Release Notes for Router Software Version 10.0

Router Software Version 10.0
Site Manager Software Version 4.0

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This document contains the latest information about Bay Networks™ Router Software Version 10.0:

- Supported bridging/routing protocols
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- Supported Flash memory cards
- Supported standards

Protocols Supported

Version 10.0 of Bay Networks Router Software supports the following bridging/routing protocols and router configuration features:

- AppleTalk and AppleTalk Update-based Routing Protocol (AURP)
- Advanced Peer-to-Peer Networking (APPN)
- Asynchronous Transfer Mode (ATM)
- ATM Data Exchange Interface (ATMDXI)
- ATM LAN Emulation
- Binary Synchronous Communication Type 3 (BSC3)
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- Internet Protocol (IP)
- Internet Packet Exchange (IPX) protocol

- Internet Stream Protocol (ST2)
- Learning Bridge and Spanning Tree protocols
- Logical Link Control 2 (LLC2) protocol
- Native Mode LAN (NML) protocol
- Open Shortest Path First (OSPF) protocol
- Open Systems Interconnection (OSI) routing protocol
- Point-to-Point Protocol (PPP)
- Protocol Prioritization
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- Router Redundancy
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- Source Routing Bridge protocol
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- Telnet protocol (inbound and outbound)
- Transmission Control Protocol (TCP)
- Transparent-to-Source Routing Translation Bridge
- Virtual Networking System (VINES)
- X.25 protocol
- XMODEM and YMODEM protocols
- Xerox Network Systems (XNS) protocol

Upgrading to Version 10.0/4.0

To upgrade your router software to Version 10.0, or to upgrade your Site Manager software to Version 4.0, refer to *Upgrading Routers from Version 5 to Version 10.0* or *Upgrading Routers from Version 7-9.xx to Version 10.0* for instructions. These upgrade documents are included in your upgrade package.

New Features in Version 10.0

Bay Networks has implemented many changes to the router software for Version 10.0. This section describes the major new features in this release.

Advanced Peer-to-Peer Networking (APPN)

The following sections describe new APPN features in Version 10.0.

High-Performance Routing

APPN's high-performance routing (HPR) increases data routing performance and reliability. HPR allows high-speed forwarding in intermediate nodes at the Data Link Control layer (Layer 2) of SNA, operating much faster than the intermediate session routing (ISR) base component in APPN. HPR consumes fewer network resources (memory and control processor) by

- Minimizing storage and processing activities in intermediate nodes
- Reducing the amount of error recovery on individual lines
- Implementing nondisruptive path switching function that reroutes sessions around failed links or nodes

HPR uses the Rapid Transport Protocol (RTP) and Automatic Network Routing (ANR). RTP also supports adaptive rate based (ARB) congestion control.

The Bay Networks APPN HPR implementation supports the following option sets:

- 1400 (HPR Base)
- 1401 (RTP Tower)

For detailed information on HPR, refer to *Configuring APPN Services*.

Dependent Logical Unit Requester and Server

APPN's Dependent Logical Unit Requester (DLUR) supports LU type 0,1,2,3 and LU6.2 dependent logical units within APPN. In contrast to the base APPN architecture, which uses independent LUs for LU-to-LU sessions, dependent LUs need a mainframe-based system services control point (SSCP) to establish and manage LU-to-LU sessions. DLUR allows these dependent LUs to use APPN networks by encapsulating the SSCP control flows within the APPN LU 6.2 sessions. The APPN network routes the dependent LU-LU data flows.

DLUR works with the dependent LU server (DLUS) component of the virtual telecommunications access method (VTAM) to provide a path for SSCP flows between VTAM and dependent LUs across an arbitrary APPN backbone network. The DLUR node serves as a point of connection for PU2.0 devices (such as 3270-type devices) to attach to an APPN backbone.

The DLUR and DLUS components in an APPN network allow the SSCP and the PU2.0 device to exchange control flows across the APPN backbone. DLUR and DLUS form a tunnel (called a CP-SVR pipe) that allows the SSCP at the DLUS side of the pipe to send SNA control flows to the PU2.0 device at the DLUR side of the pipe. The CP-SVR pipe is a pair of LU6.2 sessions that encapsulate the SSCP control flows.

For detailed information on DLUR and DLUS, refer to *Configuring APPN Services*.

BSC Transport Services (BTS)

BSC Transport Services support the transmission of binary synchronous communication (BSC) data over a multiprotocol backbone network. BTS operates on the Bay Networks AN™, running Software Version 10.0 or later.

With BTS, users of BSC equipment can improve their networks by

- Integrating BSC devices into an existing network of newer client/server services
- Eliminating direct BSC lines, which are expensive and often underused
- Ensuring an extremely reliable and resilient method of data transmission via TCP/IP

For more information, see *Configuring BSC Transport Services*.

Bisynchronous Enhancements

Bisynchronous lines now support packet capture. For information refer to *Troubleshooting Routers*.

Bandwidth-on-Demand (BOD)

BOD service (formerly called simple bandwidth-on-demand) provides up to three secondary lines to support a congested primary line for a total of four lines. These additional lines increase bandwidth for data traffic, improving communication and reducing network delays. For more information, refer to *Configuring Dial Services*.

Each additional line can operate at a different speed. PPP multilink, the protocol the router uses for bandwidth-on-demand circuits, provides the functionality to manage lines of varying speed and traffic distribution across lines. For more information, refer to *Configuring PPP Services*.

Delayed Boot

Delayed Boot, or Remote User Interface Boot (RUI Boot), lets you specify the exact date and time a Bay Networks router boot takes place. It functions in all other aspects as a normal boot initiated from the Administration menu of Site Manager. You can schedule a Delayed Boot using the Configuration Manager available from the Tools menu of Site Manager. For more information, refer to *Managing Routers and BNX Platforms*.

You can also use Technician Interface commands to

- Add delayed boot services to a router.
- Schedule one or more nonrepeatable, delayed boot events on a router.
- Name the router software image file and the router configuration file you want the router to use for a specific delayed boot event.
- Manage (disable, re-enable, or delete) delayed boot services or specific delayed boot events configured on a router.

The router's RUIBOOT software supports all delayed boot services.

For information, refer to *Using Technician Interface Scripts*.

Config Generator

Config Generator (rpt2cfg) is a UNIX command-line tool that you use to create bootable binary configuration files from your edited ASCII configuration file reports. With Config Generator, you can create configuration files faster than with the Site Manager Configuration Manager. For more information, refer to *Managing Routers and BNX Platforms*.

Data Link Switching (DLSw) Support for Secondary SDLC

Secondary SDLC services enable a Bay Networks router to act as a secondary device on an SDLC link. Specifically, the router

- Supports a single SDLC link communicating to a Front End Processor (FEP) or similar SNA communications processor
- Functions as a secondary PU 2.0 device on that link
- Co-exists with other secondary SDLC devices, PU 2.0 or PU 2.1, on the same SDLC link
- Allows SNA devices attached to multiple remote routers to share a single SDLC link to the FEP
- Communicates at up to 256 Kb/s, depending on other devices connected to the link
- Attaches to the FEP directly (by using a null modem cable) or via a leased line

See "Amendments to the Documentation" in *Release Notes for Site Manager Version 4.0* for more information on secondary SDLC support.

DLSw Filtering

With Version 10.0, Bay Networks now provides two prioritization mechanisms that affect DLSw traffic:

- DLSw prioritization
- Protocol prioritization

DLSw Prioritization

DLSw prioritization allows you to prioritize traffic within DLSw based on predefined or user-defined fields. Examples of DLSw prioritization criteria include

- Source and destination SAP; you can use this to assign NetBIOS traffic (SAP 0xF0) to a lower priority than SNA traffic
- Source and destination MAC address; you can use this to provide host bound traffic preference over other traffic
- Any field in the SNA Transmission Header (TH) and Response/Request Header (RH); you can use this to provide Class Of Service (COS) priority preference

You can also prioritize traffic based on any user-defined values within the headers and data packets.

For example, to move all NetBIOS traffic into queue 1, apply the following filter:

Action = Queue_1
Criteria = Source SAP
Range = 0xF0-0xF0

For detailed information about DLSw prioritization, refer to *Configuring DLSw Services*.

Protocol Prioritization

You can use protocol prioritization to transmit DLSw traffic before other traffic on an individual synchronous line interface. This is done by creating a filter, as follows:

Criteria = TCP Source Port
Range = 2065 - 2067
Action = High Queue

This ensures that SNA and NetBIOS traffic receive preference on the network. For more information on how to access and configure traffic filters for DLSw services, refer to *Configuring Traffic Filters and Protocol Prioritization.*

Adding Bandwidth for Dial-on-Demand Circuits

To relieve a congested demand line, you can activate up to three dial-up lines from an existing bandwidth-on-demand pool to increase the amount of bandwidth for data traffic. This feature aids time-critical applications so that data reaches the destination as efficiently as possible. For more information, refer to *Configuring Dial Services*.

ISDN PRI Enhancements

PRI supports the following switch types:

- AT&T 4ESS for the United States
- PRI KDD and PRI NTT for Japan
- PRI TS014 for Australia.

Demand Circuit Groups

To set up a large network that includes a recovery router to back up a regional router supporting many remote sites, you can simplify configuration by using unnumbered interfaces as part of a demand circuit group.

A demand circuit group is a group of circuits that share the same user-defined, unnumbered protocol configuration. An unnumbered protocol configuration does not restrict the router to a specific destination address. Instead, it enables the router to use any circuit in the group for an incoming call, eliminating the need to configure a unique demand circuit for each remote node in the network. One demand circuit group supports many remote routers, thereby reducing the configuration tasks for a large network.

For more information, refer to *Configuring Dial Services*.

Dual Bus Cable Support for the SPEX-HS Net Module

The SPEX™-HS Net Module now supports dual bus cables. To enable dual bus cable support for the SPEX-HS Net Module, your router must be running Bay Networks Router Software and Boot PROM Version 10.0 or later, and diagnostic PROM (asndiag.exe) Version 2.16 or later. For more information, refer to *Installing and Maintaining ASN Routers and BNX Platforms*.

Floating B for the AN and ANH

If your ISDN service provider only offers 2B + D service, the floating B option for the AN and ANH™ enables you to use only one B channel for dial service applications. Floating B is an alternative if you cannot purchase 1B + D service.

Outbound LAN Traffic Filters for LAN Protocols

Outbound traffic filters act on packets that the router sends out a specific interface to a local or wide area network. Earlier versions of Site Manager supported outbound traffic filters on WAN circuits only. You can now create filters for outbound traffic on the following interface types:

- Ethernet (10Base-T and 100Base-T)
- FDDI
- Token Ring
- Synchronous
- MCE1
- MCT1

Outbound LAN traffic filters do not include protocol prioritization filtering actions. Only outbound WAN traffic filters support protocol prioritization.

When implementing outbound traffic filters for LAN protocols, note that in some configurations the filters may cause a decline in throughput performance. For LAN circuits where the forwarding rate of the router is critical, we suggest that you monitor the throughput performance after configuring outbound LAN filters. If you notice an unacceptable performance degradation, try using inbound traffic filters to accomplish the filtering goal.

For more information on traffic filters, refer to *Configuring Traffic Filters and Protocol Prioritization*.

IP Inbound Traffic Filter Detailed Logging

Inbound IP traffic filters support a new action called Detailed Logging. A filter with this action adds an entry containing IP header information to the system Events log for every packet that matches the filter criteria and ranges.

Protocol Prioritization and the Frame Relay DE Bit

Frame Relay packets in the Low priority protocol prioritization queue have the Discard Eligible (DE) bit set by default. The DE bit is off by default in Frame Relay packets in the Normal and High priority queues. In the Edit Protocol Priority Interface window of the Configuration Manager, you can now change the default status of the Frame Relay Discard Eligible (DE) bit for packets in the Low priority and Normal priority queues.

X.25

When you configure the X.25 Service Type as Defense Data Network (DDN), you can now automatically configure service records that use default parameter values for every DDN SVC on your network. This means that you do not have to individually configure DDN service records. To use the default DDN service record feature, set the Use Default Service Configuration packet-level parameter to ON.

If you want to configure specific DDN SVCs with nondefault values, you can configure them individually. If you set the Default DDN parameter to ON, the default values apply only to the remaining SVCs.

For more information, refer to *Configuring X.25 Services*.

New Revision of FRE-2 060 Fast Routing Engine with 64-MB RAM

Version 10.0 supports the new revision of the FRE®-2 060 Fast Routing Engine with 64 MB of RAM. The FRE-2 060 with 64 MB is used for applications that require additional memory to support more virtual circuits or larger routing tables.

The FRE2-060 64 MB has a fixed, default memory allocation of 48-MB local memory and 16-MB global memory. If you have an existing FRE-2 060 board (with less than 64 MB), and you want to upgrade to 64 MB, contact the Bay Networks Technical Response Center.

Data Compression

Release 10.0/4.0 includes hardware-based compression for Frame Relay and PPP networks that use the Octal Synchronous link module for the Backbone Node (BN®) using FRE-2 processors. Bay Networks provides two compression daughterboards:

- AG2104037 — Octal Sync with a 32-context hardware compression daughterboard
- AG2104038 — Octal Sync with a 128-context hardware compression daughterboard

Context refers to compression and decompression for a single VC. The numbers 32 and 128 assume a history size of 8 KB for each context. You can also use a history size of 32 KB, with a corresponding decrease in the number of contexts you can configure simultaneously.

Bay Networks software-based compression and hardware-based compression interoperate fully because they use the same algorithm. For more information, refer to *Configuring Data Compression Services*.

To upgrade a 9.0 configuration with an Octal Sync link module to a 10.0 configuration with a hardware compression daughterboard, follow these steps:

1. **Use a 10.0 image to boot the router that currently uses a 9.0 configuration.**
2. **Add the hardware compression daughterboard to the Octal Sync link module, and then hot swap the Octal Sync link module.**
3. **Bring up Site Manager Version 4.0, and bring up the Configuration Manager in dynamic mode.**

   Doing this loads the wfDrivers.wfHwCompLoad.0 driver, which supports the Octal Sync link module with the hardware compression daughterboard.

If WCP software compression was enabled in the 9.0 configuration file, the engine type defaults to Software. You must use Site Manager in dynamic mode to change the engine type from Software to Hardware.

If WCP was not enabled in the 9.0 configuration file, use the Add/Delete Protocols option to add compression and enable WCP.

DECnet

Bay Networks routing software for DECnet services now supports Level 1 Only routing. Use Level 1 Only routing to maintain paths to only those systems within the router's local area. Level 1 Only routing prevents the sending of Level 2 routing updates, thus reducing traffic on an interface.

By default, the Bay networks routing software for DECnet services performs both Level 1 and Level 2 routing. When the router performs both Level 1 and Level 2 routing, you can configure each router interface as either Level 1 and Level 2, or as Level 1 Only.

When you configure the router to perform Level 1 Only routing, the router maintains paths only to those systems within its local area. When the router performs Level 1 Only routing, you must configure all router interfaces as Level 1 Only.

For more information, refer to *Configuring DECnet Services*.

Router Redundancy

Router redundancy protects a network from irrecoverable failures of an entire router. You configure routers to be members of a router redundancy group. The group includes a primary router that performs normal routing and bridging services, and one or more secondary routers that take over if the primary router fails. You can configure multiple router redundancy groups on the same network.

For more information, refer to *Configuring Interface and Router Redundancy.*

New and Enhanced Technician Interface Scripts

The following sections describe new and enhanced Technician Interface scripts.

Embedded Scripts

Several Technician Interface scripts are now embedded within the 10.0 router software image. These embedded scripts replace and perform faster than their former batch file (<*entity_name*>.bat) versions. Release 10.0 includes embedded scripts for the following router software entities:

- CSMACD
- FTP
- FR
- IP
- SNMP
- SYNC
- TCP
- TELNET
- TFTP

For more information about Technician Interface scripts, refer to *Using Technician Interface Scripts*.

New/Enhanced Scripts

The following Technician Interface scripts are new or enhanced in Release 10.0:

- **show appn** (Enhanced): Added information on High Performance Routing (HPR) and its components, Rapid Transport Protocol (RTP) and Automatic Network Routing (ANR)
- **showbot** (New): Shows information on Binary Synchronous Communication (BSC) transport services
- **show bisync** (New): Shows information on Binary Synchronous lines
- **show dls** (Enhanced): Added information on the DLS configuration, Protocol Prioritization, and Traffic Filters
- **show dsx3** (New): Shows statistical information for ATM DS-2 and E-3 interfaces

- **show isdn** (Enhanced): Added ISDN local phone numbers
- **show ppp** (Enhanced): Added information on Challenge Handshake Authentication Protocol (CHAP), and multilink statistics and information
- **show rredund** (New): Shows information on router redundancy.
- **show sws** (Enhanced): Added information on Caller Resolution and Outbound Filtering and Bandwidth-on-Demand
- **show wcp** (Enhanced): Clarified display headings, and added hardware compression support
- **enable/disable snmp** (New): Enables or disables SNMP on the router

PPP Multilink

The multilink feature of PPP provides capabilities beyond those of multiline circuits. The major characteristics of multilink include the ability to

- Group up to four lines in a multilink bundle
- Use lines that have different speeds, proportionally distributing traffic over those lines
- Balance traffic load and maintain packet sequence
- Use switched lines (such as ISDN-B channels) as well as leased lines (except for ISDN leased lines)
- Monitor congestion

You can have more than one multilink bundle active between two peer routers. Each bundle is a separate circuit; that is, a separate logical connection. You cannot pair non-multilink lines with multilink lines in a circuit. Multilink can resequence packets sent over different lines of the link, but Version 10.0 does not support packet fragmentation and reassembly.

Multilink is available on the following platforms:

- BLN®/BCN®
- LN®/CN®
- AFN®
- AN™
- ASN™

You can use the multilink feature over the following physical media:

- V.35
- MCT1/MCE1
- ISDN B-channel drivers
- Raise-DTR modems
- V.25bis modems
- HSSI

Monitoring the PPP Link

PPP supports Link Quality Monitoring (LQM) only over standard synchronous links, not over high-speed serial interfaces.

When you enable link quality monitoring for the local router by setting the Link Quality Protocol parameter to LINKQR, you turn on LQM for both sides of the link. The LQR period is the same on both sides of the link.

Guidelines New in Version 10.0

The following guidelines are new in Version 10.0.

New Default Memory Allocations for 4-MB AFN

The default memory allocations for the 4-MB AFN are now

- Local memory = 3520 KB
- Global memory = 576 KB

New Default Memory Allocations for 8-MB ACE-32 Processor

The default memory allocations for the 8-MB ACE®-32 processor are now

- Local memory = 6 MB
- Global memory = 2 MB

Multilink Circuits Using PPP

A multi*link* circuit using PPP cannot communicate with a router running a version earlier than 10.0 because pre-10.0 versions use a multi*line* circuit in which LCP is run on only one line. In this situation, therefore, you must use uniline PPP.

PPP Software Incompatibilities

If you need to configure PPP to run over a point-to-point connection between a Version 5.*x* and a Version 10.0 router, read this section.

Version 5.*x* router software uses a Bay Networks proprietary implementation of PPP. Version 7.*x*, Version 8.*x*, Version 9.*x*, and Version 10.0 routers support a new implementation of PPP. The new implementation complies with the established requirements of the following Internet RFCs: 1332, 1333, 1334, 1378, 1552, 1638, 1661, 1662, 1762, 1763, and 1764. Version 10.0 routers also support the multilink feature, described in RFC 1717.

With the different implementations of PPP, each adhering to a different set of RFCs, the following functions will not work between a Version 5.*x* and a Version 9.*x* or Version 10.0 router:

- Link Quality Monitoring (LQM)
- Source-routing over Token Ring networks

For communication over a synchronous line between a Version 5.*x* and a Version 9.*x* or Version 10.0 router, each running PPP, make the following configuration checks:

- On the Version 9.*x* or Version 10.0 router:
  - The type of synchronous line service (MIB object ID 1.3.6.1.4.1.18.3.4.5.1.18, *wfSyncService*) must have a value of *Transparent*. (This is the default setting for the Service parameter in the Edit Sync Parameters window. To access the parameter through the Configuration Manager, click on the appropriate sync connector and select Edit Line Details.)

- On the Version 5.*x* router:
  - The LQM Time parameter must have a value of 0, which disables Link Quality Monitoring on the Version 5.*x* router.
  - The Quality of Service parameter must have a value of LLC1, the default setting.

For information on how to check these Version 5.*x* parameters, refer to your Version 5.*x* configuration guide.

For further information on configuring different versions of routers to assure software compatibility, see *Upgrading Routers from Version 5 to Version 10.0* and *Upgrading Routers from Version 7-8.xx to Version 10.0*.

Obtaining the Highest Possible Throughput with the 100Base-T Link Module

Bay Networks 100Base-T link modules offer a range of price and performance characteristics. For those applications that require the highest possible throughput, the following guidelines should be followed.

To obtain the highest aggregate throughput, use only one of the two ports on the 100Base-T link module. Demanding high throughput from both ports simultaneously will result in some packet loss and this may decrease the performance of sensitive applications.

To maximize throughput on either port, operate at half duplex (which is the default setting). Configuring one of the full duplex settings will not increase throughput and may, in some cases, decrease throughput. (The full duplex setting is used to allow operation at greater distances over fiber optic cable. For example, to connect to a 28115 over a 2-km fiber link, you would use the full duplex with flow control setting and connect a copper-to-fiber adapter to the router interface RJ45 port.) Using the most powerful router engine will also increase performance. The FRE060 will provide as much as a 30% improvement in performance over a FRE040. The amount of RAM memory on the router engine also increases performance, but to a lesser extent. Using an engine with 16 MB of memory will fulfill the performance requirements of most applications. (We recommend that you use an engine with more than 16 MB if the application requires extra storage capacity. For example, the routing tables for extremely large networks may require extra storage.)

Finally, larger packet sizes yield better performance than smaller packet sizes. In general, you should configure your application to use the largest packet size possible.

Rebooting while Writing to or Compacting Partitioned Flash Memory

Rebooting an AN or ASN while it is writing to or compacting partitioned Flash memory will corrupt the file system. As a result, the router will not start after rebooting.

Supported AFN, AN, and ASN Orders, and Link Modules

Table 1 lists the AFN orders supported by Router Software Version 10.0.

Table 1. AFNs Supported by Router Software Version 10.0

Order No.	Name
1515, 1516, 1517, and 1518	Single Ethernet, Dual Sync
1521	Dual Sync, Dual Token
1520	Dual Sync, Single Token

Table 2 lists the ANs supported by Router Software Version 10.0.

Table 2. ANs Supported by Version 10.0

Order No.	Name
20002	Single Ethernet/Dual Synchronous
21002	Single Token Ring/Dual Synchronous
22002	Single Ethernet/Single Token Ring/Dual Synchronous
23002	Twelve Ethernet/Dual Synchronous
23102	Eight Ethernet/Dual Synchronous

Table 3 lists the ASN net modules supported by Router Software Version 10.0.

Table 3. ASN Net Modules Supported by Version 10.0

Order No.	Name
34000	Dual Ethernet
34001	Dual Sync
34002	Dual Token Ring
34003	FDDI
34004	Stack Packet Exchange (SPEX)
34005	Dual Sync/ISDN BRI
34008	Quad BRI
34010	100-MBIT Fast Ethernet

Table 4 lists the link modules supported by Bay Networks routers other than the AFN, AN, and ASN running Version 10.0.

Note: *Since the FN™ router supports only one link module and you need two link modules to make a local connection, you should not use MCT1 link modules in the FN router.*

Table 4. Link Modules Supported by FNs, LNs, CNs, BLNs, BLN-2s, and BCNs Running Version 10.0

Order No.	Name
5405	Dual Ethernet
5300	Quad Sync (Async)
5740	Dual Sync, Single Token
5720	Single Sync, Single Token
5740	Dual Sync (Async), Single Token
5720	Single Sync, (Async) Single Token 4 MB
5720	Dual Sync, Single Token 4 MB

(continued)

Table 4. Link Modules Supported by FNs, LNs, CNs, BLNs, BLN-2s, and BCNs Running Version 10.0 *(continued)*

Order No.	Name
5705	Single Token
5720	Single Sync, Single Token 4 MB
5705	Single Token 4 MB
5200	Dual Port T1
5200	Dual Port T1
5220	Single Port T1
5201	Dual Port T1 (56 K)
5250	Dual Port E1
5221	Single Port T1 (56 K)
5200	Dual Port T1 Framer/Multiplexer
5220	Single Port T1
5201	Dual Port T1 Framer/Multiplexer (DACS 56K)
5221	Single Port T1 (56 K)
5250	Dual Port E1 Framer/Multiplexer
5280	Quad Sync
5280	Quad Sync (Async)
5430	Dual Sync, Dual Ethernet
5430*	Dual Sync (Async), Dual Ethernet (Version 10.0 supports this link module, with limitations.)
5405	Dual Ethernet
5420	Dual Sync, Single Ethernet (Version 10.0 does not support Module ID 32, Order No. 5420, Part No. 100860.)
5420*	Dual Sync (Async), Single Ethernet (Version 10.0 does not support Module ID 32, Order No. 5420, Part No. 100860, but does support Order Nos. 1521 and 1520 with limitations.)

(continued)

Table 4. Link Modules Supported by FNs, LNs, CNs, BLNs, BLN-2s, and BCNs Running Version 10.0 *(continued)*

Order No.	Name
5410	Single Sync, Single Ethernet
5410	Single Sync (Async), Single Ethernet
5505	Dual Ethernet, Hardware Filters
5530*	Dual Sync, Dual Ethernet, Hardware Filters (Version 10.0 supports this link module, with limitations)
5450	Quad Ethernet
5950	Quad Ethernet, Hardware Filters
5945	Single Port MCT1
5944	Dual Port MCT1
5710	Dual Token (4/16 MB)
50021	Quad Token (4/16 MB) (The FN does not support this module.)
5930	FDDI Multimode (DAS)
5943	FDDI Hybrid (DAS - Multimode/Single Mode)
5940	FDDI Single Mode (DAS)
5942	FDDI Hybrid (DAS - Single Mode/Multimode)
5946	FDDI Multimode, Hardware Filters (DAS)
5949	FDDI Hybrid, Hardware Filters (DAS - Multimode/ Single Mode)
5947	FDDI Single Mode, Hardware Filters (DAS)
5948	FDDI Hybrid, Hardware Filters (DAS - Single Mode/ Multimode)
5295	Single Port High Speed Serial Interface (HSSI)
5431	Ethernet Synchronous Advanced Filtering (ESAF-4) with 0 CAMS

(continued)

Table 4. Link Modules Supported by FNs, LNs, CNs, BLNs, BLN-2s, and BCNs Running Version 10.0 *(continued)*

Order No.	Name
5531	Ethernet Synchronous Advanced Filtering (ESAF-4) with 2 CAMS
5532	Ethernet Synchronous Advanced Filtering (ESAF-4) with 6 CAMS
51001	ATM OC-3 Multimode Fiber (155 MB/s)
51002	ATM OC-3 Single Mode Fiber (155 MB/s)
77009	Single Port MCE1
77007	Dual Port MCE1
5008	Octal Synchronous Link Module
50038	100Base-T Link Module
AG13110112†	ATM Routing Engine OC-3 Multimode
AG13110113†	ATM Routing Engine OC-3 Single Mode
AG13110114†	ATM Routing Engine DS-3
AG13110115†	ATM Routing Engine E-3
AG2104037	Octal Synchronous Link Module with a 32-Context Hardware Compression Daughterboard
AG2104038	Octal Synchronous Link Module with a 128-Context Hardware Compression Daughterboard

* Order Nos. 5420, 5430, and 5530 are fully compatible with ACE processor modules, regardless of whether they are running Series 5, Series 7, or Series 8 router software.

† Supported on BLNs, BLN-2s, and BCNs only.

The Console port of the System I/O Link Module provides local or out-of-band access to the router via the Technician Interface.

Version 10.0 AN Ethernet with ISDN BRI Tested Configurations

Each of the configurations in Table 5 has been tested to ensure successful operation using 4-MB AN Ethernet nodes with ISDN BRI. The table includes those configurations believed to be most popular for

- Branch office locations with synchronous primary WAN connections, such as PPP or Frame Relay and ISDN switched services Dial Backup
- Internet Access Router using ISDN Dial on Demand

Most protocol configurations are supported using 8 MB. Larger memory sizes are required to support many Frame Relay PVCs and multiple compression contexts.

Table 5 includes a few 8-MB configurations since these were borderline 4 MB.

Table 5. Tested Configurations Using 4-MB AN Ethernet Nodes with ISDN BRI

Router Config	LAN Protocols			Routing Protocols	Sync I/F WAN Protocols[1]			Switched Services Feature (PPP)			ISDN BRI Enabled[2]	Compression Enabled[2]	Minimum Memory Required
	IP	IPX	BRDG	RIP	PPP	FR	X25	DoD	DBU	BoD			
A	X	X	X	X		X			X				4 MB
B	X	X		X		X			X		X		4 MB
C	X	X	X	X		X						X	4 MB
D	X	X	X	X		X			X		X		8 MB
E	X	X		X				X		X	X		4 MB
F	X	X	X	X				X		X	X	X	8 MB
G	X	X		X	X					X	X		4 MB
H	X	X	X	X	X					X	X	X	8 MB
I	X	X	X	X			X					X	4 MB
J	X	X	X	X			X	X			X		8 MB

[1]Frame Relay is configured with two Direct Mode PVCs.
[2]Configurations requiring compression and ISDN enabled simultaneously require 8 MB of DRAM.

Supported Flash Memory Cards

Table 6 lists the 2-MB, 4-MB, and 8-MB Personal Computer Memory Card International Association (PCMCIA) standard Flash memory cards that are qualified for use in Bay Networks routers.

Table 6. Approved Flash Memory Cards

Size	Vendor	Part Number
2 MB	AMD	AMC002AFLKA
	Amp	1-797078-3
	Fujitsu	MB98A811220
	Fujitsu	MB98A8111-20
	Intel™	1MC002FLKA
	Maxell	EF2MTB(AA)WEL.M-200
	Maxell	EF2MTB(AA)WEL.I-200
	Mitsubishi	MF82M1-G1EAT01
	Mitsubishi	MF82M1-GBDAT01
	Panasonic	BN-02MHFR
	Texas Instruments	CMS68F2MB-250
4 MB	AMD	AMC004CFLKA-150
	AMP	797262-3
	Epson	HWB40158X0
	IBM	IBM17O0400D1DA-25
	Intel	IMC004FLSAQ1381
8 MB	AMD	AMC008CFLKA
	AMD	AMC008DFLKA
	Centennial	FLO8-20-11119-01
	Epson	HWB801BNX0
	Intel	IMC008FLSP/Q1422

Standards Supported

Table 7 lists the Requests for Comments (RFCs) and other standards documents with which Version 10.0 is compliant. Version 10.0 may support additional standards that are not listed in this table.

Table 7. Standards Supported by Version 10.0

Standard	Description
IEEE 802.10	Bridge with Spanning Tree
RFC 768	User Datagram Protocol (UDP)
RFC 791	Internet Protocol (IP)
RFC 792	Internet Control Message Protocol (ICMP)
RFC 793	Transmission Control Protocol (TCP)
RFC 813	Window and Acknowledgment Strategy in TCP
RFC 826	Ethernet Address Resolution Protocol
RFC 827	Exterior Gateway Protocol (EGP)
RFC 854	Telnet Protocol Specification
RFC 855	Telnet Option Specifications
RFC 856	Telnet Binary Transmission
RFC 857	Telnet Echo Option
RFC 858	Telnet Suppress Go Ahead Option
RFC 859	Telnet Status Option
RFC 860	Telnet Timing Mark Option
RFC 861	Telnet Extended Options: List Option
RFC 863	Discard Protocol
RFC 877	Transmission of IP Datagrams over Public Data Networks
RFC 879	TCP Maximum Segment Size and Related Topics
RFC 888	"STUB" Exterior Gateway Protocol

(continued)

Table 7. Standards Supported by Version 10.0 *(continued)*

Standard	Description
RFC 894	Transmission of IP Datagrams over Ethernet Networks
RFC 896	Congestion Control in IP/TCP Internetworks
RFC 903	Reverse Address Resolution Protocol
RFC 904	Exterior Gateway Protocol Formal Specification
RFC 919	Broadcasting Internet Datagrams
RFC 922	Broadcasting Internet Datagrams in Subnets
RFC 925	Multi-LAN Address Resolution
RFC 950	Internet Standard Subnetting Procedure
RFC 951	Bootstrap Protocol
RFC 959	File Transfer Protocol
RFC 994	Protocol for Providing the Connectionless-mode Network Service
RFC 1009	Requirements for Internet Gateways
RFC 1027	Using ARP to Implement Transparent Subnet Gateways
RFC 1042	Transmission of IP over IEEE/802 Networks
RFC 1058	Routing Information Protocol
RFC 1079	Telnet Terminal Speed Option
RFC 1084	BOOTP Vendor Information Extensions
RFC 1091	Telnet Terminal-Type Option
RFC 1108	Security Options for the Internet Protocol
RFC 1112	Host Extensions for IP Multicasting Appendix I. Internet Group Management Protocol
RFC 1116	Telnet Line-mode Option
RFC 1139	Echo Function for ISO 8473
RFC 1155	Structure and Identification of Management Information for TCP/IP-based Internets

(continued)

Table 7. Standards Supported by Version 10.0 *(continued)*

Standard	Description
RFC 1157	Simple Network Management Protocol (SNMP)
RFC 1163	BGP-2 obsoleted by RFC 1267
RFC 1164	Application of BGP in the Internet
RFC 1166	Internet Numbers
RFC 1188	Proposed Standard for the Transmission of IP over FDDI
RFC 1191	Path MTU Discovery
RFC 1209	Transmission of IP Datagrams over SMDS
RFC 1212	Concise MIB Definitions
RFC 1213	MIB for Network Management of TCP/IP-based Internets
RFC 1267	Border Gateway Protocol 3 (BGP-3)
RFC 1654	Border Gateway Protocol 4 (BGP-4)
RFC 1293	Inverse ARP for Frame Relay
RFC 1294	Obsoleted by RFC 1490
RFC 1304	Definition of Managed Objects for the SIP Interface Type
RFC 1315	Management Information Base for Frame Relay DTEs
RFC 1323	TCP Extensions for High Performance
RFC 1331	Point-to-Point Protocol (PPP) for the Transmission of Multiprotocol Datagrams over Point-to-Point Links
RFC 1332	PPP Internet Protocol Control Protocol (IPCP)
RFC 1333	PPP Link Quality Monitoring
RFC 1334	PPP Authentication Protocols
RFC 1340	Assigned Numbers
RFC 1350	The TFTP Protocol (Revision 2)
RFC 1376	PPP DECnet Phase IV Control Protocol (DNCP)
RFC 1378	PPP AppleTalk Control Protocol (ATCP)

(continued)

Table 7. Standards Supported by Version 10.0 *(continued)*

Standard	Description
RFC 1390	Transmission of IP and ARP over FDDI Networks
RFC 1377	OSI over PPP
RFC 1403	BGP OSPF Interaction
RFC 1434	Data Link Switching: Switch-to-Switch Protocol
RFC 1483	Multiprotocol Encapsulation over ATM AAL5
RFC 1490	Multiprotocol Interconnect over Frame Relay
RFC 1076	Redefinition of Managed Objects for IEEE 802.3 Repeater Devices (for AN Hubs only)
RFC 1577	Classical IP and ARP over ATM
RFC 1717	PPP Multilink Protocol (MP)
RFC 1757	Remote Network Monitoring Management Information Base (RMON) (for AN Hubs equipped with Data Collection Module only)
RFC 1552	The PPP Internetwork Packet Exchange Control Protocol (IPXCP)
RFC 1583	OSPF Version 2
RFC 1634	Novell IPX over Various WAN Media (IPXWAN)
VINES 4.11	The Bay Networks router software works with the Banyan VINES 4.11 standard. Bay Networks Router Software Version 8.10 and higher also supports VINES 5.50 sequenced routing.

Version 10.0 also supports

- LAN Emulation functions as defined in the ATM Forum LAN Emulation Over ATM (Version 1.0) specification
- ATM signaling functions and Signaling AAL functions as defined in the ATM Forum ATM User-Network Interface Specification (Version 3.0)