

BXM-155 Broadband Switch Module

THE BXM-155 IS A MULTI-PORT ATM OC-3c/STM-1 INTERFACE CARD THAT USES CUSTOM APPLICATION-SPECIFIC INTEGRATED CIRCUIT (ASIC) TECHNOLOGY, FOR THE BPX 8600 SERIES, TO DELIVER THE INDUSTRY'S MOST ADVANCED AND RELIABLE ATM NETWORKING FEATURES. IT SUPPORTS PVCs, SVCs, S-PVCs AND MPLS LVCs (LABEL VC). IT PROVIDES REDUNDANCY PROTECTION FOR CARD AS WELL AS LINE VIA SONET/SDH AUTOMATIC PROTECTION SWITCHING (APS). ITS HIGH-SPEED CONNECTIVITY TAKES ATM TO NEW LEVELS OF EFFICIENCY AND SCALABILITY.

ENHANCED MODELS OF THE BXM-155 NOW ALSO AVAILABLE, DELIVER THE MOST ADVANCED ATM SWITCHING AND TRAFFIC MANAGEMENT CAPABILITIES IN THE INDUSTRY. THESE MODELS EXTEND SCALABILITY BY DOUBLING THE CONNECTION DENSITY AND CELL BUFFERS ON SELECTED MODELS AS WELL AS PROVIDING FUTURE SUPPORT FOR VC MERGING FOR LARGE MPLS-BASED IP+ATM NETWORKS.

Key Features

- High scalability and connection densities with up to 96 OC-3c/STM-1 ATM ports on a single BPX[®] 8600 series wide-area switch
- Complete network control through dynamic resource sharing and support for all ATM service classes
- Industry's first fully compliant ATM Forum available bit rate (ABR) virtual source/virtual destination (VS/VD) capability in custom ASICs
- New level of ATM price/performance to optimize the network life cycle
- Support for VC merging with future software upgrade to allow "label" sharing for different MPLS VCs with the same destination and class of service (enhanced -D and -DX models only)

To address Asynchronous Transfer Mode (ATM) networking issues related to growing traffic demands, varying types of traffic, and the cost-effective deployment of broadband ATM, there is a need for an ATM network platform that delivers unprecedented scalability, performance, and functionality at a low cost.

Advanced ATM traffic management capabilities are implemented in a family of custom ASICs that create high-density, high-speed ATM interface modules for the BPX 8600 and IGX[™] 8400 series wide-area switches.

This ASIC technology cost-effectively delivers the most advanced ATM switching and traffic management capability in the industry. It represents the first commercially available implementation of VS/VD.

The BXM-155 broadband switch module is an OC-3c/STM-1 version of the BXM interface card for the BPX switch platform. It operates at the standard Synchronous Optical Network (SONET)/ Synchronous Digital Hierarchy (SDH) rate of 155.520 Mbps. The card provides 4- or 8- OC-3c/STM-1 ATM ports per card, each of which can be configured for either trunk or access application.

Technical Specifications

Physical Layer

- 4- or 8- OC-3c/STM-1 (155.520 Mbps) ports
- Complies with ATM Forum UNI Specification Version 3.1, 4.0
- Trunk- or port-interface mode
- Cell transfer rate of 353,208 cells per second
- Compliant with SONET standards:
 - Bellcore GR-253-CORE
 - ANSI T1.105
- Compliant with SDH standards:
 - ITU-T G.707, G.708, and G.709
 - ITU-T G.957, G.958
- STM-1 electrical interface compliant with ITU-T G.703
- 1:1 BXM redundancy
- Support for SONET/SDH 1+1 and 1:1 APS

Fiber-optic interface options:

Back Card	Source 1310nm	Tx Power (dBm)		Rx Range (dBm)		Physical	Range (km)
		Min	Max	Min	Max		
MMF	LED	-22	-15	-31	-10	SC	2
SMF (R)	Laser (Class 1)	-15	-8	-34	-10	SC	20
SMF (LR)	Laser (Class 1)	-5	0	-34	-10	SC	40

- STM-1 electrical physical interface characteristics:
 - CMI encoding
 - 4-port back card with SMB connectors
 - Max distance allowed: 120 meters
 - Avg Tx Power: 13.5 mW into 75 ohm load
 - Acceptable Voh: 3.89 V - 4.33 V; Acceptable Vol: 3.00 V - 3.50 V
 - Input sensitivity: 150 mV/300 μW for a 75 ohm load

Synchronization

- Can be configured for internal timing from the BPX internal Stratum 3 clock conforming to ATT Pub. 62411
- System clock synchronization to service module port option

ATM Layer

- Configurable for trunk and public or private User-Network Interface (UNI) application
- UNI conformant to ATM Forum UNI Specification V.3.1, ITU-T I.361 and I.432 specification
- Support for ATM Forum ILMI 4.0
- Complies with standard Usage Parameter Control (UPC) per ATM Forum UNI Specification V.3.1, TM 4.0 and ITU-T I.371
- Supports virtual circuit connections (VCCs) and virtual path connections (VPCs) per ATM Forum UNI Specification V.3.1 and ITU-T I.371
- Connections:
 - 16,384 to 32,768 connections per card
- Virtual path identifier (VPI)/virtual channel identifier (VCI) range for VCCs and VPCs: per UNI Specification 3.1
- Support for VC merging with future software upgrade (enhanced -D and -DX models only)

Traffic Management

- Per-VC queuing and scheduling
- Per-VC traffic shaping
- Per-VC weighted fair queuing (WFQ)
- Up to 16 classes of service with the following configurable parameters:
 - Separate cell discard threshold for CLP0 and CLP1 cells
 - Separate early packet discard (EPD) threshold for CLP0 and CLP1 cells with future software upgrade (enhanced -D and -DX models only)
 - Maximum Queue Depth (MQD) with partial packet discard (PPD)
 - Service Priority Level (SPL)
 - Explicit Forward Congestion Indication (EFCI) threshold

Constant Bit Rate Service

- UPC per ATM Forum Specification UNI V.3.1, TM V.4.0 and ITU-T I.371
- UPC: Ingress rate monitoring and discarding for:
 - Peak Cell Rate (PCR)
 - Cell Delay Variation Tolerance (CDVT)

Variable Bit Rate Service

- Usage parameter control (UPC) per ATM Forum UNI Specification V.3.1, TM V.4.0 and ITU-T I.371
- UPC: Ingress rate monitoring and cell tagging for:
 - PCR
 - CDVT
 - Sustainable Cell Rate (SCR)
 - Maximum Burst Size (MBS)
- CLP tagging, enabled, or disabled on a per-virtual-circuit (VC) basis at the ingress side
- Support for both VBR-rt and VBR-nrt
- EPD

ABR Service and Congestion Control

- VS/VD per ATM Forum Traffic Management Specification V.4.0
- Explicit Rate (ER) stamping
- EFCI tagging monitoring
- ForeSight®
- Support for non-AAL5 traffic (enhanced -D and -DX models)

ABR VS/VD

VSs and VDs resource management (RM) cell generation and termination

- Virtual connection queue (VCQ) assigned to each VC ingress
- VCQ configurable parameters:
 - Separate cell discard threshold for CLP0 and CLP1 cells
 - EPD threshold
 - Maximum queue depth with PPD
 - Reserved buffer space for RM cells
- Support for UBR and VBR access
- Interworking with ForeSight® (enhanced -D and -DX models only)

Unspecified Bit Rate Service

- UPC per ATM Forum UNI Specification V.3.1, TM V.4.0 and ITU-T I.371
- Minimum cell rate configurable and guaranteed
- EPD

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Virtual Trunks

- Support for up to 31 virtual trunks per card, each with 16 class-of-service queues
- UNI and NNI option for the interface with public ATM network
- Per virtual trunk traffic shaping
- Reconfigurable maximum trunk rate

Cell Buffering

- Large ingress and egress cell buffer architecture
- 337,920 to 1,024,000 cells stored per card
 - Accommodate large traffic bursts
 - Avoid network congestion and cell discard
 - Suited to TCP/IP traffic

Intelligent QoS (Quality of Service) Management Suite

Connection Admission Control (CAC)

Automatic Routing Management

- Automatic end-to-end connection management mechanism
- Deterministically allocates bandwidth and routes VCs autonomously over optimum network paths
- Automatic rerouting preserves service integrity during network failures

Advanced CoS (Class of Service) Management

- Up to 16 class-of-service queues, with independent service algorithms dedicated to each interface in the network

Optimized Bandwidth Management

- Dedicated queue- and rate-controlled servers for each VCC/VPC
- Dynamic thresholding, providing fairness and more than 95 percent utilization

ATM-Frame Relay (FR) Service Interworking

- Provides transparent end-to-end connectivity, operating two services on a single switch platform

Switched Virtual Circuits

- Signaling protocol per ATM Forum UNI Specification V3.0 and V3.1
- E.164/NSAP addressing per ATM Forum UNI Specification V.3.1
- Support for ATM Forum Private Network-Network Interface (PNNI) Per ATM Forum PNNI Specification V.1.0

Fault Management and Reporting

- Compliant with Bellcore GR-253-CORE

Alarms

- Loss of Signal (LOS)
- Loss of Pointer (LOP)
- Loss of Frame (LOF)
- Loss of Cell delineation (LOC)
- Alarm Indication Signal (AIS)
- Remote Defect Indication (RDI)
- Alarm integration up/down count

Performance Monitoring

- Performance monitoring provided for line, section, and path
- Bit Interleaved Parity (BIP) error detection
- Far-End Block Error (FEBE) count
- Unavailable Seconds (UAS)
- Errored Seconds (ES)
- Severely Errored Seconds (SES)
- Header Checksum (HCS) monitoring

Statistics

- ATM statistics collected on a per-VC basis
- Four levels of ATM-layer statistics collection provided

OAM

- Segment and end-to-end Operations Administration and Maintenance (OAM) loopbacks supported per Bellcore TA-NWT-001248
- External OAM segment flows, consisting of segment loopback cells per ATM Forum UNI Specification V.3.1 and ITU-T1.371
- Generation and detection of AIS and RDI OAM cells
- OAM cell generation and loopback facility supported for diagnostics and self-test purposes

Protection Switching

- Support for SONET/SDH Automatic Protection Switching (APS)
- Support per Bellcore GR-253-CORE, ITU-T G.783
- 1+1, 1:1 and ITU-T G.783 Annex B option

Network Management

- Management using Cisco Wan Manager™ software
- Simple Network Management Protocol (SNMP)-based for configuration and statistics collection
- Graphical user interface

Alarm Indicators

- Via LEDs on face plate

Status Site	Alarm LED Green	Alarm LED Yellow	Alarm LED Red
Card	Active	Standby	Fail
Port	Active & OK	Active-remote alarm	Active-local alarm

Physical Specifications

- Dimensions: (H x W x D) 19 in x 1.1 in x 27 in (48.26 cm x 2.79 cm x 68.58 cm)
- Weight: 6 lb (2.7 kg)

Electrical Specifications

- Input power required: -48V DC
- Power consumption: 70W

Electrical and Safety Standards Compliance

- EMI/ESD compliance
 - FCC Part 15
 - Bellcore GR1089-CORE
 - IEC 801-2
 - EN55022
- Safety compliance
 - EN 60950
 - UL 1950
- Bellcore NEBS: Level 3-compliant
- Optical safety: IEC 825-1 (Class 1)

Summary Specifications

Product Number	Enhanced Model	Number of Ports per Card	Ingress Cell Buffer (cells)	Egress Cell Buffer (cells)	Number of Connections per Card	VC Merge Capable
BXM-155-4		4	102,400	235,520	16,384	
BXM-155-8		8	235,520	235,520	16,384	
BXM-155-4D	Yes	4	256,000	256,000	16,384	Yes
BXM-155-8D	Yes	8	256,000	256,000	16,384	Yes
BXM-155-4DX	Yes	4	512,000	512,000	32,768	Yes
BXM-155-8DX	Yes	8	512,000	512,000	32,768	Yes



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