

Summary

Bay Networks introduces the BayStack™ 150 Series 10BASE-T Hubs, a family of four hubs that provide a full-featured 10 megabit-per-second (Mbps) Ethernet repeater system solution. Featuring advanced management capability, BayStack 150 10BASE-T hubs are economical and easy to use, providing more features, delivering greater flexibility and reliability, and offering a wider range of management options than competing products at comparable prices.

Ideal for customers who are building their first Ethernet network or who are laying the foundation of a corporate network infrastructure, the BayStack 150 Series hubs enable you to build your network right the first time. Working with other BayStack products, including the BayStack 200 Series 100BASE-T hubs, BayStack 300 Series Ethernet switches, and the Advanced Remote Node router, the BayStack 150 Series 10BASE-T hubs contribute to an affordable, scalable, and flexible solution for creating high-performance Ethernet networks.

Introduction

Four versions of the BayStack 150 Series 10BASE-T hubs are available (see Figure 1). Two managed (master) 12-port or 24-port hubs (hub/NMMs) are available, both of which include a built-in network management module (NMM). Two manageable (slave) 12-port or 24-port hubs are also available, which can be used for standalone connectivity where management is not required, or managed by a master hub/NMM unit. When configured as part of a hub stack, the slave hubs can be cascaded to deliver a low-cost managed solution which can be scaled as network requirements dictate. All four hubs feature RJ-45 modular connectors.

Each hub includes a field-removable power supply that can be easily replaced, ensuring maximum network availability and minimal repair time. The power supply can be removed without disturbing hubs in a rack-mount configuration. Each BayStack 150 Series hub also features a built-in, recessed AUI port in the rear of the chassis that provides connectivity to a variety of media, such as 10BASE-FL fiber, 10BASE-2 ThinNet, 10BASE-T UTP, or AUI coaxial cables via external transceivers.

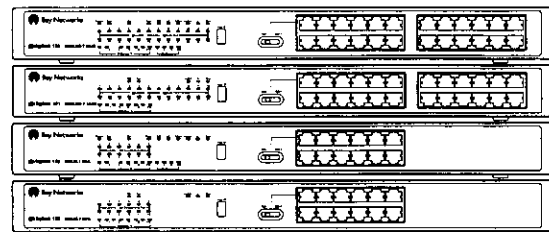


Figure 1: BayStack 150 Series 10BASE-T Hubs: Model 150, 151, 152 and 153 (from top).

Up to eight BayStack 150 10BASE-T hubs can be cascaded using standard Category 5 UTP cabling, creating a hub stack capable of up to 8 segments and 192 ports with or without network management. Hubs can be easily assigned to an isolated segment by using Optivity® network management software from Bay Networks. All hubs assigned to the same segment function as a single repeater.

Management capabilities are provided in the BayStack 150 and BayStack 152 hubs via a built-in NMM. One hub/NMM provides complete management for an entire 8-hub stack. A single hub/NMM can also control and monitor multiple segments separated by as much as 100 meters through the hub's cascade connectors.

For local management, a concise, understandable, easy-to-read LED display provides at-a-glance network monitoring, including hub position within the stack.

Key Hub Features

- **12 or 24 10BASE-T ports** with RJ-45 jacks.
- **Field-removable/replaceable power supply** provides minimal network downtime when the expense of redundant power systems are not required.
- **Stacking capability** allows for one hub/NMM to manage up to 7 additional hubs for a total of 192 managed ports.
- **Redundant NMM capability** allows for two or more hub/NMM units to be installed in a stack, enabling one to be used as a standby in case of primary hub/NMM failure.
- **Multi-segment Management Cascade** supports management for up to 8 Ethernet segments via hub isolation configured by Optivity.
- **Parallel Repeater technology** designates all hubs in a cascade that are assigned to the same segment to function as one repeater.
- **Recessed AUI port** supports console management. This allows installation of a standard transceiver on the rear of the hub, minimizing space requirements.
- **Cascade connectors** enable a single NMM to provide Advanced agent management to remote cascade segments separated by up to 100 meters.
- **Slim-line one rack unit height** allows high-density installations.
- **Automatic Stack Position Resolution** eliminates the need for switch settings to be configured manually to indicate hub position in a stack.
- **Communications port** allows hub/NMM configuration and management through an RS-232 terminal, PC, or modem.
- **Concise LED display** provides real-time network monitoring through the front panel, including utilization rates with LED meters and a stack position indicator.
- **Per-port automatic polarity detection and correction** corrects wire-pair inversions on 10BASE-T receive data (RD) lines.
- **Per-port autopartitioning** disconnects ports that experiencing jabber (excessively long transmissions), excessive consecutive

collisions, or a single collision of excessive length.

- **Per-port 10BASE-T link integrity test** function allows observation of port link status.
- **Front panel MDI/MDI-X switch** eliminates the need for crossover cables when connecting to another stack.
- **Regional power cords** are available for North America, the U.K., parts of Continental Europe, Japan, and Australia.
- **Multi-language technical documentation** is available in English, German, French, Spanish, Italian, and Japanese.
- **Durable sheet metal enclosure** ensures high performance under hostile conditions.

Key Management Features

Built-in management within BayStack 150 and 152 hub/NMMs employs Simple Network Management Protocol (SNMP), which is extended to BayStack 151 and 153 hubs when deployed in a stack configuration. The BayStack 150 and 152 hub/NMMs provide agent management, including support for Expanded View™, statistics for all segments in the stack, plus capabilities such as RMON and Autotopology™ dynamic mapping. All BayStack Ethernet NMMs support Bay Networks Optivity network management software.

Key Fault Tolerance Features

- **Automatic termination and bypass** allows BayStack 150 hubs to automatically detect the top and bottom of the stack and apply termination to the cascade. If any hub fails or loses power, the cascade automatically bypasses that hub. Hub position within the stack is indicated via the "Hub ID" LED.
- **SmartSwap™** non-volatile configuration memory (NVRAM) automatically saves and restores the configurations of all hubs in the stack through power cycles and hub replacements. Individual hubs save their own configuration, while the hub/NMM saves the configuration of all hubs in the stack.

- **Software-based redundant links** are supported between any two 10BASE-T ports in the stack when used in conjunction with a hub/NMM and Optivity. This feature is planned for a future release.
- **Redundant clocks** allow either the top or bottom hub in the stack to provide clocking for the entire stack. Should the hub providing the clock fail, the other hub will automatically take over that function for the stack.
- **Port security** provides intrusion control and eavesdrop protection when used with Optivity network management software. This feature is planned for a future release.
- **Parallel Repeater technology** protects the stack from being disrupted in the event of a hub shutdown.

BayStack 150 Series 10BASE-T Hub Technical Review

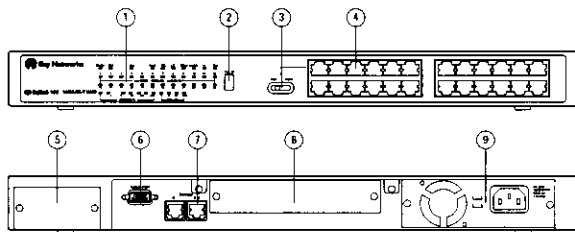


Figure 2: Front and rear views of the 24-port BayStack 150 10BASE-T Hub. The 12-port version is identical except for the number of ports.

1 - Concise LED Display

The LED display provides real-time network monitoring with:

- Collision ratio (Models 150 and 152 only) and Network Utilization LED meters.
- Primary management (master) hub LED (Models 150 and 152 only).
- Cascade connection status LEDs.
- Console port connection (Models 150 and 152 only), AUI port activity.
- Collision (Models 151 and 153 only) and Packet integrity LED indicators such as Runt, Frame Check Sequence (FCS)/Alignment, Late Collisions, and other errors (Models 150 and 152 only).

- Bi-color port link and partition/autopartition status LEDs.
- Hub Isolate LED indicator.

2 - Seven Segment Hub Identification LED

Provides at-a-glance location status of the hub relative to the master hub/NMM. This is automatically determined through the hub circuitry.

3 - MDI-X/MDI Port Switch

A built-in MDI-X/MDI switch converts Port 1 from a media-dependent interface with crossover (MDI-X) port to a media-dependent interface (MDI) port. This allows users to connect two hubs via the 10BASE-T ports without using a crossover cable.

4 - 10BASE-T Ports

Each BayStack 150 Series hub includes either 12 or 24 built-in 10BASE-T ports with RJ-45 connectors.

5 - Recessed AUI port

Provides connectivity to other media via external transceiver. Recessed location allows for deployment in space-constrained environments.

6 - Communications Port

The RS-232 (DB-9 male) communications port can be used as a service port or as an SNMP out-of-band port (Models 150 and 152 only).

7 - Cascade Connectors

The cascade connectors allow you to connect a stack of up to 8 hubs as a single segment. All hubs in the cascade are assigned to the same segment and operate as a single Ethernet repeater.

Two RJ-45 cascade connectors provide the repeater cascade (one segment), as well as the management cascade, for the entire stack. The cascade cable can be as long as 100 meters (total cumulative distance).

The cascade cable carries segment and network management information and data between the hubs. When cascade connections are used to connect hubs, customers should keep the following guidelines in mind:

- The stack must not exceed a total of 8 hubs.

- Cascade cabling requires standard (Category 3 or better) four-pair unshielded twisted pair (UTP) cable terminated with RJ-45 connectors (see Figure 3).
- Cascade cables may be hot swapped.

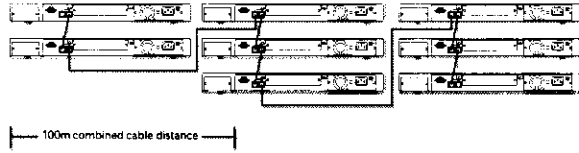


Figure 3: Dispersed hubs connected through cascade connectors.

8 - Auxiliary Port

Provided for future product developments.

9 - Field Removable/Replaceable AC Power Supply

Allows for minimal downtime when servicing the hub. The switching power supply adapts to various regional AC power sources, ranging from 100-260 VAC at 50-60 Hz.

BayStack 150 Series Network Management Module Technical Review

Network management is provided by built-in network management modules in the BayStack Model 150 and 152 Hub/NMMs.

The built-in Ethernet NMM provides SNMP-based management, as well as four groups of RMON to BayStack 150 Series 10BASE-T hubs connected in the stack. SNMP is the standard communications protocol that simplifies management of devices linked together in a networking environment. An SNMP agent resides in the NMM and responds to queries sent by a network management application, such as Optivity. Optivity then collates the results of these queries and presents them graphically on the management station display.

The agent software resides in the NMM and uses the information it collects to provide management for all hubs in a managed stack. The agent software allows customers to observe the flow and quality of network data across the segments, as well as faults and errors occurring on the ports.

A communications port on the rear panel of the hub can be used to configure the NMM via an RS-232 terminal, a PC running terminal emulation software, or remotely using an out-of-band modem connection. Front-panel LEDs display data on the master hub providing management services to the hub stack. Multiple hub/NMMs can reside in the stack, and are available as stand-by back-ups to the master.

Hub/NMM units provide Bay Networks Advanced-level management to hubs located in the cascade, and standard-level (SNMP) management to hubs that are isolated from the cascade. The isolated hubs act as a separate collision domain, allowing the administrator to proactively manage the network as the traffic levels dictate. An internetworking device, such as a BayStack 304 Ethernet segment switch, is used to connect isolated hubs to the cascade so data can pass between them.

The BayStack 150 Series 10BASE-T Hub/NMMs and associated agents offer the following features:

- By using the Stack Management Bus along with intelligent hubs, the hub/NMMs provide comprehensive, simultaneous Standard agent management and core statistics collection at near-line speeds for all stack segments, including isolated hubs.
- NMM agent software and configuration information is stored in on-board Flash EEPROM.
- The agent and boot image can be loaded from local Flash EEPROM or from a remote load server on the network. There is also a fail-safe mode that loads the agent from Flash EEPROM if a remote image cannot be found.
- The NMM agent and boot can be upgraded using BootP/TFTP.

The built-in BayStack 150 Series Hub/NMMs extend Bay Networks Standard-level management to all hubs in the stack, including isolated hubs. In addition, hubs that reside on the same Ethernet segment as the hub/NMM are also provided with Advanced-level management, which delivers a more comprehensive feature set. These features include Autotopology, which automatically generates maps that offer both logical and physical views of the network, enhancing the

customer's ability to "see" network operations. In addition, Advanced-level management provides the following functionality:

- RMON: Support for IETF RMON MIB (RFC 1271) Alarms and Events Groups, Statistics and History.
- Support for up to 288 user-configurable thresholds. Thresholds can be applied to any counters on ports, hubs or segments.
- Software-based redundant links. Any two 10BASE-T ports in a stack with a hub/NMM installed may be designated as a redundant pair through Optivity. If one link fails, the standby link will automatically be enabled. This feature is planned for a future release.
- A full suite of LED indicators is also provided, which display hub status at a glance (see Figure 4).

Optivity Network Management Support

The powerful Bay Networks Optivity network management solution is available at three levels, Workgroup, Campus, and Enterprise, and is suitable for managing any size network, from small workgroup environments to enterprise networks spanning thousands of nodes. Listed below are the first versions of Optivity that will support the BayStack 150 Series 10BASE-T hubs. All versions listed below will be available by Q1FY98.

Optivity Workgroup

- EZ LAN (v3.4) for Windows

Optivity Campus

- Optivity (v6.2) for HP OpenView for Windows

Optivity LAN

- Optivity (v8.0) for SunNet Manager
- Optivity (v8.0) for HP OpenView UNIX
- Optivity (v8.0) for NetView AIX

LED Display

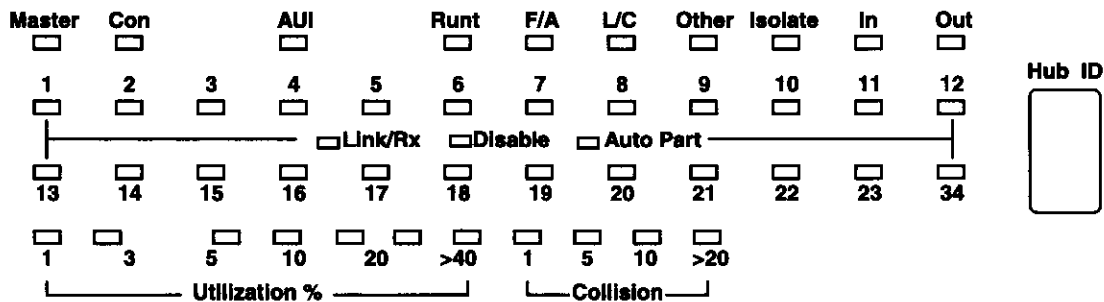


Figure 4: LED matrix and function table.

Type	Label	Color	Meaning
Port Status indicator	Link/Rx	Green	Port is connected to a powered Ethernet station. Blinking green LED indicates port is receiving data.
	Disable	Amber	Port has been manually partitioned.
	Autopartition	Amber	Port has been autopartitioned.

Type	Label	Color	Meaning
Master Hub Indicator	Master	Green	Serving as an active master hub in the stack.
Console	Con	Green	Master hub's RS-232 port is being used for console interfaces or out-of-band management using SLIP protocol.
FCS/Alignment	F/A	Amber	Data packets have been corrupted during transmission. FCS (frame check sequence error) = data packet fails internal consistency check Alignment bits in packet do not add up to the whole number of bytes.
Late Collision	L/C	Amber	Collision occurred after the 512th bit of a frame.
Runt	Runt	Amber	Indicates hub received a packet that was too short (< 64 bytes).
Other	Other	Amber	Indicates other types of Ethernet errors occurred.
Isolate	Isolate	Amber	Indicates the hub has been manually segmented from the rest of the stack. Hub is still managed via the master hub.
Utilization %	Utilization %	Green	Displays increments of bandwidth utilization on the segment.
Collision Ratio	Col	Amber	Collision rate at tens of collisions per second on the segment.
Cascade Cable In/Out	In, Out	Green	Indicates that another hub is connected to the cascade port on the back of the hub.
Hub ID	Hub ID	7 seg. LED	Indicates the unique unit ID number of a hub within the stack. Hub automatically assigns its ID relative to the master hub.
AUI	AUI	Yellow	Indicates data is being received through the AUI port.

Figure 4: LED function table, cont.

Technical Specifications

BayStack 150 Series 10BASE-T Hubs

Network Protocol

10 Mbps Ethernet

Standards Support

IEEE 802.3 CSMA/CD

IEEE 802.3i 10BASE-T

Electrical Specifications

Power consumption-

Models 150, 152: 50W

Models 151,153: 20W

AC line frequency: 50 to 60 Hz

Physical Specifications

Weight:

Model 150: 6.2 lb (3.0 kg)

Model 151: 5.5 lb (2.7 kg)

Model 152: 6.0 lb (2.9 kg)

Model 153: 5.3 lb (2.6 kg)

Dimensions:

(H) 1.73 in. x (W) 17.2 in. x (D) 8.46 in.

[(H) 44.4 mm x (W) 441 mm x (D) 217 mm]

Rack space: One rack unit per hub (19 inch)

Environmental Specifications

Operating temperature: 0° to 50° C
Storage temperature: -20° to +65° C
Operating humidity: 20% to 80% max.
relative humidity, noncondensing
Storage humidity: 5% to 90% max. relative
humidity, noncondensing
Ventilation clearance: Minimum 2 in. (5.08
cm) on all sides (stacking OK)
Operating conditions: At least 6 ft (1.83 m)
to nearest source of electromagnetic noise
Power source availability: Adequate power
source within 6 ft (1.83 m)
Recommended wiring closet service
clearance: 5 in. (front); 7 in. (rear)

Safety Agency Approvals

UL-listed
CSA-listed
TUV-licensed

Electromagnetic Emissions Summary

Meets requirements of:
FCC Part 15, Sub part B, Class A ITE
VCCI Class A ITE
EN 55 022 (CISPR 22, Class A)
AS/NZS 3548 Class A
EN 50082-1 Susceptibility

For the complete electromagnetic emissions
statements and declaration of conformance,
see Installation and Reference for the
BayStack 150 Series 10BASE-T Hubs (Bay
Networks part number 893-01021-A).

Compliance with the VCCI regulation is
dependent upon the use of shielded AC power
cables. The user is responsible for procuring
the appropriate cables.

Common Questions

Will the BayStack 150 Series 10BASE-T hub product line replace the Bay Networks 100 Series hubs?

No. The BayStack 100 Series hubs are a core Bay Networks product and will continue to be available for customers wishing to grow their BayStack 100 Series stacks, and for those customers who need full RMON, redundant power, and multiple media adapter options.

When should I buy a BayStack 150 Series hub as opposed to a BayStack 100 Series hub?

Both are excellent products and one should consider both economics and features when deploying new products into the network. Generally, the BayStack 150 Series hubs should be used when full RMON, redundant power, and multiple media adapter options are *not required*.

What is a cascade segment?

A cascade segment is a repeater bus that extends between hubs in a stack of BayStack 150 Series 10BASE-T hubs. It is analogous to a single System 5000 or System 3000 Ethernet backplane segment. Any hub in the stack can be configured to be on the one cascade segment, or it can be isolated from the stack for additional segment density.

What is an isolated hub ?

An isolated hub is not connected to any of the segments in the cascade cables that run between the hubs in the stack. No network data is shared between an isolated hub and the others in the stack unless an external connection is made by the user. However, any hub/NMM in the stack can still provide Standard agent management for that isolated hub. BayStack 300 Series Ethernet switches may be used to combine multiple isolated segments.

How do I isolate a hub?

Optivity network management software provides the mechanism to isolate a hub. The user interface screen simplifies management tasks, and enables changes to be made on screen as network traffic dictates.

How do I connect to a fiber run?

Use a standards-based 10BASE-FL transceiver attached to the built-in AUI port.

Will per-port configuration switching, also called port switching, be available for the BayStack 150 products?

No. Per-port configuration switching is a relatively expensive feature that is not offered in BayStack.

Are BayStack 150 Series Hub/NMMs or cascade cables hot swappable?

Yes and no. Hubs being hot-swapped from a stack, and any immediately adjacent hubs in the cascade, should be powered off during the replacement. SmartSwap non-volatile configuration memory automatically saves and restores the configuration of all hubs in the stack through power cycles and hub replacements. Cables attached to the cascade connectors may be hot swapped. Users who require a stackable, hot swappable solution should consider the Distributed 5000 hubs.

How many hub/NMMs are needed for Standard management on all stack segments?

One. A single BayStack Model 150 or Model

152 hub/NMM can provide Bay Networks powerful Standard management for all segments in the stack, including isolated hubs.

To how many segments can my hub/NMM provide Advanced management capabilities?

One. Although a single hub/NMM provides Standard management for all segments in the stack, higher levels of management are only provided for the segment to which the hub/NMM is directly attached. If the user requires higher management levels for multiple segments from a single NMM, both the Distributed 5000 or System 5000 hubs offer this capability. If Advanced management is required on multiple segments, a separate BayStack Series 150 hub/NMM should be installed on each of the desired segments.

Table 1. Network management features of the BayStack Series 150 10BASE-T hubs.

Agent Features	BayStack 150 Series Hub/NMM
Expanded View	√
SNMP	√
MIB-II	√
Configuration and status for all ports in the chassis/stack	√
Per-port statistics for all Ethernet ports in the chassis/stack	√
Find Nodes, Show Nodes for all Ethernet ports	√
Port-to-MAC address mapping	√
RMON RFC 1271 Ethernet Statistics and History	√
RMON RFC 1271 Alarms and Events	√
Autotopology	√

Ordering and Availability

Order No.	Description	U.S. List Price
CG1001?11*	BayStack 150 10BASE-T Hub/NMM with 24 RJ-45 ports	\$1249
CG1001?12*	BayStack 151 10BASE-T Hub with 24 RJ-45 ports	\$999
CG1001?13*	BayStack 152 10BASE-T Hub/NMM with 12 RJ-45 ports	\$749
CG1001?14*	BayStack 153 10BASE-T Hub with 12 RJ-45 ports	\$649

* Note: The seventh character (?) of the hub order number *must* be replaced with the proper code to indicate desired product nationalization:

"A" No power cord included.

"B" Includes European "Schuko" power cord common in Austria, Belgium, Finland, France, Germany, The Netherlands, Norway, and Sweden.

"C" Includes power cord commonly used in the United Kingdom and Ireland.

"D" Includes power cord commonly used in Japan.

"E" Includes North American power cord.

"F" Includes Australian power cord, also commonly used in New Zealand and the People's Republic of China.

Availability

The new BayStack 150 Series 10BASE-T Hubs will begin shipping in July 1997.

Warranty Information

Bay Networks provides a lifetime warranty for hardware from date of delivery to the end user. Warranty service is provided under an "advanced replacement" repair or exchange program and can be obtained by calling your local product reseller or by contacting Bay Networks directly.

Service and Support

Bay Networks provides a wide range of support services under the Bay Networks Service Program. Included in these offerings are telephone support, installation, parts exchange, software maintenance, and a host of other contract maintenance and consulting programs. Please contact your local product reseller or Bay Networks for more details on these support programs. To contact the Bay Networks service sales desk, please call 1-508-436-8880.

Technical Assistance for Installed Products

Support for installed Bay Networks products is available from your local product reseller or through the Bay Networks Technical Response Center (TRC) Contract Hotline. The TRC contract hotline can be reached in the United States and Canada by calling 1-800-473-4911, in Europe by calling 011-33-92-966-968, in Asia Pacific by calling 011-61-2-9927-8800, and worldwide by calling 1-408-495-1000.

Technical information is available using the InfoFACTS fax-on-demand system in the United States and Canada by calling 1-800-786-3228 and internationally by calling 1-408-495-1002. Technical information can also be found in the Bay Networks forum on CompuServe or on the Bay Networks World Wide Web home page at <http://www.baynetworks.com>.

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