StrataCom BPX Service Node

This chapter provides information about the StrataCom BPX Service Node. The information is organized into the following sections:

- Product Overview
- Standard Features
- Broadband and Narrowband Services
- AXIS Interface Shelf
- BPX Service Node Network Management Architecture
- Network Planning and Design
- Product Numbers

Note Documentation for the BPX Service Node is available in two forms: on a CD-ROM called Cisco Connection Documentation, Enterprise Series and printed books. A CD and hard-copy installation documentation ship with each chassis, and a configuration note ships with each component ordered. All configuration notes are available on the CD. Additional CDs and a subscription CD update service are also available.

You can also access Cisco technical documentation on the World Wide Web URL http://www.cisco.com. For more information, see the chapter "Documentation" at the end of the catalog.

Product Overview

The StrataCom BPX Service Node is a powerful broadband ATM switch. Designed to meet the demanding, high-traffic needs of a public service provider or large private enterprise, the BPX Service Node delivers high-performance ATM adaptation and aggregation for all types of user traffic.

The BPX Service Node offers 10 to 20 Gbps of high-throughput switching for multiple traffic types—voice, data, and image. The switch improves network and trunk utilization to more that 95 percent and supports a wide range of interfaces from Frame Relay to full broadband subscriber interfaces up to 622 Mbps. You can offer multiple services for LAN, X.25, SNA, Frame Relay, and ATM traffic from a single BPX platform.

The BPX Service Node provides 800 Mbps of dedicated bandwidth to each of 12 available slots, allowing you to expand capacity and maintain high performance. Narrowband interfaces are provisioned on separate shelves for full utilization of BPX Service Node capacity to deliver narrowband and broadband services.

It offers backbone ATM switching and integrates user services over broadband and narrowband ATM trunks. With 20 Gbps of high-throughput, low-latency switching, service providers can deliver innovative, revenue-generating data, voice, and video services. For large enterprises, the BPX combines LAN, SNA, voice, and other types of traffic over a single wide area network (WAN). The BPX also enables organizations to migrate to the next generation of switched internetworks while complementing existing investments in routers and frame relay switches.

The BPX Service Node delivers the following services:

- Internet/Intranet

  The BPX aggregates Internet and intranet traffic, supports a full range of access options, and scales services to accommodate from hundreds to thousands of subscribers on a single node. BPX Service Nodes currently are deployed by many Internet Service Providers (ISPs) and at Network Access Points (NAPs). Advanced traffic management capabilities provide the highest throughput and trunk utilization without risk of cell loss.

- ATM

  The BPX Service Node supports a wide range of interfaces for data traffic including ATM, Frame Relay, SMDS, LAN, SNA, X.25, and broadband video. Traffic is switched at speeds up to 622 Mbps.

- Switched internetworking

  The BPX Service Node provides a reliable platform for delivering transparent or high-speed LAN-to-LAN solutions for Ethernet, Fast Ethernet, Token Ring, and FDDI traffic across a metropolitan or global ATM backbone.

- Frame Relay

  The BPX Service Node provides a smooth migration path to ATM and broadband services with complete service interworking.

- Voice

  The BPX Service Node provides the advanced traffic management features and class of service guarantees required for delivering real-time, high-quality voice applications.

- Video

  The BPX Service Node delivers the required Quality of Service (QOS) for video over ATM applications including video-on-demand, videoconferencing, and video telephony.

- Wireless

  Support is available for analog and digital cellular, wireless data, and Enhanced Specialized Mobile Radio (ESMR) services from a single BPX.

Standard Features

The BPX Service Node switch includes the following features:

- Multishelf architecture
- Intelligent advanced switching capabilities
- Reliability
- Scalability
- High service availability and performance

Multishelf Architecture

The BPX Service Node integrates narrowband and broadband services in a single, highly reliable platform. The BPX broadband shelf supports 20-Gbps of switching capacity. The broadband shelf includes a crosspoint switching fabric that supports broadband interfaces and switches ATM cells over broadband network trunks. The AXIS interface shelf supports narrowband interfaces, adapting non-ATM traffic into 53-byte ATM cells and concentrating it for high-speed switching by the broadband shelf. By integrating narrowband and broadband interfaces on a single platform, service providers can fully utilize the node capacity, incrementally expand capacity as needed, and cost-effectively provide services to an almost unlimited number of subscribers.

Intelligent Advanced Switching Capabilities

The BPX Service Node also includes the StrataCom Intelligent Network Server (INS) node control processor, which provides intelligent call processing for Frame Relay and ATM switched virtual circuits (SVCs), switched voice services (DPNSS, Q.931), and dial-up services. The INS allows service providers to support advanced applications such as dial-up Internet and intranet access for remote users, LAN Emulation (LANE) to bridge network traffic between multiple LANs, and transport of multiple protocols over ATM.

The BPX broadband shelf, AXIS interface shelf, INS node control processors, and applications and services are managed as a single network element. With the StrataCom StrataSphere network management solution, this integrated approach allows network managers to simplify management of multiple services and Service Nodes.

Reliability

The BPX Service Node is designed for the highest levels of reliability in mission-critical enterprise networks and demanding service provider environments. Every system component can be configured for 100 percent redundancy, and all BPX modules can be removed and reinserted without affecting the performance of other modules or impacting service delivery. In addition, AutoRoute connection management automatically reroutes virtual circuits in the event of a trunk failure.

Scalability

With high port density, each BPX Service Node supports numbers of users ranging from hundreds to hundreds of thousands, while lowering the cost per subscriber. Capacity can be added as demand requires, giving the BPX unmatched scalability to meet the demands of rapidly increasing numbers of subscribers and deployment of multiple services such as ATM, Frame Relay, Internet, and video. With a capacity of 20 Gbps, BPX-based networks deliver the highest levels of performance for large files, high traffic volumes, and delay-sensitive voice and video. Support for interface speeds up to OC-12/STM-4 (622 Mbps) enable organizations to deliver multiple, high-quality services ranging from transparent LAN services and virtual private network services to video and LAN-to-ATM access capabilities.

High Service Availability and Performance

The BPX Service Node is deployed in the world's largest public ATM and Frame Relay data services—it is a proven switching solution. Robust, redundant architecture ensures high service availability, allowing service providers to provide uninterrupted service to millions of subscribers worldwide. The breadth of interface options, advanced traffic management capabilities, and sophisticated built-in network management features maximize application performance. High throughput without data loss allows service providers to guarantee quality of service and application performance, ensuring subscriber satisfaction and improving subscriber retention.

Broadband and Narrowband Services

The BPX Service Node has a modular design that supports both broadband and narrowband user services through a broadband shelf and support for up to 16 AXIS interface shelves.

Broadband Shelf

The broadband shelf is the heart of the BPX Service Node, providing a 20-Gbps crosspoint switching fabric in a 15-slot chassis. Three slots are reserved for common control modules, and 12 slots are provided for interface modules. The switch employs a midplane design, and each front card has a corresponding line module providing the physical interface to the transmission media. This design permits easy upgrading or replacement of function modules without disturbing cabling.

The broadband shelf design includes three functional card groups—the common core group, the service interface group, and the network interface group. A separate network management interface provides the connection to the StrataSphere network management platform.

Common Core Group

Common core cards provide the following functions:

- ATM cell switching
- Internal and remote node communication
- Node synchronization
- Network management communication
- Shelf management communication
- Alarm and status monitoring

Service Interfaces

ATM Service Interface (ASI) modules provide standard interfaces for connecting to cell-based customer premise equipment (via ATM UNI standard user interface) or to non-StrataCom networks (via NNI network interface).

ASI modules support native ATM sessions at speeds of T1/E1, n x T1/E1 Inverse Multiplex ATM (IMA), T3/E3, OC3/STM-1, and OC12/STM-4. These interfaces enable configuration of permanent virtual circuits (PVCs) or switched virtual circuits (SVCs) for the following service classes:

- Constant bit rate (CBR)
- Variable bit rate real time (VBR-RT)
- Variable bit rate non-real time (VBR-NRT)
- Unspecified bit rate (UBR)
- Available bit rate (ABR)

ASI modules support up to 16 classes of service and both ATM Frame Relay network interworking and service interworking, giving them the ability to handle all currently defined ATM traffic types, as well as future types.

Network Interfaces

Broadband Network Interface (BNI) modules connect the BPX Service Node to other BPX or StrataCom IGX and IPX nodes. These modules support up to 16 classes of service and network trunk interfaces including T1/E1, n x T1/E1 IMA, T3/E3, OC3/STM-1, and OC12/STM-4.

Virtual Trunking

Virtual Trunking allows enterprise customers and service providers to interconnect BPX Service Nodes through a public ATM service or ATM crossconnect. When interconnected, each user connection on the BPX Service Node benefits from the full functionality of advanced networking features—AutoRoute, OptiClass, ForeSight, and FairShare.

AXIS Interface Shelf

The AXIS interface shelf enables a wide range of user services to be supported by the BPX Service Node. AXIS modules adapt incoming data to 53-byte ATM cells using industry-standard ATM Adaption Layers (AAL) for transport over the ATM network.

Multiservice Functionality

The AXIS shelf supports a wide range of services from a single platform. This enables organizations to reduce equipment costs, fully utilize trunking resources, protect their investments in existing premise equipment, and rapidly deploy new services as required. Services below 34 Mbps are provisioned on the AXIS shelf, and interfaces supported include the following:

- Frame Relay
- High-speed Frame Relay
- ATM Frame UNI
- SMDS
- T1/E1 ATM UNI
- n x T1/E1 IMA UNI
- Circuit emulation
- ISDN switched access

AXIS Scalability

AXIS aggregates traffic from as many as 80 T1 or E1 ports onto a single port of a multiport broadband trunk card. This high port density maximizes use of the BPX Service Node high-capacity switch fabric. Each 9-inch rack-mount shelf supports up to 80 DS1 or E1 ports or more than 2,000 64-Kbps users. AXIS has a compact footprint that minimizes the space required within central offices.

Intelligent Network Server Node Control Processor

The Intelligent Network Server (INS) node control processor provides intelligent call processing of ATM and Frame Relay switched virtual circuits, switched voice services, and dial-up access capabilities. Sophisticated interaction between call processing and signaling software and the network database enables the BPX Service Node to deliver flexible, instantaneous any-to-any connectivity. These advanced switching features enable enterprises and service providers to deploy applications including LAN internetworking, client/server and client/client computing, shared workspaces, remote access, and multimedia communications. The INS supports three key applications:

- ISDN dial-up Frame Relay—provides ISDN dial backup for Frame Relay access lines for maximum service availability and ISDN connectivity for remote offices.
- Dynamic network switching—enables private PBX voice and data traffic to be switched over the ATM WAN. Provides significant cost savings, enhanced capabilities, and PBX feature transparency throughout the StrataCom network.
- ATM and Frame Relay SVCs—provides ATM and Frame Relay SVCs, critical for creating the logical connections required for electronic commerce, Internet/intranet access, and ATM internetworking from the desktop, between LANs, and over the WAN.

BPX Service Node Advanced Features

The StrataCom BPX Service Node advanced features deliver multiservice functionality, efficient use of bandwidth, high performance for all users, and guaranteed quality of service for all traffic types. Sophisticated routing software maximizes system reliability and therefore, service availability. Class of service features support up to 16 network-wide service classes and guarantee performance levels of each, enabling high-performance delivery of a wide range of services from data and Internet services to voice and video. ABR-based traffic management features dynamically allocate bandwidth so that multiple services can share the network simultaneously. This significantly reduces network costs while delivering higher application performance. Per-VC queuing ensures bandwidth availability to all users. Together, these advanced features enable service providers and enterprises to fully utilize network capabilities, deliver services or differentiate their services to meet a wide range of networking needs, and cost-effectively increase application performance.

The following advanced features are available with the BPX Service Node:

- AutoRoute
- OptiClass
- ForeSight
- FairShare

AutoRoute

AutoRoute end-to-end connection management software automatically routes and reroutes virtual connections over optimal paths through the network. It keeps traffic moving over the shortest paths while guaranteeing quality of service for each connection. AutoRoute automatically reroutes virtual circuits to alternate paths in the event of a trunk or switch failure. AutoRoute also tracks resources designated to individual connections to prevent overloading of individual trunks, ensuring high levels of network reliability and availability. AutoRoute eliminates the need to manually manage virtual circuits and allocate bandwidth, reducing network operating costs.

OptiClass

The OptiClass class of service feature offers enterprise network managers and service providers up to 16 classes of service that can be assigned to specific connections. With OptiClass, minimum bandwidth guarantees may be assigned for each connection, ensuring that services are delivered with the appropriate quality of service required. Together with AutoRoute, OptiClass automatically ensures quality of service for each application, resulting in higher performance and throughput. With OptiClass, unused bandwidth on network trunks and ports is also made available to any connection that can use it. OptiClass also gives network managers the flexibility to easily add new services, enabling service providers to more quickly deploy new services.

ForeSight

ForeSight bandwidth optimization and congestion avoidance software continuously monitors trunk utilization to adjust bandwidth to all connections, proactively avoids queuing delays, and virtually eliminates cell loss. The ATM Forum ratified a rate-based, closed-loop method of traffic control, which is the basis of ForeSight. The BPX Service Node employs a full virtual source/virtual destination (VS/VD) implementation of the ATM Forum ABR standard. As a result, the BPX Service Node can improve network bandwidth utilization to up to 95 percent while delivering traffic without cell loss. This allows a service provider to deliver additional services, resell spare capacity, and scale the network without large additional capital investment. It permits enterprise network managers to significantly reduce networking costs while delivering greater network functionality and higher application performance.

FairShare

FairShare is a patented per-virtual-circuit queuing and rate scheduler. It allocates bandwidth fairly among network users by providing a virtual “firewall” between connections and service classes. Unlike a shared buffer scheme, per-virtual-circuit queuing prevents one misbehaving connection from affecting the performance of others.

BPX Service Node Network Management Architecture

Cisco’s StrataSphere network management provides the unique capabilities required for managing ATM WANs. While Stratm is the ASIC implementation of ATM, StrataSphere distributes the logical management intelligence throughout the network via a set of building blocks, or modules. By distributing network management functionality, service management and process automation can be tightly integrated—simplifying management of even the most complex WANs and providing a comprehensive end-to-end management solution.

Network Planning and Design

The StrataSphere Modeler lets network managers read, design, modify, and analyze networks on line. With StrataSphere Modeler software, the best network topology can be quickly and easily designed, based on existing network configuration data. The StrataSphere Optimizer enables “what if” scenarios based on predefined parameters to analyze user traffic patterns, optimize for least cost, and determine minimum adequate redundancy. Optimizer software simplifies prototyping of new services and helps network managers determine how future growth will impact service usage and resource allocation.

Management and Operations

StrataView Plus software provides powerful fault, configuration, and performance management capabilities for the BPX Service Node. A user-friendly, graphics-oriented interface running under HP OpenView and IBM NetView for AIX platforms, StrataView Plus lets network managers view the entire network at once to quickly identify and isolate network problems.

Service Management and Integration

The StrataSphere Service Agent provides network and service layer management views and control through a Simple Network Management Protocol (SNMP) proxy agent. This feature enables automated provisioning, simplifies customer network management, and provides a basis for other value-added service management solutions. The StrataSphere Statistics Agent software collects comprehensive network statistics for billing, cost allocation, performance management, and capacity planning. The Statistics Agent saves time and simplifies billing and planning. StrataSphere BILLder software lets network managers monitor network traffic flow and allocate costs. Once billing periods are defined, StrataSphere BILLder captures the data from that period and formats it in a standard or customized billing record.

BPX Service Node System Specifications

Table 219 lists BPX Service Node specifications.

Table 219 BPX Service Node Specifications

Characteristic	Description
15 module slots	2 slots reserved for redundant control and switch modules 1 slot reserved for Alarm Status Monitor (ASM) module 12 slots for general-purpose function modules
Dimensions (H x W x D)	22.75 x 17.72 x 27" (57.8 x 45 x 68.6 cm) 19" (48.3 cm) rack mountable
Power requirements	-48V DC or 208/240V AC input 1400W dissipation (max)
Crosspoint switch fabric	Switch capacity of 20 Gbps 12 800-Mbps switch ports that can support up to OC-12 cell rate Arbiter establishes up to 20 million cell connections per second
Network interfaces	T3 (44.736 Mbps) with PLCP per TA-TY-000773 OC-3 (155.520 Mbps) with SONET framing per ANSI T1.105 E3 (34.368 Mbps) per ITU-T Rec. G.804 STM-1 (155.520 Mbps) with SDH framing per ITU-T Rec. G.708 OC12/STM-4 (622.08 Mbps), complies with SONET standards Bellcore GR-253-CORE, ANSI T1.105; complies with SDH standards ITU-T G.708 and G.709; ITU-T G.957 and G.958
Common network interface features	Up to 16 programmable queues for class-based or VP/VC-based queuing Queues programmable by maximum queue depth, minimum service bandwidth, maximum service bandwidth, Cell Loss Priority (CLP) thresholds, EFCI thresholds ForeSight closed-loop, rate-based congestion management Fully-compliant ABR VS/VD implementation Explicit rate (ER) marking EFCI marking
Broadband service interfaces	Conformance to ATM Forum Specification v3.1: T3/DS3 UNI (44.736 Mbps) OC-3 UNI (155.520 Mbps) SONET OC-12 UNI (622 Mbps) SONET E2 UNI (34.368 Mbps) STM-1 UNI (155.520 Mbps) SDH STM-4 UNI (622 Mbps) SDH
Optional redundancy	All components are optionally redundant to 100% system redundancy including the control processor, crosspoint switch, network interfaces, service interfaces, critical backplane signals, power supplies, power modules, and cooling fans
Network management	Interfacing to network management is provided by SNMP connection via: 1 802.3 AUI interface for local connection to StrataView Plus 2 asynchronous control/printer ports

Characteristic	Description
Alarms, indicators, and controls	Major node alarm, minor node alarm, alarm cut-off and history indicators Visual and audible (major and minor) relay closures provided for connection to central office alarm system, including power supply status indicators and LAN activity indicator Each interface module has a minimum of three visual indicators: Active (green), Standby (yellow), and Fail (red)
Node synchronization	Stratum 3 clock per ATT PUB 62411 Software programmable source: internal clock, transmission line, auxiliary port to an external clock source

AXIS Interface Shelf Specifications

Table 220 lists AXIS interface shelf specifications.

Table 220 AXIS Specifications

Description	Feature
16 slots	6 slots reserved for common control cards 10 slots available for function modules
Dimensions (H x W x D)	8.75 x 17.45 x 20" (21.8 x 43.6 x 50 cm) 19" (48.3 cm) rack mountable
Power requirement	-48 VDC or 110/220 VAC 400W Redundant power feeds
Switching	640 Mbps ATM cell bus
Subscriber interfaces	Frame Relay High-speed Frame Relay ATM Frame UNI n x T1/E1 IMA UNI T1/E1 ATM Circuit emulation ISDN Primary Rate Switched Access
Redundancy	1:1 optional common equipment redundancy 9:1 optional subscriber interface redundancy
Network management	SNMP configuration and monitoring Trivial File Transfer Protocol (TFTP) software download TFTP statistics collection
Connection management	PVCs or SVCs

Table 221 lists the standards that the BPX Service Node supports.

Table 221 Standards Supported by the BPX Service Node

Standards	**ATM** **Physical Media Dependent (PMD)** DS1 and DS3; ITU-T G.804, Bellcore TA-TSY-772, TA-TSY-773, TR-TSY-499, G.703, ANSI T1.107/107A E3; ITU-T G.705, G.804 OC3; ANSI T1/E1.2/93-020RA, Bellcore TR-NWT-000253, TR-TSY-000020, ANSI T1.105 **ATM Layer, traffic management and signaling** ITU-T1.362: ATM adaptation layer ITU-T1.432: Cell delineation and HEC ITU-T1.361: ATM cell format ITU-T1.371: traffic control and congestion management ITU-T1.350: Quality of Service and network performance **ATM to Frame Relay** ITU-T1.555: mapping ITU-T1.36X.1: FRSSCS ITU-T1.363: AAL5 **ATM UNI Specification V.3.1 including:** PMD ATM Layer ATM Adaptation Layers Traffic Management Interim Local Management Interface (ILMI) OA&M **SVC Signaling: ATM Switched Virtual Connections** ITU-T Q.2931 (DSS2) ITU-T Q.2110 (SSCOP) ITU-T Q.2130 (SSCF) ATM Forum UNI V.3.1 ATM Forum UNI V.4.0 **Frame Relay** ANSI T1.606 and ITU-T 1.233.1: Frame Relay service description ANSI T1.618 and ITU-T Q.922: Data Transfer Protocol ANSI T1.606 and ITU-T 1.370: Congestion Management ANSI T1.617 Annex D and ITU-T Q.933 Annex A: signaling ITU-T 1.372: NNI interface requirements Bellcore TR-TSV-1369 Frame Relay PVC exchange service Frame Relay Forum NNI implementation agreement **SMDS** TA-TSY-001239: generic requirements for low-speed SMDS access TR-TSY-000772: generic system requirements in support of SMDS SIG-TS-001/199: SMDS data exchange protocol

Product Numbers

Table 222 lists the product numbers you can use to order the BPX Service Node and the AXIS interface shelf.

Table 222 BPX Service Node and AXIS Interface Shelf Product Numbers

Description	Product Numbers
BPX Products	
BPX, 15-slot: includes BCC-32M, BCC15-BC, ASM, ASM-BC	BPX
BPX redundant option: includes BCC-32M, BCC-BC	BPX-REDUNDANT
BPX Trunk and Interface Card Assemblies	
Broadband Network Interface (BNI)—3 T3 ports	BPX-BNI-3-T3/C
Broadband Network Interface (BNI)—3 E3 ports	BPX-BNI-3-E3/B
ATM Service Interface (ASI) card—2 T3 ports	BPX-ASI-2-T3/C
ATM Service Interface (ASI) card—2 E3 ports	BPX-ASI-2-E3/B
T3 back card for BNI or ASI	BPX-T3-BC
E3 back card for BNI or ASI	BPX-E3-BC
T3 to 6-Mbps (T2) ATM adapter with AC power supply	BPX-AT3-6M-AC
T3 to 6-Mbps (T2) ATM adapter with DC power supply	BPX-AT3-6M-DC
ATM Service Interface 2 port 155 Mbps	BPX-ASI-2-155/B
Broadband Network Interface 2 port 155 Mbps	BPX-BNI-2-155/B
Multimode fiber back card	BPX-MMF-2-BC
Single-mode fiber back card	BPX-SMF-2-BC
Single-mode fiber long reach back card	BPX-SMFLR-2-BC
BPX Spares and Accessories	
AC power option 1—single AC supply/single AC line input	BPX-AC1-1
AC power option 2—redundant supplies/single AC line input	BPX-AC2-1
AC power option 3—redundant supplies/redundant AC line input	BPX-AC2-2
48 VDC power input module	BPX-DC
Chassis assembly	BPX-CH/C=
Backplane	BPX-BP=
Fan assembly	BPX-FAN=
Faceplate—blank front	BPX-FP-BF=
Faceplate—blank back	BPX-FP-BB=
AC power supply	BPX-AC=
AC power supply rack enclosure, 1 AC line input	BPX-AC-RACK1=
AC power supply rack enclosure, 2 AC line inputs	BPX-AC-RACK2=
BPX controller card, 32 MB of DRAM	BPX-BCC-32M=
BPX controller back card	BPX-BCC-15=
Alarm Status Monitor (ASM)	BPX-ASM=
ASM back card	BPX-ASM-BC=

Description	Product Numbers
BPX System Software	
BPX system software license—Release (version number 720)	BPX-SW-720
BPX system software license—Release (version number 721)	BPX-SW-721
BPX system software license—Release (version number 724)	BPX-SW-724
BPX system software license—Release (version number 725)	BPX-SW-725
BPX system software license—Release (version number 7274)	BPX-SW-7274
BPX system software license—Release (version number 7275)	BPX-SW-7275
BPX system software license—Release (version number 7277)	BPX-SW-7277
BPX system software license—Release (version number 7281)	BPX-SW-7281
BPX system software license—Release (version number 7282)	BPX-SW-7282
BPX Feature License	
BPX ForeSight license per 2-port T3 or E3 ASI card	BPX-FS-2
Configuration save and restore license per node	BPX-CSR
Virtual trunking license per node	BPX-VT
Multiuser configuration sessions per node	BPX-MUC
Priority bumping software license per node	BPX-PRBUMP
BPX Power Cords	
BPX power cord with NEMA L6-20 twistlock plug	PWRCD-NA
BPX power cord with CEE 7/7 plug	PWRCD-FU
BPX power cord with AS 3112 plug	PWRCD-ANZ
BPX power cord with BS 1363 plug	PWRCD-GBI
BPX power cord with CDI 23 16/V11 plug	PWRCD-IT
AXIS Interface Shelf	
AXIS, 16-slot, rack mount, ASC, ASC-BC	AXIS
AXIS Core Cards	
Broadband Network Module—1 T3 port	AX-BNM-T3
Broadband Network Module—1 E3 port	AX-BNM-E3
BNM back card with DB15 clock connector	AX-T3E3-D-BC
BNM back card with BNC clock connector	AX-T3E3-B-BC
Service redundancy module	AX-SRM-T1E1
AXIS Service Modules	
Frame service module, 4 fractional T1 ports	AX-FRSM-4T1
Frame service module, 4 channelized T1 ports	AX-FRSM-4T1-C
Frame service module, 4 fractional E1 ports	AX-FRSM-4E1
Frame service module, 4 channelized E1 ports	AX-FRSM-4E1-C
Circuit emulation service module, 4 T1 ports	AX-CESM-4T1
Circuit emulation service module, 4 E1 ports	AX-CESM-4E1
ATM UNI service module, 4 T1 ports	AX-AUSM-4T1

Description	Product Numbers
ATM UNI service module, 4 E1 ports	AX-AUSM-4E1
AIMUX trunking module, T3 to T1s	AX-AIMNM-T3-T1
AIMUX trunking module, E3 to E1s	AX-AIMNM-E3-E1
4-port T1 back card for service module, DB15 connectors	AX-DB15-4T1-BC
4-port E1 back card for service module, DB15 connectors	AX-DB15-4E1-BC
4-port E1 back card for service module, BNC connectors	AX-BNC-4E1-BC
8-port T1, 1-port T3 back card for AIMUX trunking module	AX-RJ48-T3T1
8-port E1, 1-port E3 back card for AIMUX trunking module	AX-RJ48-E3E1
8-port E1, 1-port E3 back card for AIMUX trunking module	AX-SMB-E3E1
Redundancy back card for DB15-4T1-BC based service module	AX-R-DB15-4T1
Redundancy back card for DB15-4E1-BC based service module	AX-R-DB15-4E1
Redundancy back card for BNC-4E1-BC based service module	AX-R-BNC-4E1
AXIS Spares and Accessories	
AXIS DC power entry module	AX-DC
AC power option 1—1 875W, 1 AC input	AX-AC1-1
AC power option 2—2 875W, 1 AC input	AX-AC2-1
AC power option 3—2 875W, 2 AC input	AX-AC2-2
875W AC power supply	AX-PS-AC
AXIS shelf contoller card	AX-ASC=
AXIS shelf controller card back card	AX-ASC-BC=
AC power supply rack enclosure, 1 AC line input	AX-AC-RACK1=
AC power supply rack enclosure, 2 AC line inputs	AX-AC-RACK2=
Short cable, AC shelf to AXIS	AX-CAB-AC-SHRT
Long cable, AC shelf to AXIS	AX-CAB-AC-LONG
AXIS Cooling Options	
AXIS two-shelf cooling	AX-COOL2
AXIS additional two-shelf cooling	AX-BOOST2
AXIS Firmware	
Firmware media kit for use with AXIS	AX-FW-2113
AXIS Software/Feature Licenses	
AXIS ForeSight license for each frame service module	AX-FS-4
AXIS FUNI license for each frame service module	AX-FUNI-4
AXIS ABR ForeSight license for each 4-port ATM service module	AX-ABR-4
AXIS AIMUX license for each 8-port ATM service module	AX-AIMUX-8
AXIS service redundancy license for each SRM-T1E1 card	AX-SR-8