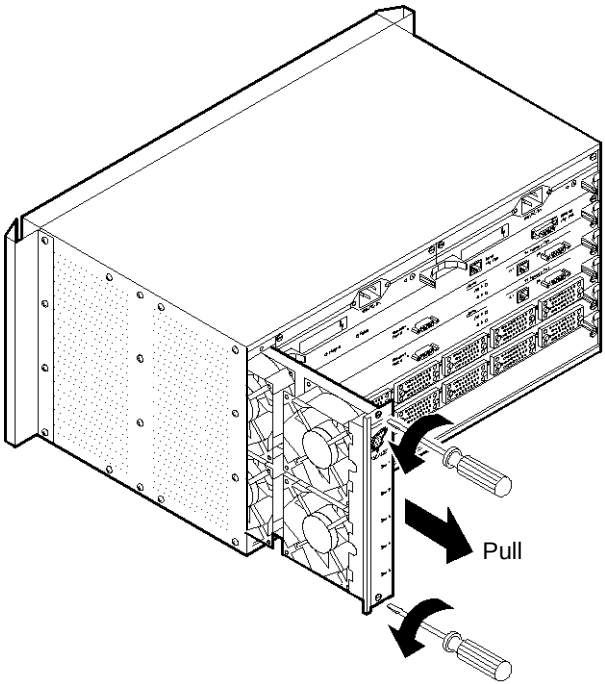


Figure 6-5. Removal of the Cooling Fan Module

To replace the cooling fan module

1. Using the appropriate static guard measures and a flathead screwdriver, remove each of the *#2* flathead screws from the cooling fan module.
2. While holding onto the fan module handle, carefully slide the cooling fan module out of the switch.
3. Line up the replacement cooling fan module with the card guide and carefully slide the module into the chassis.
4. Line up the screw holes on the switch with the screw holes on the cooling fan module.
5. Using a flathead screwdriver, install each of the *#2* flathead screws into the cooling fan module.

7

Installing a Redundant STDX

This chapter explains how redundancy works and describes how to set up a STDX 6000 as the redundant partner of another STDX 6000.

About Redundancy

The STDX 6000 supports a redundant one-for-one switch configuration. A pair of identically configured switches are interconnected through redundancy panels, with one switch being the active switch and the other switch being the standby partner. When the active switch fails, the standby switch automatically detects the outage and becomes the active switch. User ports, trunks, and circuits are automatically re-established by the new active switch.

Redundancy and recovery in a STDX 6000 comprises both hardware and software mechanisms that allow the STDX to continue operating after certain types of failures occur. Within a STDX 6000, redundant hardware consists of dual power supplies and dual cooling fans. All other hardware within a STDX (including the PP and I/O modules) is not redundant. Instead, two identical switches can be connected together, where one is the active switch and the other is a standby (redundant partner). The active switch can assess all I/O modules and serial ports; the standby switch cannot. The Ethernet, however, is active on both switches.

From a software perspective, the standby switch is fully operational, except that it never receives any data from the I/O modules or serial ports. For instructions about how to configure the redundant partner of a STDX switch, contact the Ascend Technical Resource Center (see page 8-4).

Failure of the active STDX causes the redundant partner to become active, thereby taking over full operation and complete control over the I/O modules and serial ports. There is never a partial changeover to a redundant partner. After a successful changeover, a trap is sent to inform the NMS.

The Ethernet interfaces provide the communications path for the periodic redundancy polling between the two switches. The redundancy polling provides a “keep-alive” mechanism, whereby the standby partner continuously monitors the availability of the active switch. If the active switch fails to respond to polling from the standby switch, the standby assumes the active switch has failed and the following events occur:

- The standby switch disables the active switch, performs a warm boot, and takes over control of the I/O modules and serial interfaces.
- The old active node reboots itself and attempts to become the new standby, redundant partner. If no errors are encountered, it becomes the standby switch; otherwise, it remains inactive.

There are two special cases in which the failure of an active switch will not result in the redundant changeover

- When an active switch reboots after a successful Flash download, or warm boots after a successful Parameter RAM (PRAM) synchronization. For more information, refer to "Downloading a Switch Configuration" in the *Cascade Network Administrator's Guide for CascadeView/DOS* (for DOS) or the *CascadeView/UX Network Configuration Guide* (for UNIX).

- When the PRAM configuration of the standby redundant STDX 6000 is kept in synchronization with the active switch. This is accomplished in two ways:

  – All SNMP sets that are received by the active switch from the NMS are forwarded to the redundant switch.

  – Redundancy "keep alive" polls provide a mechanism for exchanging PRAM checksums between the two switches. When the active switch detects a PRAM checksum mismatch, it initiates a transfer of its PRAM to the redundant switch. As a final measure, when the changeover occurs from the active switch to the redundant switch, the NMS computes the current PRAM checksum and compares it to the PRAM checksum reported by the now active switch. If the PRAM checksums do not match, the NMS automatically initiates a PRAM synchronization operation.

Installation Considerations

In a redundant configuration, both switches are identical in all aspects. Each slot on the redundant switches must contain the identical I/O configuration. Also, the optional Ethernet module is required on the PP card of each switch.

The Ethernet interface is used by the pair of switches to exchange the redundancy polling messages. However, during the installation process you should disconnect the Ethernet interface of both switches. It is undesirable for the switches to exchange redundancy information until the installation process is complete.

In a redundant setup, both switches require an additional hardware component called redundancy panels. The two switches are cabled to a common set of redundancy panels that serve two purposes

- They provide the communications paths to external devices. Only the active switch can access the interfaces.
- They provide independent hardware redundancy logic. The redundancy logic provides the ability for the standby partner to disable the active switch.

Because the disabling of the active switch by the redundant partner is performed via the redundancy cables and logic, a minimum of one redundancy cable is required from each of the switches for a successful changeover to occur.

The 24-Bundle T1 and the 30-Bundle E1 cards are equipped with a redundancy control port. However, the multi-interface IOP module (or 6-port Universal I/O, or UIO) does not have an external redundancy control port. The redundancy path for the multi-interface IOP is carried by the same connector used for Ports 1 and 2.

The 8-port and 18-port UIO modules do not support redundancy.

Cabling

I/O modules on redundant switches are not directly attached to external devices, such as routers or modems. Instead, they are connected to one or more redundancy panels.

Redundancy panels provide an additional set of interface ports to which the external devices are connected. In this way, the I/O modules share connectivity to the redundancy panels, and it is the redundancy panels that are connected to the external devices. The redundancy panels ensure that only one switch can communicate with the attached devices.

To simplify the cabling process, it is recommended that you designate one switch as Switch A and the other switch as Switch B. The redundancy panels contain labels for Switch A versus Switch B. The cabling is identical for the 24-Bundle T1 card and the 30-Bundle E1 card; however, the cabling for the multi-interface IOP module varies slightly, as described in the next section.

Cabling the Multi-Interface IOP Module

The multi-interface IOP module has three 80-pin connectors, labeled 1, 2, and 3 (as shown in Figure 7-1). Its ports are split into two ports each for a total of six ports.

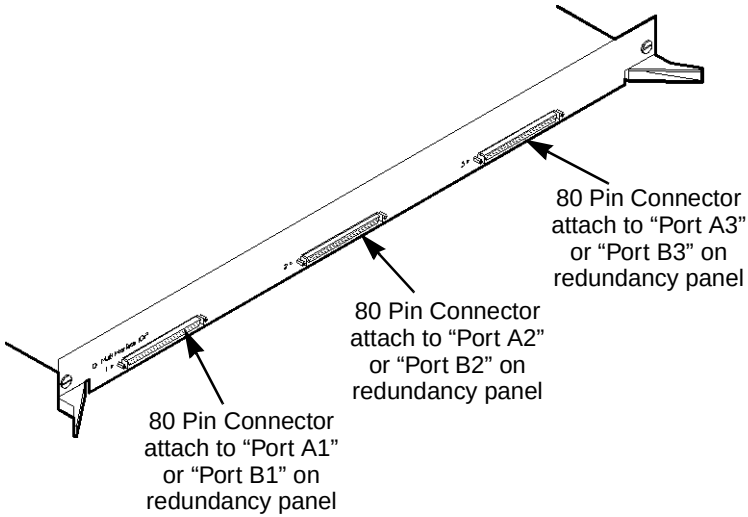


Figure 7-1. Multi-Interface IOP Module

The multi-interface IOP module connects to an EIA 530A Redundancy Panel (shown in Figure 7-2). The bottom half of the redundancy panel contains six interface ports labeled 1 through 6.

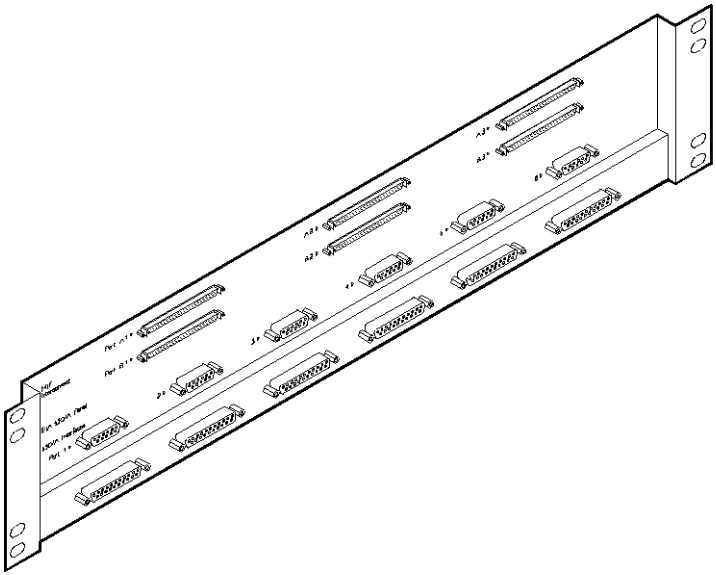


Figure 7-2. EIA 530A Interface Ports 1 Through 6

The multi-interface module should be cabled to the redundancy panels as follows:

- For the switch that you designated as Switch A, connect the multi-interface 80-pin connector labeled “1” to the redundancy panel 80-pin connector labeled “A1.” Connect the multi-interface 80-pin connector labeled “2” to the redundancy panel 80-pin connector labeled “A2.”
- For the switch that you designated as Switch B, connect the multi-interface 80-pin connector labeled “1” to the redundancy panel 80-pin connector labeled “B1.” Connect the multi-interface 80-pin connector labeled “2” to the redundancy panel 80-pin connector labeled “B2.”

When Switch A is active, redundancy connector A1 enables Switch A to access external device ports 1 and 2. When Switch B is active, redundancy connector B1 enables Switch B to access external device ports 1 and 2.

Redundancy connectors A1 and B1 allow access to external ports 3 and 4, while A3 and B3 allow access to external ports 5 and 6.

Redundancy connectors A1 and B1 have an additional property. Besides providing access to external ports 1 and 2, they also contain the redundancy logic needed for the changeover from the standby switch to the active switch. (T1 and E1 cards are equipped with actual redundancy control ports. Refer to the next section, “Cabling the T1 and E1 Cards”.)

Cabling T1 and E1 Cards

Unlike the EIA 530A redundancy panel shown in Figure 7-2, a single T1 or E1 redundancy panel can accommodate up to four pairs of cards. Figure 7-3 shows the T1/E1 redundancy panel.

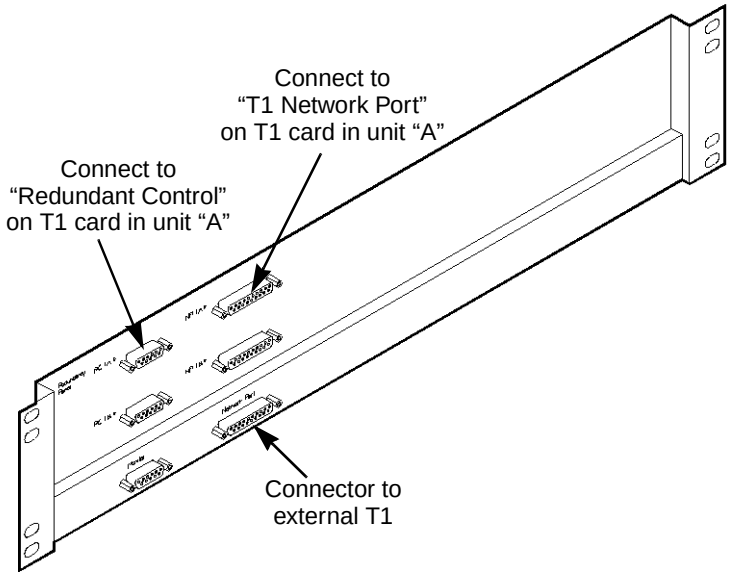


Figure 7-3. T1/E1 Redundancy Panels

The following scenario describes the process for connecting T1 cards to the T1 redundancy panels. Assume that each switch in the redundant pair has a T1 card installed in Slot 2 and Slot 3. Beginning with the T1 card occupying Slot 2, connect the T1 card to the redundancy panels as shown in Table 7-1.

Table 7-1. T1 Cards and Redundancy Panels

	T1 Card Connector Label	Redundancy Panel Label
T1 in Slot 2 of Switch A	Redundant Control “T1 Network Port”	“RC 1A” “NP 1A”
T1 in Slot 2 of Switch B	Redundant Control “T1 Network Port”	“RC 1B” “NP 1B”
T1 in Slot 3 of Switch A	Redundant Control “T1 Network Port”	“RC 2A” “NP 2A”
T1 in Slot 3 of Switch B	Redundant Control “T1 Network Port”	“RC 2B” “NP 2B”

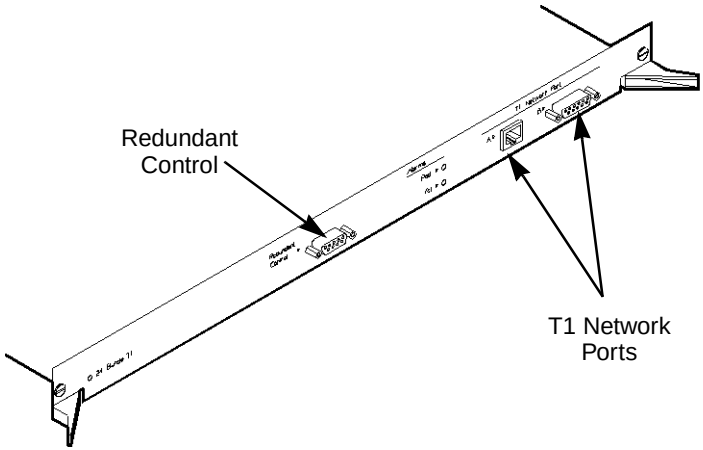


Figure 7-4. 24-Bundle T1 Card

Powering Up the Redundant Configuration

In a redundant configuration, both switches are identical in all aspects. That is, there is no concept of primary and secondary, or of master and slave. The first switch that you power up automatically becomes the active switch and gains access to the external interfaces on the redundancy panels. The second switch to be powered up becomes the standby, or redundant partner, and is thereby prevented from accessing the external interfaces on the redundancy panels.

To power up the redundant configuration

1. At the NMS, create a configuration for the redundant switch in the same way that you would configure any other switch. This process includes adding a STDX icon to the map and adding I/O module types, physical ports, and logical ports as necessary. For details, refer to the *Cascade Network Administrator's Guide for CascadeView/DOS* or the *CascadeView/UX Network Configuration Guide* (for UNIX).

2. With both switches powered off, make all cable connections for both switches with the exception of the Ethernet modules.

3. Power on the switch that you designated as Switch A. The switch should be installed using the same methods outlined for installing any other switch, including a download of the NMS configuration script and PRAM synchronization. Refer to the *Cascade Network Administrator's Guide for CascadeView/DOS* or the *CascadeView/UX Network Configuration Guide* (for UNIX).

4. Power off Switch A, and power on Switch B. Perform the installation and verification of Switch B.

5. At this point, both switches should have identical software and configuration information. Connect the Ethernet interface of each PP module to the local Ethernet.

6. Power on Switch A. Provided that Switch B was still powered up, Switch A then becomes the standby switch. The green Good LED on the standby switch should be blinking to indicate its standby status.

7. To test the redundant setup, execute the Switch to Standby Unit command from the NMS and observe the changeover.

8

Troubleshooting

This chapter provides general troubleshooting solutions for the STDX 6000 hardware. Unless otherwise noted, only hardware problems and their solutions are listed in this guide. If you suspect software problems, consult the troubleshooting information in the *Cascade Network Administrator's Guide for CascadeView/DOS* or the *CascadeView/UX Diagnostics and Troubleshooting Guide* (for UNIX).

Determining the Operating Status

In most cases, the overall status of the STDX 6000, as well as the status of all installed modules, is indicated by status lights that appear on the Packet Processor, power supplies, and individual I/O modules.

When experiencing hardware problems, check the status lights and compare them to Table 8-1 to determine the problem and appropriate resolution.

Table 8-1. Troubleshooting Tips

Problem	Cause	Solution
All LEDs, Good, Marginal, and Failed, remain solid on the PP module.	One of the following conditions exist. Either: • The card is in reset mode. • The card failed its internal CPU diagnostics. • The 960 boot prom, 8031 boot prom, or processor either failed, is loose, or is missing.	Contact the Ascend Technical Response Center (see page 8-4). The module has to be replaced. Refer to "Replacing the Packet Processor" on page 6-2.
Marginal LED remains solid on the PP module.	A marginal error condition exists on the switch.	May indicate failure of a redundant power supply or fan module. Check the background diagnostics.
Failed LED remains solid on the PP module.	Power up diagnostics have failed.	Check the switch for a failed Packet Processor card or a corrupt Flash Operating System.

Table 8-1. Troubleshooting Tips (Continued)

Problem	Cause	Solution
Blinking Red LED appears on the PP module.	Power up diagnostics detected a fatal error on the card.	Contact the Ascend Technical Response Center (see page 8-4). The affected module has to be replaced. Refer to "Installing or Replacing I/O Modules" on page 6-4 for replacement instructions.
Solid Red LED appears on the PP module.	The NMS software has detected or reported a fatal error on the card.	Contact the Ascend Technical Response Center (see page 8-4).
No LEDs are lit on the switch's power supply or I/O modules.	The switch is not receiving power. The power cord may not be properly attached to the switch or to the wall outlet receptacle.	Check the power cord in the primary receptacle on the switch (and secondary redundant receptacle) to ensure proper seating at the wall outlet and in the switch.
No LED appears lit on an I/O module.	The module may not be seated properly in the chassis, or no PRAM is resident on the card.	Check the seating of the I/O module in the chassis. Ensure that the card is configured with PRAM. For instructions, refer to the *Cascade Network Administrator's Guide for CascadeView/DOS* or the *CascadeView/UX Network Configuration Guide* (for UNIX).
Switch continually reboots.	Bad or corrupt Flash Operating System, or bad PRAM.	Put jumper on and reload the Flash software. Refer to the *Cascade Network Administrator's Guide for CascadeView/DOS* or the *CascadeView/UX Diagnostic and Troubleshooting Guide* (for UNIX).

Contacting the Technical Response Center

Ascend provides a full range of support services to ensure that the maximum network uptime is achieved with low equipment cost. The staff at the Ascend Technical Response Center is also available to assist you with any problems that you may encounter when using the NMS software. The Ascend Technical Response Center can be contacted by phone, email, or fax.

Calling by Phone

Ascend offers support 24 hours a day, 7 days a week. To contact the Ascend Technical Response Center by phone, call either of the following numbers:

1-800-DIAL-WAN **1-508-692-2600**

Sending Electronic Messages or Faxes

To contact the Ascend Technical Response Center by email, address your requests to:

cs@casc.com

To contact Ascend Technical Response Center by fax, call:

1-508-692-1218

Include the following information when requesting support through electronic mail or a fax message:

- Your name and telephone number
- Name of contact person and telephone number (if different from above)
- Brief description of the problem
- List of identifiable symptoms
- Any information that you gathered as a result of reviewing the Technical Support Checklist in the *CascadeView/UX Diagnostics and Troubleshooting Guide*.

A

I/O Modules

This appendix contains technical information about each of the hardware I/O modules that are currently available from Ascend Communications. The following modules are described:

- 6-Port Universal I/O Module
- 6-Port V.35 I/O Module
- 8- and 18-Port Universal I/O Modules
- Channelized T1 I/O Module
- Channelized E1 I/O Module

6-Port Universal I/O Module

The 6-Port Universal I/O module is a base module for the BX 6000. It supports connections to a variety of popular synchronous interfaces, including modern international serial interfaces. The module contains six universal ports that can operate with data rates from 19.2 Kbps to 4.096 Mbps. It provides the BX 6000 with redundancy for six serial ports, and allows US and new international serial interfaces. There are three panel types, all of which support redundancy.

Users can individually configure each of the physical ports on the 6-Port Universal I/O module as DCE or DTE to provide any frame-based logical port function. Individual connections can be made to a user device such as a router, bridge, or cluster controller. Individual connections can also be made to a network trunk via a DSU/CSU device.

For user devices, the connections can be Frame Relay or non-Frame Relay. If they are not Frame Relay, the BX 6000 will assemble the data links into Frame Relay format.

Operational Features

The BX 6000 6-port UIO module

- Supports redundant node configurations.
- Uses standard interfaces to existing network products without modifications, including international serial interfaces.
- Provides high port density configurations.
- Allows customization of connector types through external I/O assembly.

Specifications

Physical Dimensions

Size: 15.75 in. wide x 1.06 in. high x 9.25 in. deep

Weight: 2 lbs.

Power Requirements

12 Watts

Agency Approvals

Electromagnetic Emissions Certifications:
FCC Part 15 Class A, CISPR EN55022 Class A

Temperature range: 5° to 35°C

Physical Interfaces

- CCIT V.35, 34-pin ISO 2593 (RS-422 drivers for the balanced signal, US only)
- X.21, 15-pin D sub
- EIA530/A, 25-pin D sub and/or 26-pin Mini-D sub
- Timing options: internal clock, external clock or loop timing, independent transmit and receive path timing

Status Indicators

Single green LED:
Normal operation — LED lit
Initialization — Blinking LED
Module failure — LED off

Ordering Information

Description	Product Code
6-Port Universal I/O Module[a]	60008
V.35 Connector Panel	60009
X.21 Connector Panel	60010
EIA530A Connector Panel	60011
EIA530 Connector Panel	60012

a. The 6-port Universal I/O module requires the use of one V.35, X.21, EIA530, or EIA530A connector panel within each unit

6-Port V.35 I/O Module

The 6-Port V.35 I/O module contains six V.35 ports, each of which is capable of data rates from 19.2 Kbps to 4.096 Mbps. Users can individually configure each of the V.35 ports on the module as DCE or DTE to provide any frame-based logical port functions. The individual connections can be made to a user device such as a router, bridge, or cluster controller. Individual connections can also be made to a network trunk via a DSU/CSU device.

For user devices, the connections can be Frame Relay or non-Frame Relay. If they are not Frame Relay, the BX 6000 will assemble the data links into Frame Relay format.

Operational Features

The BX 6000 6-Port V.35 I/O module

- Provides PVC rate monitoring for usage statistics.
- Allows ports to be user or trunk interface.
- Reduces per-port costs of Frame Relay services.
- Provides high port density configurations.
- Allows for configuration flexibility.

Specifications

Physical Dimensions

Size: 15.75 in. wide x 1.06 in. high x 9.25 in. deep

Weight: 2 lbs.

Power Requirements

25 Watts

Agency Approvals

Electromagnetic Emissions Certifications: FCC Part 15 Class A

NEBS TR-NWT-00063, TR-NWT-001089 (pending)

Temperature range: 5° to 45°C

Physical Interfaces

- ISO 2593 V.35 34-pin female connector, optional crossover to male with a cable
- Timing options: internal clock, external clock or loop timing, independent transmit and receive path timing

Status Indicators

Single green LED:

Normal operation — LED lit
Initialization — Blinking LED
Module failure — LED off

Ordering Information

Description	Product Code
6-Port V.35 I/O Module	60004

Figure A-1 shows the V.35 I/O module back panel.

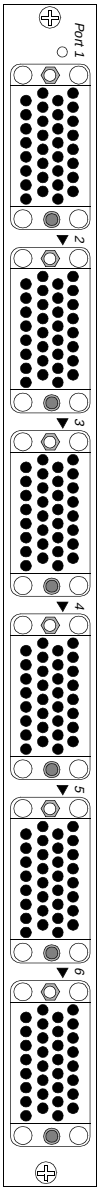


Figure A-1. V.35 I/O Module Back Panel

8- and 18-Port Universal I/O Modules

The UIO module is available in 8-port (UIO-8) and 18-port (UIO-18) models that support X.21 or V.24 communication. Users can configure pairs of the X.21 or V.24, using one of the two external cables types, as DCE or DTE to provide any frame-based logical port functions.

Individual connections can be made to a user device such as a router, bridge, or cluster controller. Individual connections can also be made to a network trunk via a DSU/CSU device. For user devices, the connections can be Frame Relay or non-Frame Relay. If they are not Frame Relay, the BX assembles the data links into Frame Relay format.

The UIO module enables BX 6000 switches to provide increased concentration of the outer tier of a network. The UIO module allows aggregation of low-speed connection (2.4 Kbps - 128 Kbps, with 9.6 Kbps being the most common) into a BX that can provide local Frame Relay switching and channel traffic to backbone network sites via T1 or E1 circuits. The UIO module is capable of saturating all 8 or 18 physical ports at 128 Kbps full duplex. Each port is individually configurable at 2.4, 4.8, 8, 9.6, 12, 16, 24, 32, 38.4, 48, 56, 64, 96, 112, or 128.

The UIO module is specially suited for BX switches located in private networks, but is also applicable to public networks. The 8- or 18-port density makes the UIO module extremely cost effective for concentrating multiple sites (branch offices, retail stores, banking machines).

Operational Features

The BX 6000 8- and 18-port UIO modules

- Provide PVC rate monitoring for usage statistics.
- Allow ports to be user or trunk interface for flexibility.
- Support Frame Relay and SMDS DXI.
- Allow flexibility with non-Frame Relay services via direct FRAD and translated FRAD (PPP to RFC 1490).
- Allow X.21 or V.24 pair configuration via external cable.
- Provides high port density configurations.

Specifications

Physical Dimensions

Size: 15.75 in. wide x 1.06 in. high x 9.25 in. deep

Weight: 2 lbs.

Power Requirements

25 Watts

Agency Approvals

Electromagnetic Emissions Certifications: FCC Part 15 Class A

Temperature range: 5° to 45°C

Physical Interfaces

- ISO 2110 V.24 25-pin female connector
- ISO 4903 X.21 15-pin female connector
- Optional cross-over to male with V.24 or X.21 cable
- Clocking options supported: transmit and receive can be independently timed with internal clock, external clock, or loop timing

Status Indicators

Single green LED:

Normal operation — LED lit
Initialization — Blinking LED
Module failure — LED off

Ordering Information

Description	Product Code
8-Port Universal I/O Module (with V.24 cables)*	60033A
8-Port Universal I/O Module (with X.21 cables)*	60033B
18-Port Universal I/O (with V.24 cables)*	60032A
18-Port Universal I/O (with X.21 cables)*	60032B
V.24 Straight Through Cable	40030X
X.21 Straight Through Cable	40032X

* The 8- and 18-port UIO modules use a custom cable design. Four V.24 or four X.21 adapter cables are provided with the 8-port module. Nine V.24 or nine X.21 adapter cables are provided with the 18-port module. Separate product codes (provided for straight through cables) are for the purposes of ordering spare parts.

Channelized T1 I/O Module

The Channelized T1 I/O module provides a built-in T1 CSU interface and standard multiplexing D4 channels (DS0). Users can map the DS0 channels on the T1 interface to a maximum of 24 HDLC data links. Contiguous or non-contiguous n x DS0 channels compose each HDLC data link. This makes it easy and economical to interface to multiple customer sites over a single T1 connection by eliminating the complication of numerous cables in “groom and fill” operations.

Users can configure each of the n x DS0 data link channels on the Channelized T1 module as DCE or DTE to provide any frame-based logical port function.

Individual connections can be made to a user device such as a router, bridge, or cluster controller. Individual connections can also be made to a network trunk via a DSU/CSU device. The connections can be Frame Relay or non-Frame Relay. If they are not Frame Relay, the BX 6000 will assemble the data links into Frame Relay format.

Operational Features

The BX 6000 Channelized T1 I/O module

- Provides PVC rate monitoring for usage statistics.
- Provides up to 24 individual HDLC data links on a single T1.
- Supports contiguous or non-contiguous DS0 channels.
- Allows ports to be user or trunk interface for flexibility.
- Allows users to configure as DTE, DCE, and NNI Frame Relay interfaces.
- Contains an integral T1 CSU/DSU.
- Has T1 and Fractional T1 interfaces.
- Provides for high port density.
- Provides flexibility of configuration.

Specifications

Physical Dimensions

Size: 15.75 in. wide x 1.06 in. high x 9.25 in. deep
Weight: 2 lbs.

Power Requirements

25 Watts

Agency Approvals

Electromagnetic Emissions Certifications: FCC Part 15 Class A
NEBS TR-NWT-00063, TR-NWT-001089 (pending)
Temperature range: 0° to 50°C

Physical Interfaces

- T1 interface: 15-pin Sub-D male connector
- Redundancy connector: 9-pin connector
- Built-in T1 CSU/DSU, supporting:
  - T1 line coding options: D4, ESF
  - Zero encoding options: Jammed bit, B8ZS
- Timing options: loop timing, internal timing

Status Indicators

Single green LED:
Normal operation — LED lit
Initialization — Blinking LED
Module failure — LED off
Red LED — Carrier or synchronization loss
Yellow LED — Remote alarm detection

Ordering Information

Description	Product Code
Channelized T1 I/O Module	60005

Figure A-2 shows the T1 I/O module back panel.

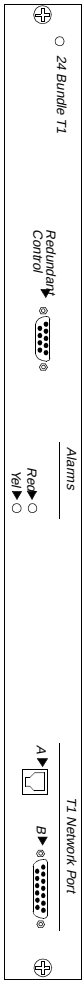


Figure A-2. Channelized T1 I/O Module Back Panel

Channelized E1 I/O Module

The Channelized E1 I//O module provides standard multiplexing G.704 channels (64 Kbps). Users can map the 64 Kbps channels on the E1 interface to a maximum of 30 HDLC data links or 1.984 Mbps. Contiguous or non-contiguous n x 64 Kbps channels compose each HDLC data link.

Users can configure each of the n x 64 Kbps data link channels on the Channelized E1 module as DCE or DTE to provide any frame-based logical port function. Through any of these channels, network managers can make connections to a user device such as a router, bridge, or cluster controller. Connections can also be made to a network trunk.

For user devices, connections can be Frame Relay or non-Frame Relay. If they are not Frame Relay, the BX switch will assemble the data links into Frame Relay format.

Operational Features

The BX 6000 Channelized E1 I/O module

- Provides PVC rate monitoring for usage statistics.
- Provides up to 30 individual HDLC data links on a single T1.
- Supports contiguous or non-contiguous G.704 channels.
- Allows ports to be user or trunk interface for flexibility.
- Allows users to configure as DTE, DCE, and NNI Frame Relay interfaces.
- Contains an integral E1 CSU/DSU.
- Has E1 and Fractional E1 interfaces.
- Provides for high port density.
- Provides flexibility of configuration.

Specifications

Physical Dimensions

Size: 15.75 in. wide x 1.06 in. high x 9.25 in. deep

Weight: 2 lbs.

Power Requirements

15 Watts

Agency Approvals

Electromagnetic Emissions Certifications: FCC Part 15 Class A, CISPR EN55022 A, Vfg. 243 1991

Temperature range: 5° to 35°C

Physical Interfaces

- E1 interface: G.703 coaxial pair 75 ohm
- Unbalanced, or G.703 Symmetrical Pair 120 ohm Balanced, DB-15 connector
- Redundancy connector: DB-9 connector
- Timing options: loop timing, internal timing

Status Indicators

Single green LED:
Normal operation — LED lit
Initialization — Blinking LED
Module failure — LED off

Red LED — carrier or synchronization loss

Yellow LED — Remote alarm detection

Ordering Information

Description	Product Code
Channelized E1 I/O Module (75 ohm/unbalanced, coaxial)	60013
Channelized E1 I/O Module (120 ohm/balanced, twisted pair)	60017

Figure A-3 shows the channelized E1 I/O module back panel.

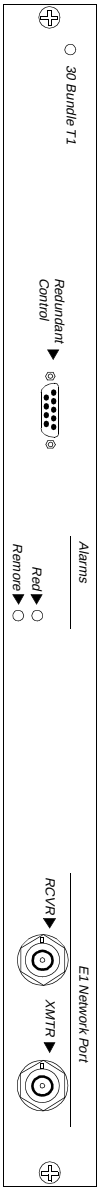


Figure A-3. Channelized E1 I/O Module Back Panel

B

Cables and Pinout Assignments

This appendix provides cable diagrams and pinout assignments for the following STDX 6000 cables:

- EIA 449 Straight Through Cable
- EIA 449 Crossover Cable
- RS-232 PP1-DCE Shielded Console Cable
- RS-232 PP1-DTE1 Shielded Console Cable
- RS-232 PP1-DTE2 Shielded Console Cable
- V.35 Straight Through Cable
- V.35 Crossover Cable
- X.21 Straight Through Cable
- X.21 Crossover Cable

- T1 Straight Through Cable - DB-15
- T1 Crossover Cable - DB-15
- T1 Straight Through USOC-RJ-48C Connector
- T1 Crossover USOC-RJ-48C Connector
- 8/18-Port UIO X.21 Straight Through Cable
- 8/18-Port UIO V.24 Straight Through Cable

Any of the above-listed cables may be purchased from Ascend Communications. Be sure to use the appropriate product code for ordering. To obtain a current product code/price list, contact your Ascend Account Manager.

In addition to the above-listed cables, the following loopback connectors are also described in this appendix. These connectors are *not* orderable from Ascend Communications.

- V.35 Loopback Connector (Male)
- X.21 Loopback Connector (Male)
- T1 Loopback Connector (Male)
- RJ-48 Loopback Connector (Male)

EIA 449 Straight Through Cable

Table B-1. Pinouts for EIA 449 Straight Through Cable

Pin	Connector #1 Signal	Pin	Connector #2 Signal
1	Shield	1	Shield
3	External Receive Clock (P)	3	External Receive Clock (P)
4	Transmit Data (P)	4	Transmit Data (P)
5	Transmit Clock (P)	5	Transmit Clock (P)
6	Receive Data (P)	6	Receive Data (P)
7	Request To Send (P)	7	Request To Send (P)
8	Receive Clock (P)	8	Receive Clock (P)
9	Clear To Send (N)	9	Clear To Send (N)
10	Local Loopback	10	Local Loopback
11	Data Set Ready (P)	11	Data Set Ready (P)
12	Data Terminal Ready (P)	12	Data Terminal Ready (P)
13	Data Carrier Detect (P)	13	Data Carrier Detect (P)
14	Remote Loopback	14	Remote Loopback
17	External Transmit Clock (P)	17	External Transmit Clock (P)
18	Test Mode	18	Test Mode
19	Signal Ground	19	Signal Ground
20	Receive Common	20	Receive Common
21	External Receive Clock (N)	21	External Receive Clock (N)
22	Transmit Data (N)	22	Transmit Data (N)
23	Transmit Clock (N)	23	Transmit Clock (N)
24	Receive Data (N)	24	Receive Data (N)

Table B-1. Pinouts for EIA 449 Straight Through Cable (Continued)

Pin	Connector #1 Signal	Pin	Connector #2 Signal
25	Request To Send (N)	25	Request To Send (N)
26	Receive Clock (N)	26	Receive Clock (N)
27	Clear To Send (P)	27	Clear To Send (P)
29	Data Set Ready (N)	29	Data Set Ready (N)
30	Data Terminal Ready (N)	30	Data Terminal Ready (N)
31	Data Carrier Detect (N)	31	Data Carrier Detect (N)
35	External Transmit Clock (N)	35	External Transmit Clock (N)
37	Send Common	37	Send Common
	Required Twisted Pairs		
	3 & 21 7&25		
	4 & 22 8 & 26		
	5 & 23 9 & 27		
	6 & 24 10 & 19		Product Code:
			40014X (5 ft.) 40014Y (15 ft.) 40014Z (30 ft.)

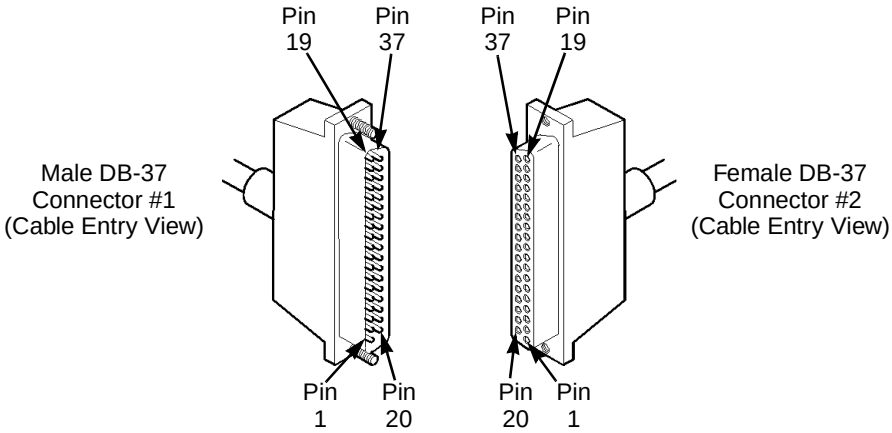


Figure B-1. EIA 449 Straight Through Cable Diagram

EIA 449 Crossover Cable

Table B-2. Pinouts for EIA 449 Crossover Cable

Pin	Connector #1 Signal	Pin	Connector #2 Signal
1	Shield	1	Shield
3	External Receive Clock (P)	5	Transmit Clock (P)
4	Transmit Data (P)	6	Receive Data (P)
5	Transmit Clock (P)	3	External Receive Clock (P)
6	Receive Data (P)	4	Transmit Data (P)
7	Request To Send (P)	13	Data Carrier Detect (P)
8	Receive Clock (P)	17	External Transmit Clock (P)
10	Local Loopback	36	Unbalanced CTS
11	Data Set Ready (P)	12	Data Terminal Ready (P)
12	Data Terminal Ready (P)	11	Data Set Ready (P)
13	Data Carrier Detect (P)	7	Request To Send (P)
14	Remote Loopback	18	Test Mode
17	External Transmit Clock (P)	8	Receive Clock (P)
18	Test Mode	14	Remote Loopback
19	Signal Ground	19	Signal Ground
20	Receive Common	20	Receive Common
21	External Receive Clock (N)	23	Transmit Clock (N)
22	Transmit Data (N)	24	Receive Data (N)
23	Transmit Clock (N)	21	External Receive Clock (N)
24	Receive Data (N)	22	Transmit Data (N)
25	Request To Send (N)	31	Data Carrier Detect (N)
26	Receive Clock (N)	35	External Transmit Clock (N)

Table B-2. Pinouts for EIA 449 Crossover Cable (Continued)

Pin	Connector #1 Signal	Pin	Connector #2 Signal
29	Data Set Ready (N)	30	Data Terminal Ready (N)
30	Data Terminal Ready (N)	29	Data Set Ready (N)
31	Data Carrier Detect (N)	25	Request To Send (N)
35	External Transmit Clock (N)	26	Receive Clock (N)
36	Unbalanced CTS	10	Local Loopback
37	Send Common	37	Send Common
	Required Twisted Pairs		
	3 & 21 11 & 29		
	4 & 22 12 & 30		
	5 & 23 13 & 31		
	6 & 24 14 & 18		
	7&25 17 & 35		
	8 & 26 36 & 20		
	10 & 37		Product Code: 40015X (5 ft.) 40015Y (15 ft.) 40015Z (30 ft.)

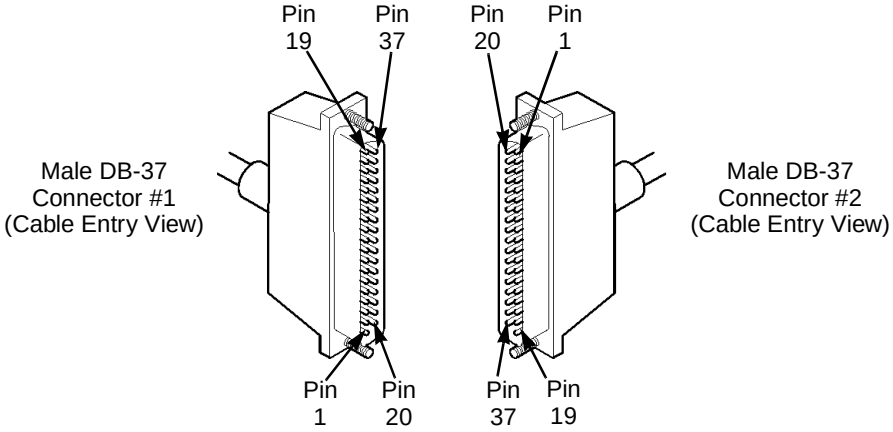


Figure B-2. EIA 449 Crossover Cable Diagram

RS-232 PP1-DCE Shielded Console Cable

Table B-3. Pinouts for RS-232 PP1-DCE Shielded Console Cable

Pin	RJ48 Signal	Pin	DB-25 Signal
1	Request To Send	4	Request To Send
2	Data Terminal Ready	20	Data Terminal Ready
3	Transmit Data	2	Transmit Data
4	Data Set Ready	6	Data Set Ready
5	Receive Data	3	Receive Data
6	Ground	7	Ground
7	Data Carrier Detect	8	Data Carrier Detect
8	Clear To Send	5	Clear To Send
			Product Code: 40005X 40005Y

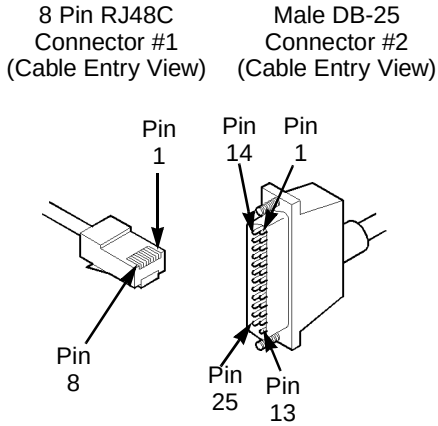


Figure B-3. RS-232 PP1-DCE Shielded Cable Diagram

RS-232 PP1-DTE1 Shielded Console Cable

Table B-4. Pinouts for RS-232 PP1-DTE1 Shielded Console Cable

Pin	RJ48 Signal	Pin	DB-25 Signal
1	Request To Send	5	Clear To Send
2	Data Terminal Ready	6	Data Set Ready
3	Transmit Data	3	Receive Data
4	Data Set Ready	20	Data Terminal Ready
5	Receive Data	2	Transmit Data
6	Ground	7	Ground
7	Data Carrier Detect	8	Data Carrier Detect
8	Clear To Send	4	Request To Send
			Product Code: 40007X

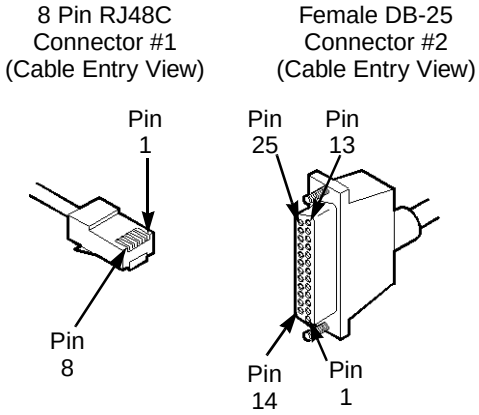


Figure B-4. RS-232 PP1-DTE1 Shielded Cable Diagram

RS-232 PP1-DTE2 Shielded Console Cable

Table B-5. Pinouts for RS-232 PP1-DTE2 Shielded Console Cable

Pin	RJ48 Signal	Pin	DB-9 Signal
1	Request To Send	8	Clear To Send
2	Data Terminal Ready	6	Data Set Ready
3	Transmit Data	2	Receive Data
4	Data Set Ready	4	Data Terminal Ready
5	Receive Data	3	Transmit Data
6	Ground	5	Ground
7	Data Carrier Detect	1	Data Carrier Detect
8	Clear To Send	7	Request To Send
			Product Code: 40035X 40035Y 40035Z

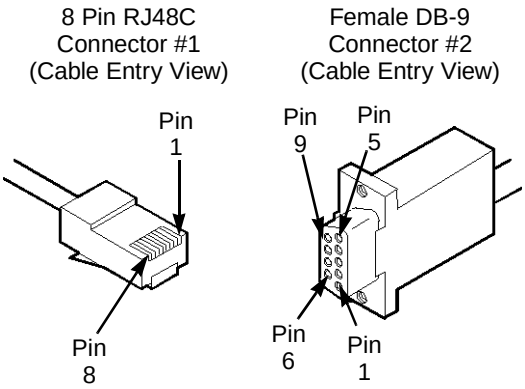


Figure B-5. RS-232 PP1-DTE2 Shielded Cable Diagram

V.35 Straight Through Cable

Table B-6. Pinouts for V.35 Straight Through Cable

Pin	V.35 Connector #1 Signal	Pin	V.35 Connector #2 Signal
A	Earth Ground	A	Earth Ground
B	Signal Ground	B	Signal Ground
C	Request To Send	C	Request To Send
D	Clear To Send	D	Clear To Send
E	Data Set Ready	E	Data Set Ready
F	Data Carrier Detect	F	Data Carrier Detect
H	Data Terminal Ready	H	Data Terminal Ready
L	Local Loopback	L	Local Loopback
N	Remote Loopback	N	Remote Loopback
P	Transmit Data (Signal P)	P	Transmit Data (Signal P)
R	Receive Data (Signal P)	R	Receive Data (Signal P)
S	Transmit Data (Signal N)	S	Transmit Data (Signal N)
T	Receive Data (Signal N)	T	Receive Data (Signal N)
U	External Transmit Clock (Signal P)	U	External Transmit Clock (Signal P)
V	Receive Clock (Signal P)	V	Receive Clock (Signal P)
W	External Transmit Clock (Signal N)	W	External Transmit Clock (Signal N)
X	Receive Clock (Signal N)	X	Receive Clock (Signal N)
Y	Transmit Clock (Signal P)	Y	Transmit Clock (Signal P)
Z	External Receive Clock (Signal P)	Z	External Receive Clock (Signal P)
AA	Transmit Clock (Signal N)	AA	Transmit Clock (Signal N)
BB	External Receive Clock (Signal N)	BB	External Receive Clock (Signal N)
NN	Test Indicator	NN	Test Indicator

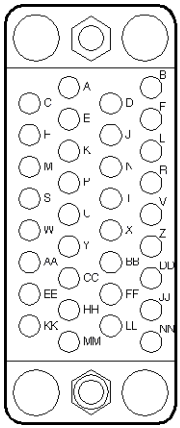
Table B-7. Twisted Pairs for V.35 Straight Through Cable

Required Twisted Pairs	
P & S	V & X
R & T	Y & AA
U & W	Z & BB

Product Code:

40011X (5 ft.)
40011Y (15 ft.)
40011Z (30 ft.)

Female V.35 Connector #1 (Cable Entry View)



Male V.35 Connector #2 (Cable Entry View)

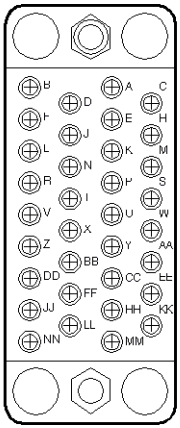


Figure B-6. V.35 Straight Through Cable Diagram

V.35 Crossover Cable

Table B-8. Pinouts for V.35 Crossover Cable

Pin	V.35 Connector #1 Signal	Pin	V.35 Connector #2 Signal
A	Earth Ground	A	Earth Ground
B	Signal Ground	B	Signal Ground
C	Request To Send	F	Data Carrier Detect
D	Clear To Send	L	Local Loopback
E	Data Set Ready	H	Data Terminal Ready
F	Data Carrier Detect	C	Request To Send
H	Data Terminal Ready	E	Data Set Ready
L	Local Loopback	D	Clear To Send
N	Remote Loopback	NN	Test Indicator
P	Transmit Data (Signal P)	R	Receive Data (Signal P)
R	Receive Data (Signal P)	P	Transmit Data (Signal P)
S	Transmit Data (Signal N)	T	Receive Data (Signal N)
T	Receive Data (Signal N)	S	Transmit Data (Signal N)
U	External Transmit Clock (Signal P)	V	Receive Clock (Signal P)
V	Receive Clock (Signal P)	U	External Transmit Clock (Signal P)
W	External Transmit Clock (Sig. N)	X	Receive Clock (Signal N)
X	Receive Clock (Signal N)	W	External Transmit Clock (Sig. N)
Y	Transmit Clock (Signal P)	Z	External Receive Clock (Signal P)
Z	External Receive Clock (Signal P)	Y	Transmit Clock (Signal P)
AA	Transmit Clock (Signal N)	BB	External Receive Clock (Signal N)
BB	External Receive Clock (Signal N)	AA	Transmit Clock (Signal N)
NN	Test Indicator	N	Remote Loopback

Table B-9. Twisted Pairs for V.35 Crossover Cable

Required Twisted Pairs	
P & S	V & X
R & T	Y & AA
U & W	Z & BB

Product Code:

40010X (5 ft.)
40010Y (15 ft.)
40010Z (30 ft.)

Pins Z and BB are Ascend-specific. When using customized cables to make DTE connections to a Ascend switch, make sure you map the Transmit Clock to the External Receive Clock.

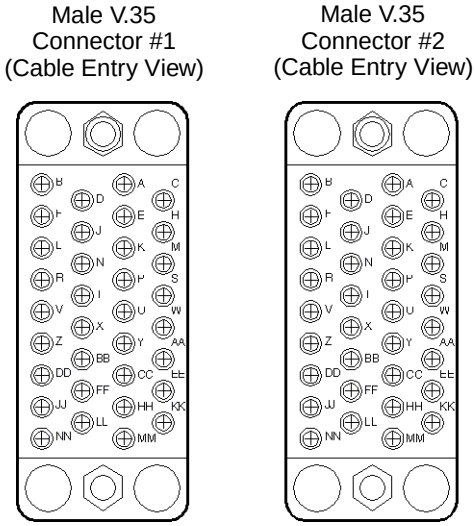


Figure B-7. V.35 Crossover Cable Diagram

X.21 Straight Through Cable

Table B-10. Pinouts for X.21 Straight Through Cable

Pin	X.21 Connector #1 Signal	Pin	X.21 Connector #2 Signal
2	Transmit Data (P)	2	Transmit Data (P)
3	Request To Send (P)	3	Request To Send (P)
4	Receive Data (P)	4	Receive Data (P)
5	Data Carrier Detect (P)	5	Data Carrier Detect (P)
6	Receive Clock (P)	6	Receive Clock (P)
7	External Transmit Clock (P)	7	External Transmit Clock (P)
8	Ground	8	Ground
9	Transmit Data (N)	9	Transmit Data (N)
10	Request To Send (N)	10	Request To Send (N)
11	Receive Data (N)	11	Receive Data (N)
12	Data Carrier Detect (N)	12	Data Carrier Detect (N)
13	Receive Clock (N)	13	Receive Clock (N)
14	External Transmit Clock (N)	14	External Transmit Clock (N)
	Required Twisted Pairs		
	2 & 9 5 & 12		
	3 & 10 6 & 13		
	4 & 11 7 & 14		

Product Code:

40008X (5 ft.)
40008Y (15 ft.)
40008Z (30 ft.)

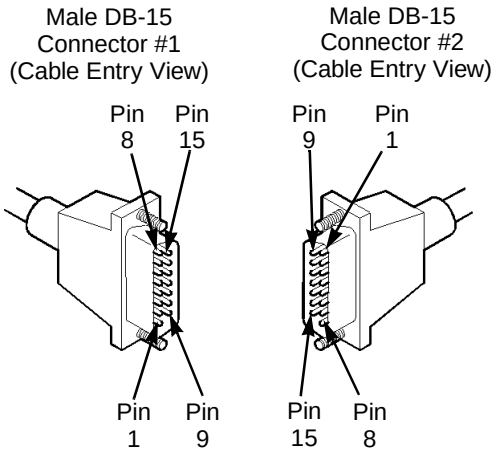


Figure B-8. X.21 Straight Through Cable Diagram

X.21 Crossover Cable

Table B-11. Pinouts for X.21 Crossover Cable

Pin	X.21 Connector #1 Signal	Pin	X.21 Connector #2 Signal
2	Transmit Data (P)	4	Receive Data (P)
3	Request To Send (P)	5	Data Carrier Detect (P)
4	Receive Data (P)	2	Transmit Data (P)
5	Data Carrier Detect (P)	3	Request To Send (P)
6	Receive Clock (P)	7	External Transmit Clock (P)
7	External Transmit Clock (P)	6	Receive Clock (P)
8	Ground	8	Ground
9	Transmit Data (N)	11	Receive Data (N)
10	Request To Send (N)	12	Data Carrier Detect (N)
11	Receive Data (N)	9	Transmit Data (N)
12	Data Carrier Detect (N)	10	Request To Send (N)
13	Receive Clock (N)	14	External Transmit Clock (N)
14	External Transmit Clock (N)	13	Receive Clock (N)
	Required Twisted Pairs		
	2 & 9 5 & 12		
	3 & 10 6 & 13		
	4 & 11 7 & 14		

Product Code:

40009X (5 ft.)
40009Y (15 ft.)
40009Z (30 ft.)

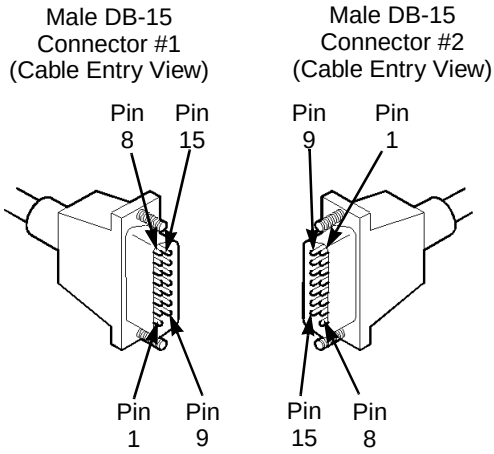


Figure B-9. X.21 Crossover Cable Diagram

T1 Straight Through Cable - DB-15

Table B-12. Pinouts for T1 Straight Through Cable (DB-15)

Pin	Male DB-15 Connector #1 Signal	Pin	Male DB-15 Connector #2 Signal
1	Transmit Tip	1	Transmit Tip
3	Receive Tip	3	Receive Tip
9	Transmit Ring	9	Transmit Ring
11	Receive Ring	11	Receive Ring
	Required Twisted Pairs		
	1 & 9		
	3 & 11		
			Product Code:
			40004

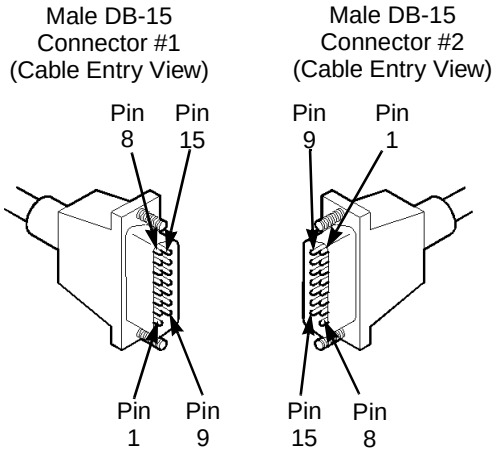


Figure B-10. T1 Straight Through Cable Diagram

T1 Crossover Cable - DB-15

Table B-13. Pinouts for T1 Crossover Cable (DB-15)

Pin	Male DB-15 Connector #1 Signal	Pin	Male DB-15 Connector #2 Signal
1	Transmit Tip	3	Receive Tip
3	Receive Tip	1	Transmit Tip
9	Transmit Ring	11	Receive Ring
11	Receive Ring	9	Transmit Ring
	Required Twisted Pairs		
	1 & 9		
	3 & 11		
			Product Code: 40020

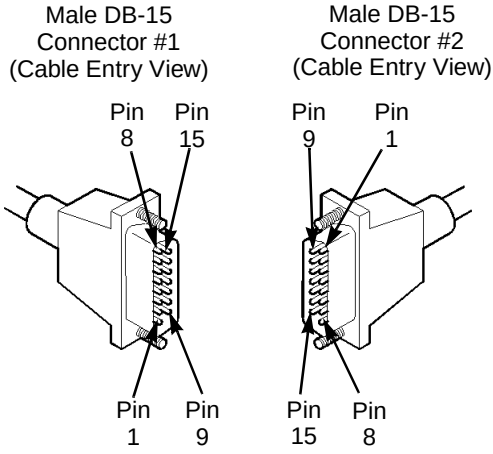


Figure B-11. T1 Crossover Cable Diagram

T1 Straight Through USOC-RJ-48C Connector

Table B-14. Pinouts for T1 Straight Through USOC-RJ-48C Connector

Pin	Signal	Pin	Signal
1	Receive Ring	1	Receive Ring
2	Receive Tip	2	Receive Tip
4	Transmit Ring	4	Transmit Ring
5	Transmit Tip	5	Transmit Tip
			Product Code: 40022X (5 ft.) 40022Y (15 ft.) 40022Z (30 ft.)

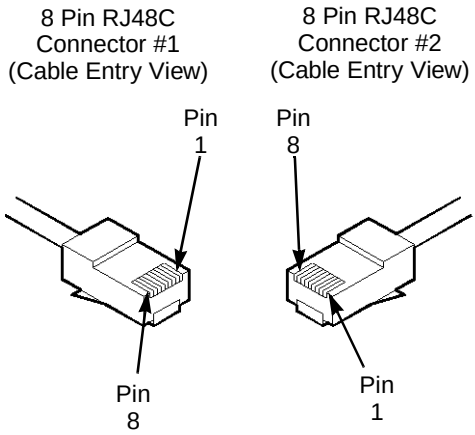


Figure B-12. T1 Straight Through USOC-RJ-48C Connector Diagram

T1 Crossover USOC-RJ-48C Connector

Table B-15. Pinouts for T1 Crossover USOC-RJ-48C Connector

Pin	Signal	Pin	Signal
1	Receive Ring	4	Transmit Ring
2	Receive Tip	5	Transmit Tip
4	Transmit Ring	1	Receive Ring
5	Transmit Tip	2	Receive Tip
			Product Code: 40023X (5 ft.) 40023Y (15 ft.) 40023Z (30 ft.)

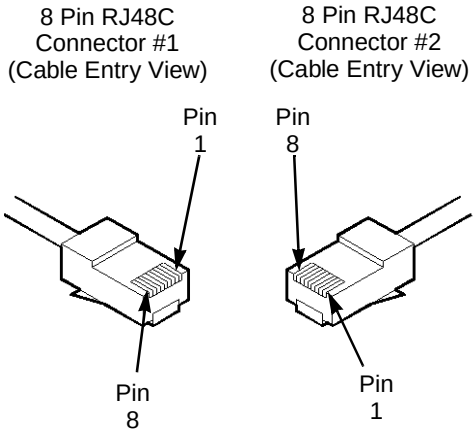


Figure B-13. T1 Crossover USOC-RJ-48C Connector Diagram

8/18-Port UIO X.21 Straight Through Cable

Table B-16. 8/18-Port UIO X.21 Straight Through Cable Pin-Out Assignments

Pin	Male SCSI Connector #1	Pin	Female DB-15 Connector #2
45	Transmit Data <1> (Signal P)	2	Transmit Data <1> (Signal P)
48	Control <1> (Signal P)	3	Control <1> (Signal P)
39	Receive Data <1> (Signal P)	4	Receive Data <1> (Signal P)
42	Indicator <1> (Signal P)	5	Indicator <1> (Signal P)
44	Signal Element Timer <1> (Signal P)	6	Signal Element Timer <1> (Signal P)
50	DT Signal Element Timer <1> (Signal P)	7	DT Signal Element Timer <1> (Signal P)
14	Ground	8	Ground
46	Transmit Data <1> (Signal N)	9	Transmit Data <1> (Signal N)
47	Control <1> (Signal N)	10	Control <1> (Signal N)
40	Receive Data <1> (Signal N)	11	Receive Data <1> (Signal N)
41	Indicator <1> (Signal N)	12	Indicator <1> (Signal N)
43	Signal Element Timer <1> (Signal N)	13	Signal Element Timer <1> (Signal N)
49	DT Signal Element Timer <1> (Signal N)	14	DT Signal Element Timer <1> (Signal N)
		Pin	**Female DB-15 Connector #3**
32	Transmit Data <2> (Signal P)	2	Transmit Data <2> (Signal P)
35	Control <2> (Signal P)	3	Control <2> (Signal P)
26	Receive Data <2> (Signal P)	4	Receive Data <2> (Signal P)
29	Indicator <2> (Signal P)	5	Indicator <2> (Signal P)
31	Signal Element Timer <2> (Signal P)	6	Signal Element Timer <2> (Signal P)
37	DT Signal Element Timer <2> (Signal P)	7	DT Signal Element Timer <2> (Signal P)
12	Ground	8	Ground
33	Transmit Data <2> (Signal N)	9	Transmit Data <2> (Signal N)

Table B-16. 8/18-Port UIO X.21 Straight Through Cable Pin-Out Assignments

Pin	Male SCSI Connector #1 (cont.)	Pin	Female DB-15 Connector #3 (cont.)
34	Control <2> (Signal N)	10	Control <2> (Signal N)
27	Receive Data <2> (Signal N)	11	Receive Data <2> (Signal N)
28	Indicator <2> (Signal N)	12	Indicator <2> (Signal N)
30	Signal Element Timer <2> (Signal N)	13	Signal Element Timer <2> (Signal N)
36	DT Signal Element Timer <2> (Signal N)	14	DT Signal Element Timer <2> (Signal N)

Required Twisted Pairs
Female DB-15 Connectors

2 & 9 5 & 12
3 & 10 6 & 13
4 & 11 7 & 14
Ground 8

Product Code:

40032X

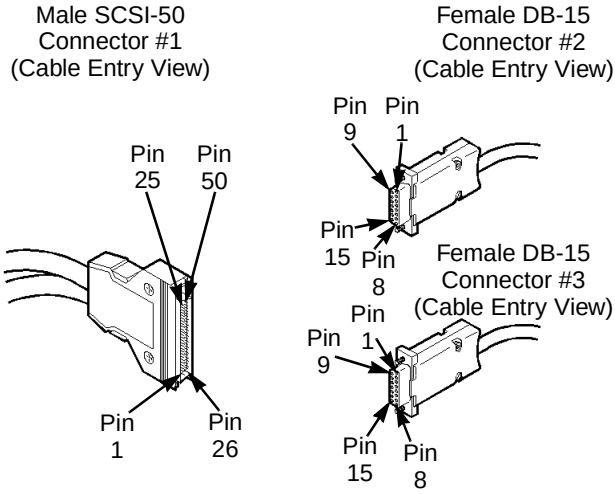


Figure B-14. 8/18-Port UIO X.21 Straight Through Cable Diagram

8/18-Port UIO V.24 Straight Through Cable

Table B-17. Pinouts for 8 and 18 Port UIO V.24 Straight Through Cable

Pin	50 Pin Male SCSI, Connector #1	Pin	Female DB-25, Connector #2
1	Receive Data (2)	2	Transmit Data
2	Transmit Clock (2)	3	Receive Data
3	Receive Clock (2)	4	Request To Send
4	Data Set Ready (2)	5	Clear To Send
5	Received Line Signal Detect (2)	6	Data Set Ready
6	Clear To Send (2)	7	GND
7	Transmit Data (2)	8	Received Line Signal Detect
8	DTE_Transmit Clock (2)	15	Transmit Clock
9	DTE_Receive Clock (2)	16	DTE_Receive Clock
10	Request To Send (2)	17	Receive Clock
12	GND	20	Data Terminal Ready
14	GND	24	DTE_Transmit Clock
			Female DB-25, Connector #3
15	Receive Data (1)	2	Transmit Data
16	Transmit Clock (1)	3	Receive Data
17	Receive Clock (1)	4	Request To Send
18	Data Set Ready (1)	5	Clear To Send
19	Received Line Signal Detect (1)	6	Data Set Ready
20	Clear To Send (1)	7	GND
21	Transmit Data (1)	8	Received Line Signal Detect
22	DTE_Transmit Clock (1)	15	Transmit Clock
23	DTE_Receive Clock (1)	16	DTE_Receive Clock

Table B-17. Pinouts for 8 and 18 Port UIO V.24 Straight Through Cable

Pin	50 Pin Male SCSI, Connector #1 (cont.)	Pin	Female DB-25, Connector #3 (cont.)
24	Request To Send (1)	17	Receive Clock
25	Data Terminal Ready (1)	20	Data Terminal Ready

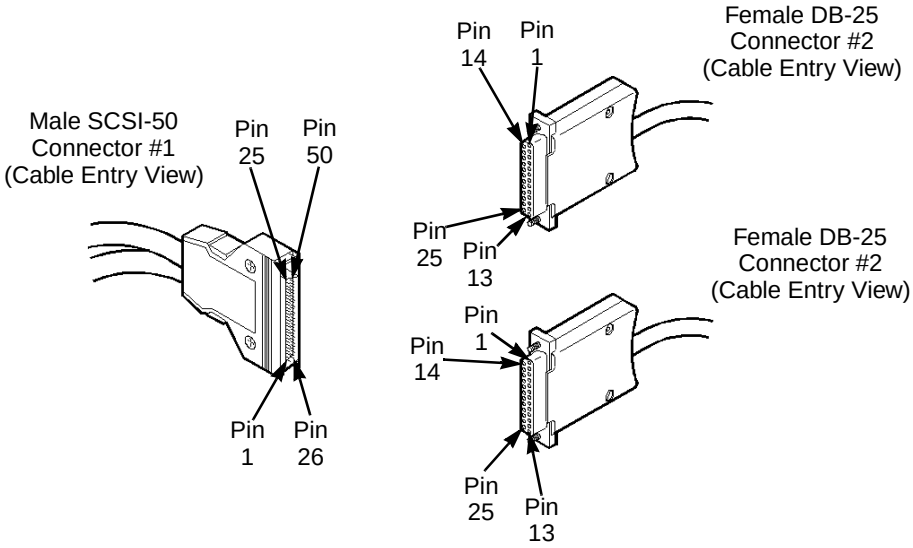


Figure B-15. 8/18-Port UIO V.24 Straight Through Cable Diagram

V.35 Loopback Connector (Male)

Table B-18. Pinouts for V.35 Loopback Connector (Male)

Pin	Signal		Pin	Signal
C	Request To Send	⇒	F	Data Carrier Detect
D	Clear To Send	⇒	L	Local Loopback
E	Data Set Ready	⇒	H	Data Terminal Ready
N	Remote Loopback	⇒	NN	Test Indicator
P	Transmit Data (Signal P)	⇒	R	Receive Data (Signal P)
S	Transmit Data (Signal N)	⇒	T	Receive Data (Signal N)
U	External Receive Clock (Signal P)	⇒	V	Receive Clock (Signal P)
W	External Transmit Clock (Sig. N)	⇒	X	Receive Clock (Signal N)
Y	Transmit Clock (Signal P)	⇒	Z	External Receive Clock (Signal P)
AA	Transmit Clock (Signal N)	⇒	BB	External Receive Clock (Signal N)

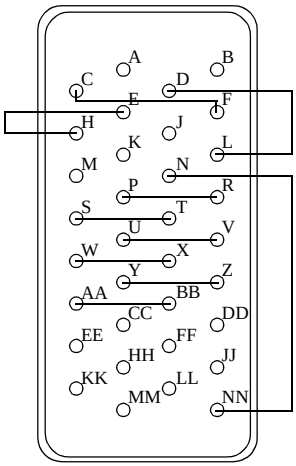


Figure B-16. V.35 Loopback Connector Connection Summary

X.21 Loopback Connector (Male)

Table B-19. Pinouts for X.21 Loopback Connector (Male)

Pin	Signal		Pin	Signal
2	Transmit Data (Signal P)	⇒	4	Receive Data (Signal P)
3	Request To Send (Signal P)	⇒	5	Data Carrier Detect (Signal P)
6	Receive Clock (Signal P)	⇒	7	External Transmit Clock (Signal P)
9	Transmit Data (Signal P)	⇒	11	Receive Data (Signal P)
10	Request To Send (Signal N)	⇒	12	Data Carrier Detect (Signal N)
13	Receive Clock (Signal N)	⇒	14	External Transmit Clock (Signal N)

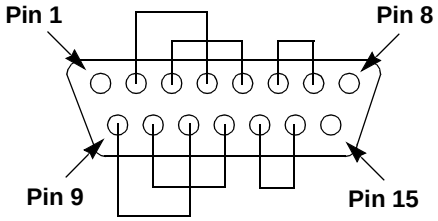


Figure B-17. X.21 Loopback Connector Connection Summary

T1 Loopback Connector (Male)

Table B-20. Pinouts for T1 Loopback Connector (Male)

Pin	Signal		Pin	Signal
1	Transmit Tip	⇒	3	Receive Tip
9	Transmit Ring	⇒	11	Receive Ring

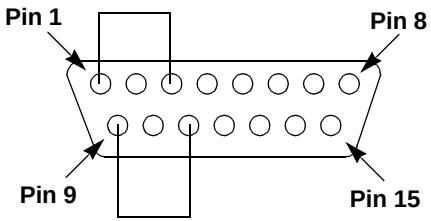


Figure B-18. T1 Loopback Connector Connection Summary

RJ-48 Loopback Connector (Male)

Table B-21. Pinouts for RJ-48 Loopback Connector (Male)

Pin	Signal		Pin	Signal
1	Receive Ring	⇒	4	Transmit Ring
2	Receive Tip	⇒	5	Transmit Tip

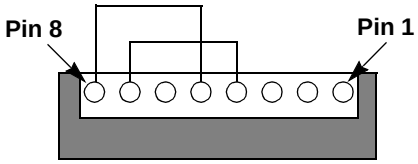


Figure B-19. RJ-48 Loopback Connector Connection Summary

C

Regulatory Information

The following section describes the regulatory requirements of the United Kingdom.

Product Attachment Information

1. According to the requirements of TIS 6328/8.2, the default configuration of the 75Ω G.703 Interface (E1) with regards to the grounding of the outer conductor of the BNC connectors is as follows:

   - Transmit port (XMTR) - connected to earth ground.
   - Receive port (RCVR) - insulated from earth ground.

   To connect the receive port to earth ground:

   a. Remove the BNC retaining nut and metal washers on the RCVR port BNC connector.

   b. Remove and discard the insulating grommet from the BNC connector.

   c. Reinstall the retaining nut and metal washers on the BNC connector. The outer shell of the RCVR port is then positively connected to earth ground.

The default earthing of the G.703 port may result in a violation to the EN55022 Class B EMI specification. Compliance with the EN55022 Class B specification requires that the outer conductor of both the Transmit and Receive ports of the 75Ω G.703 interface must be securely attached to earth ground.

2. The 75Ω G.703 interface has not been tested in a BS6701 configuration and should not be connected to BS6701 approved cabling.

3. The recommended cable specifications for interface to Ascend STDX 6000 are summarized in Table C-1.

Table C-1. Cable Specifications

Interface Type	Twisted Pairs	DC Res. Ω/km	Nom. Imp. Ω	Nom. Cap. pf/m
% Shield	Max. Length	V.35	12	78
100	15.5/27.5	90%	50m	X.21
7	78	100	15.5/27.5	90%
50m	G.703 - 75 Ω	N/A	49.2	75
66.7	95%	50m		

V.35 and X.21 Nominal Capacitance is specified as cond. to cond./cond. to earth.

To comply with the EN55022 EMI specification, it is also recommended that the V.35 cables use the following ISO2593 hood assembly:

- Hood Assembly: CDM, Nickel Plated, Part No. 783.734-90. The V.35 cables that can be ordered from Ascend use this hood assembly.

Environmental Standards Compliance

Ascend's STDX 6000 is approved by the following regulatory agencies to be fully compliant with their environmental standards:

- Network Equipment Building System (NEBS) TR-NWT-00063 Issue 5 and TR-NWT-001089 Issue 1
- British Approval Board for Telecommunications (BABT) — EMC, Safety, and Factory Compliance
- TUV — EMC, Safety, and Factory Compliance
- IEC 950, EN60950
- Canadian Standards Association (CSA) — Safety and Factory Compliance CSA 22.2
- Underwriter's Laboratory (UL) — Safety and Factory Compliance UL 1950
- Federal Communications Commission (FCC) — EMC compliance (Class A, Part 68)

In addition, Ascend's STDX 6000 meets the following Country Standards:

- Australia (Safety)
- New Zealand (EMC and Telecommunications Function)

Example Affidavit

This is an example of the affidavit that needs to be filed with the Telco concerning connection of customer premise equipment (CPE) to 1.544 Mbps services:

For the work to be performed in the certified territory of _____ (name of Telco), State of _____, County of, _____, I, _____ (Name), of _____ (Business Address), _____(phone number) being duly sworn, state the following:

I have responsibility for the operation and maintenance of the terminal equipment to be connected to 1.544 Mbps digital services. The terminal equipment to be connected complies with Part 68 of the FCC rules except for the encoded analog content and billing protection specifications. With respect to the encoded analog content and billing protection:

( ) I attest that all operations associated with the establishment, maintenance of the terminal equipment to be connected to 1.544 Mbps digital services complies with Part 68 of the FCC Rules and Regulations.

( ) The digital CPE does not transmit digital signals containing encoded analog content or billing information which is intended to be decoded within the telecommunications network.

( ) The encoded analog content and billing protection is factory set and is not under control of the customer.

I attest that the operator(s)/maintainer(s) of the digital CPE responsible for the establishment, maintenance and adjustment of the encoded analog content and billing information has (have) been trained to perform these functions by successfully having completed one of the following:

( ) A training course provided by the manufacturer/grantee of the equipment used to encode analog signals; or

( ) A training course provided by the customer or authorized representative, using training materials and instructions provided by the manufacturer/grantee of the equipment used to encode analog signals; or

( ) An independent training course (e.g. trade school or technical institution) recognized by the manufacturer/grantee of the equipment used to encode analog signals; or

( ) In lieu of the proceeding training requirements, the operator(s)/maintainer(s) is (are) under control of a supervisor trained in accordance with _____ (circle one) above.

I agree to provide _____ (name of Telco) with proper documentation to demonstrate compliance with the information as provided in the preceding paragraph, if so requested.

_____ (Signature)

_____ (Title)

_____ (Date)

Subscribe and sworn to before me, this _____ day of _____, 19__.

_____ Notary Public, my commission expires _____.

D

Console Commands

This appendix provides a list of console commands that you can enter to perform various tasks on the switch or to obtain information from the STDX 6000.

The console remembers the last ten commands that you enter. ^B can be used to recall previous commands as needed.

STDX 6000 Console Commands

The commands listed in this section apply to the STDX 6000 Frame Relay release. STDX 6000 SMDS release 3.1.94 has the same command set as release 4.0.

- To display a list of available commands, type '?'

  > ?
  CONFIGURATION CONSOLE COMMANDS:

  ping <[ip address]><oid>
  bye, end, exit, or quit
  get <oid>
  set <oid>
  next <oid>

For get, set, & next, the following OID shorthand prefixes can be used:

std, system, interface, ip, icmp, udp, snmp, ds1, frx, net, ase, node, pport, lport, ckt

- To go into master or debug mode:

  login [master|debug]

  example 1:

  > login debug
  Password: **[*your debug password*]**

  example 2:

  > login master
  Password: **[*your debug password*]**

- snmp get

  get <oid>

  example 1: get 1.3.6.1.2.1.1.1.0
  example 2: get node.10.0

- snmp set

  set <oid> <<integer> | <asn.1> | <“string”> | <[ip address]>>

  example: set node.1.0 [152.148.100.1]

  snmp next

  next <oid>

  example: next node

- change community name

  set community<0-7> <“read-only community name”>
  set community<0-7> <“master community name”> <[master ip address]>

Only one master community can be specified.

- To test reachability of an IP node:

  ping <[ip address]>

- To exit from the console:

  bye, end, exit or quit

- To clear the configuration:

  reset pram

- To restart the system:

  reset system

- To read directly from and write directly to memory:

  mb <address> | <address#bytes>(modify one byte)
  modify <address> | <address#words>(modify a 4-byte word)
  dump [[address] | [address#length]](dump memory contents)

E

Glossary of Terms

active hub

A device that amplifies transmission signals in a network, enabling signals to be sent over a much greater distance than is possible with a passive hub.

AMI (Alterable Mark Inversion)

A signaling format used in T1 lines. It provides for the “ones” pulses to have an alternating priority. Thus, if the nth one bit is represented by a positive pulse, the nth T1 would be a negative pulse.

asynchronous communications server

A LAN server that enables a network user to dial out of the network into the public switched telephone system, or to access leased lines for asynchronous communications. May also be called dial-in/dial-out servers or modem servers.

AT command set

A set of standard instructions used to activate features on a modem. Originally developed by Hayes Microcomputer Products, the AT command set is now used by almost all modem manufacturers.

ATM (Asynchronous Transfer Mode)

A method used for transmitting voice, video, and data over high-speed LANs. Also known as cell relay.

attenuation

The decrease in power of a signal over distance. Attenuation is measured in decibels.

auto-ranging

The ability for a power supply to detect the correct voltage that is being received from the power source.

backbone

That portion of a network that manages the bulk of the network traffic.

balun

A small device used to connect a balanced line (such as a twisted-pair cable) to an unbalanced line (such as a coaxial cable).

bandwidth

The transmission capacity of a computer or a communications channel.

The difference between the highest and lowest frequencies available for transmission.

bandwidth on demand

A feature of WANs that enables the user to dial up additional bandwidth as the application demands it.

BECN (Backward Explicit Congestion Notification)

A bit in the frame relay header that indicates the frame has passed through a node experiencing congestion in the opposite direction that the frame is traveling.

bits per second

The number of bits transmitted every second during a data transfer.

blue alarm

An alarm signal indicating that all one pulses are being received.

BNC connector

A small connector with a half-turn locking shell for coaxial cable. Normally used with thin Ethernet cabling.

bps

See bits per second.

bridge

A hardware device used to connect LANs (usually LANs that are using different wiring or network protocols). Bridges operate at the data-link layer of the ISO/OSI model.

broadband network

A technique for transmitting a large amount of information, including voice, data, and video, over long distances using the same cable.

broadcast

Send a message to all users currently logged in to the network.

brouter

A networking device that combines the attributes of a bridge and router.

burst mode

A method of data transmission in which information is collected and then sent in a single high-speed transmission, rather than one character at a time.

CascadeView

The Windows-based graphical user interface that you use to configure and monitor the Ascend network.

CascadeView/UX

The UNIX-based graphical user interface that you use to configure and monitor the Ascend network.

cell

Any fixed-length packet. For example, ATM uses 53-byte cells.

cell relay

A form of packet transmission that used a fixed-length, 53-byte cell over a packet-switched network. Also known as ATM (Asynchronous Transfer Mode).

channel

Any connecting path that carries information from a sending device to a receiving device. May refer to a physical medium (e.g., coaxial cable) or a specific frequency within a larger channel.

circuit

A communications channel or path between two devices.

circuit switching

A temporary communications connection that is established as needed between a sending node and a receiving node.

Clear To Send (CTS)

A hardware signal defined by the RS-232-C standard. It indicates that the transmission can proceed.

client

A device that makes use of the services provided by a server.

communications protocol

A standard way of communicating between computers, or computers and terminals.

A hardware interface standard, such as RS-232C.

concentrator

A repeater or hub that joins communications channels from several different network nodes. Provides bridging, routing, and other management functions.

connectivity

The degree to which any given computer or application can cooperate with other network components in a network environment where resources are shared.

CRC (cyclic redundancy check)

A calculation method used to check the accuracy of digital transmission over a communications link.

CSU (Channel Service Unit)

A device that functions as a certified safe electrical circuit, acting as a buffer between the customer's equipment and a public carrier's WAN.

data bits

In asynchronous transmissions, the bits that actually comprise the data being sent.

Data Carrier Detect (DCD)

A hardware signal defined by the RS-232-C standard. It indicates that the device is on-line and ready for transmission.

datagram

A message unit that contains source and destination address information, as well as the data itself, which is routed through a packet-switched network.

data-link layer

The second of seven layers of the ISO/OSI model for computer-to-computer communications. This layer validates the integrity of the flow of data from one node to another by synchronizing blocks of data and controlling the flow of data.

data packet

One unit of information transmitted as a discrete entity from one network node to another. In packet-switched networks, a data packet is a transmission unit of a fixed maximum length that contains a header, a set of data, and error control information.

Data Set Ready (DSR)

A hardware signal defined by the RS-232-C standard. It indicates that the device is ready to operate.

Data Terminal Ready (DTR)

A hardware signal defined by the RS-232-C standard. It is sent from a computer to a modem to indicate that the computer is ready to receive a transmission.

DB (data bus) connector

A cable connector used for parallel or serial ports. The number following DB indicates the number of pins in the connector (e.g., DB-25 connectors have 25 pins).

DCE (data communications equipment)

Any device that connects a computer or terminal to a communications channel or public network.

D-Channel

The data channel in ISDN, used for control signals and customer data. In Primary Rate ISDN (PRI), it operates at 64 Kbps.

dedicated line

A communications circuit used for one specific purpose, and not used by or shared between other users.

dedicated server

A computer on the network that functions only as a server performing specific network tasks.

destination address

The address portion of a packet or datagram that identifies the intended recipient.

DIP (dual in-line position) switch

A small switch used to select the operating mode of a device.

DS (Digital Signal or Digital Service)

Defines the level of common carrier digital transmission service. DS-0 = 64 Kbps (Fractional T1), DS-1 = 1.544 Mbps (T1), DS-2 = 6.312 Mbps (T2), DS-3 = 44.736 Mbps (T3), and DS-4 =274-176 Mbps (T4).

DSU (Data Service Unit)

A device that connects DTE to digital communications lines. It formats the data for transmission on the public carrier WAN, and ensures that the carrier's requirements for data formats are met.

DSX-1

A specification that indicates the physical and electrical characteristics of the standard T1 cross-connect.

DTE (Data Terminal Equipment)

Any device, such as a terminal or computer, that is connected to a communications device, channel, or public network.

duplex

The ability to transmit and receive on the same channel at the same time. Also known as full-duplex (FDX).

dynamic routing

A routing technique that allows a message's route to change as the message is in transit through the network.

error detection and correction (EDAC)

A mechanism used to determine whether transmission errors have occurred, and if so, to correct those errors.

error rate

The ratio between the number of bits received incorrectly, and the total number of bits in the transmission.

ESF (Extended Superframe Format)

Extends the DS1 superframe structure from 12 to 24 frames, for a total of 4632 bits. It redefines the 8 Kbps channel consisting of framing bits previously used exclusively for terminal and robbed-bit signalling synchronization.

Ethernet

A popular network protocol and cabling scheme with a transfer rate of 10 Mbps.

Ethernet packet

A variable-length unit in which information is transmitted on an Ethernet network.

FDDI (Fiber Distributed Data Interface)

A specification for fiber-optic networks transmitting at a speed up to 100 Mbps over a dual, counter-rotating token-ring topology.

FDM

See frequency-division multiplexing.

FECN (Forward Explicit Congestion Notification)

A bit in the frame relay header that indicates the frame has passed through a node experiencing congestion in the same direction the frame is traveling.

file transfer protocol

A method of transferring information from one computer to another, either over a modem and telephone line, or over a network.

Fractional T1

One portion of a T1 circuit. T1 circuits consist of 24 64-Kbps channels. Customers can lease as many of these circuits as are needed; they do not have to lease them all.

FRAD (Frame Relay Assembler/Disassembler)

Provides encapsulation for any HDLC-based protocol to be “enveloped” in a frame relay header and transported over the frame relay network.

frame

A block of data suitable for transmission as a single unit.

frame relay

A standard for a packet-switching protocol, running at speeds up to 2 Mbps. Frame relay provides for bandwidth on demand.

frequency-division multiplexing

A method of sharing a transmission channel by dividing the bandwidth into several parallel paths. All signals are carried simultaneously.

FTP

See file transfer protocol.

full-duplex (FDX)

See duplex.

gateway

A shared connection between a LAN and a larger system (such as a mainframe computer) or a large packet-switched network whose communications protocols differ.

Hayes-compatible modem

Any modem that recognizes commands in the industry-standard AT command set.

HDLC (High-level Data Link Control)

An international protocol defined by ISO. In HDLC, messages are transmitted in variable-length units known as frames.

heterogeneous network

A network that consists of workstations, servers, network interface cards, operating systems, and applications from many different vendors, all operating together as a single unit.

homogeneous network

A network that consists of one type of workstation, server, network interface card, and operating system, with a limited number of applications, all purchased from a single vendor. All nodes use the same protocol and the same control procedures.

hop count

The number of links that must be crossed to get from any given source node to any given destination node.

HSSI (High-Speed Serial Interface)

A high-speed interface (up to 52 Mbps full duplex) between a DTE (Data Terminal Equipment) and a DCE (data communications equipment). All timing for the interface is provided by the DCE. HSSI can drive a shielded twisted-pair cable of 50 feet (15m).

hub

A device that modifies transmission signals, allowing the network to be extended to accommodate additional workstations. Active hubs amplify signals to extend cable length. Passive hubs split the transmission signal, allowing additional workstations to be added.

ICMP (Internet Control Message Protocol)

That portion of TCP/IP that provides the functions used for network layer management and control.

IEEE standards

Various standards that define networks. Includes 802.1, 802.2, 802.3, 802.4, 802.5, and 802.6.

internal clocking

When the Ascend switch provides the transmit and receive clocks to the user equipment.

IP (Internet Protocol)

The TCP/IP session-layer protocol that regulates packet forwarding.

ISDN (Integrated Services Digital Network)

A standard for a worldwide digital communications network, intended to replace all current systems with a completely digital transmission system.

ISO (International Standards Organization)

An international standards-making group, based in Geneva, that establishes global standards for communications and information exchange.

jitter

A type of distortion found on analog communications lines that results in data transmission errors.

Kbps

Kilobits per second.

keep-alives

This message is used in the LMI (Link Management Interface) of a frame relay port to verify link integrity.

LAP (Link Access Protocol)

The link-level protocol that is used for communications between DCE (data communications equipment) and DTE (Data Terminal Equipment).

LAP-B

A bit-oriented data-link protocol used to link terminals and computers to packet-switched networks.

LMI (Link Management Interface)

(Rev 1) A synchronous polling scheme used for the link management of a frame relay channel where the user polls the network to obtain status information of the PVCs (Permanent Virtual Circuits) configured on the channel. LMI exchanges this information using DLCI 1023.

loopback

Directing signals back towards the source along a communications path.

Mbps

Megabits per second.

MIB (Management Information Base)

The set of variables forming a database contained in a CMOT or SNMP-manageable node on a network. Network management nodes can fetch/store information from/to this database.

multicast

A special form of broadcast in which copies of the message are delivered to multiple stations, but not to all possible stations.

multiplexer (mux)

A device that merges several lower-speed transmission channels into one high-speed channel at one end of the link. Another mux reverses this process at the other end.

multiplexing

A technique that transmits several signals over a single communications channel.

node

Any device attached to the network that is capable of communicating with other network devices.

node number

The number that uniquely identifies a network interface card.

noise

Extraneous signals on a transmission channel that degrade the quality or performance of the channel.

OSPF (Open Shortest Path First)

A routing protocol that takes into account network loading and bandwidth when routing information over the network. OSPF incorporates least-cost routing, equal-cost routing, and load balancing.

packet

Any block of data sent over a network. Each packet contains sender, receiver, and error control information, in addition to the actual message.

packet filter

A process used by bridges to limit protocol-specific traffic to one segment of the network, to isolate e-mail domains, and to perform other traffic-control functions.

packet-switched network

A network that consists of a series of interconnected circuits that route individual packets of data over one of several alternative routes.

PAD (Packet Assembler/Disassembler)

A device connected to a packet-switched network that converts a serial data stream from a character-oriented device (e.g., a bridge or router) into packets suitable for transmission. It also disassembles packets back into character for transmission to the character device.

passive hub

A device used in some networks to split a transmission signal, allowing additional hubs to be added to the network.

PDN (Public Data Network)

Any government-owned or controlled commercial packet-switched network, offering wide-area services to data processing users.

PPP (Point-to-Point Protocol)

A protocol that provides router-to-router and host-to-network connections.

protocol

A set of rules governing communication (and the exchange of data) between two entities or systems.

PVCs (Permanent Virtual Circuits)

A logical connection across a packet-switched network that is always in place and always available along a predetermined network path.

Receive Data (RXD)

A hardware signal defined by the RS-232-C standard. It carries data from one device to another.

red alarm

A T1 alarm condition indicating a loss of signal or loss of frame at the device's local termination.

redundancy

The duplication of hardware or software within a network to ensure complete operation.

remote connection

A workstation-to-network connection made using a modem and telephone line. It enables data to be sent or received over greater distances than those allowed by conventional cabling.

repeater

A device that receives data on one communication link and transmits it, bit by bit, on another link as fast as it is received, without buffering.

Request To Send (RTS)

A hardware signal defined by the RS-232-C standard. It requests permission to transmit.

RFC (Request For Comment)

The name of a series of notes that contain surveys, measurements, ideas, techniques, and observations, as well as proposed and accepted Internet protocol standards.

RIP (Routing Information Protocol)

A routing protocol that maintains a list of reachable networks and calculates the degree of difficulty involved in reaching a specific network from a particular location (by determining the lowest hop count).

router

An intelligent connecting device that can send packets to the correct LAN segment to take them to their destination. Routers link LAN segments at the ISO/OSI network layer. The networks connected by routers can use similar or different network protocols.

routing

The process of directing message packets from a source node to a destination node.

Serial Line over Internet Protocol

See SLIP.

shielded cable

Cable protected against electromagnetic and radio frequency interference.

shortest path routing

A routing algorithm in which paths to all network destinations are calculated. The shortest path is then determined by a cost assigned to each link.

SLIP

A protocol used to run IP over serial lines or telephone connections using modems.

smart hub

A concentrator with certain network management facilities built into the firmware. They enable the network administrator to control and plan network configurations.

SMDS (Switched Multimegabit Data Service)

A high-speed MAN service based on the 802.6 standard, for use over T1 or T3 circuits.

SNMP (Simple Network Management Protocol)

A standard protocol used to manage and monitor nodes on a network.

SVC (Switched Virtual Circuit)

A logical connection across a packet-switched network. An SVC is established on an as-needed basis and can provide a connection to any other switched user in the network.

synchronization

The timing of separate elements or events to occur simultaneously. In communications, the hardware and software must be synchronized so that file transfers can take place.

synchronous transmission

A transmission method that uses a clock signal to regulate data flow.

T1

A long-distance point-to-point circuit that provides 24 channels at 64 Kbps each (for a total of 1.544 Mbps).

T3

A long-distance point-to-point circuit that provides up to 28 T1 channels. T3 can carry 672 channels of 64 Kbps (for a total of 44.736 Mbps).

Topology

The map of a network. Physical topology refers to the location of hardware. Logical topology refers to the paths that messages take to get from one node to another.

transceiver

A device that connects a host interface to a LAN. A transceiver both transmits and receives data.

Transmit Data (TXD)

A hardware signal defined by the RS-232-C standard. It carries information from one device to another.

trunk

The communications circuit between two nodes.

twisted-pair cable

Cable that comprises two or more pairs of insulated wires twisted together. One wire carries the signal, and the other is grounded.

unshielded cable

Any cable not protected form electromagnetic or radio frequency interference.

yellow alarm

A T1 alarm that is generated when the interface receives a red alarm signal from the remote end.

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