

Part No. 206208-A  
August 1999

4401 Great America Parkway  
Santa Clara, CA 95054

# Using the Model 5625HD EtherSpeedII Switch Module

**NO**RTTEL  
NETWORKS™

---

## Copyright © 1999 Nortel Networks

All rights reserved. Printed in the USA. August 1999.

The information in this document is subject to change without notice. The statements, configurations, technical data, and recommendations in this document are believed to be accurate and reliable, but are presented without express or implied warranty. Users must take full responsibility for their applications of any products specified in this document. The information in this document is proprietary to Nortel Networks NA Inc.

## Trademarks

NORTEL NETWORKS is a trademark of Nortel Networks.

Bay Networks, Optivity, and PPX are registered trademarks and ATMSpeed, Centillion, EtherSpeedII, Expanded View, OmniView, Optivity Network Management System, SpeedView, System 5000, BayStack, Network Atlas, and Threshold Manager are trademarks of Nortel Networks.

Microsoft, Windows, and Windows NT are registered trademarks of Microsoft Corporation.

All other trademarks and registered trademarks are the property of their respective owners.

## Statement of Conditions

In the interest of improving internal design, operational function, and/or reliability, Nortel Networks NA Inc. reserves the right to make changes to the products described in this document without notice.

Nortel Networks NA Inc. does not assume any liability that may occur due to the use or application of the product(s) or circuit layout(s) described herein.

## USA Requirements Only

### Federal Communications Commission (FCC) Compliance Notice: Radio Frequency Notice

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to take whatever measures may be necessary to correct the interference at their own expense.

## European Requirements Only

### EN 55 022 Statement

This is to certify that the Nortel Networks Model 5625HD EtherSpeedII Switch Module is shielded against the generation of radio interference in accordance with the application of Council Directive 89/336/EEC, Article 4a. Conformity is declared by the application of EN 55 022 Class A (CISPR 22).

**Warning:** This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.

**Achtung:** Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

**Attention:** Ceci est un produit de Classe A. Dans un environnement domestique, ce produit risque de créer des interférences radioélectriques, il appartiendra alors à l'utilisateur de prendre les mesures spécifiques appropriées.

To maintain compliance with FCC radio frequency emission limits, shielded cables are required to connect equipment to other Class A certified devices and the use of quadshield, RG-6/U type CATV cable is required for connection to the CATV system. Any changes or modifications may void the user's authorization to operate this equipment.

---

## EC Declaration of Conformity

This product conforms to the provisions of Council Directive 89/336/EEC and 73/23/EEC. The Declaration of Conformity is available on the Nortel Networks World Wide Web site at <http://libra2.corpwest.baynetworks.com/cgi-bin/ndCGI.exe/DocView/>.

## Japan/Nippon Requirements Only

### Voluntary Control Council for Interference (VCCI) Statement

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

## Taiwan Requirements

### Bureau of Standards, Metrology and Inspection (BSMI) Statement

#### 警告使用者:

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

## Canada Requirements Only

### Canadian Department of Communications Radio Interference Regulations

This digital apparatus (Model 5625HD EtherSpeedII Switch Module) does not exceed the Class A limits for radio-noise emissions from digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications.

### Règlement sur le brouillage radioélectrique du ministère des Communications

Cet appareil numérique (Model 5625HD EtherSpeedII Switch Module) respecte les limites de bruits radioélectriques visant les appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique du ministère des Communications du Canada.

## Nortel Networks Software License Agreement

**NOTICE:** Please carefully read this license agreement before copying or using the accompanying software or installing the hardware unit with pre-enabled software (each of which is referred to as “Software” in this Agreement). BY COPYING OR USING THE SOFTWARE, YOU ACCEPT ALL OF THE TERMS AND CONDITIONS OF THIS LICENSE AGREEMENT. THE TERMS EXPRESSED IN THIS AGREEMENT ARE THE ONLY TERMS UNDER WHICH NORTEL NETWORKS WILL PERMIT YOU TO USE THE SOFTWARE. If you do not accept these terms and conditions, return the product, unused and in the original shipping container, within 30 days of purchase to obtain a credit for the full purchase price.

---

**1. License Grant.** Nortel Networks NA Inc. (“Nortel Networks”) grants the end user of the Software (“Licensee”) a personal, nonexclusive, nontransferable license: a) to use the Software either on a single computer or, if applicable, on a single authorized device identified by host ID, for which it was originally acquired; b) to copy the Software solely for backup purposes in support of authorized use of the Software; and c) to use and copy the associated user manual solely in support of authorized use of the Software by Licensee. This license applies to the Software only and does not extend to Nortel Networks Agent software or other Nortel Networks software products. Nortel Networks Agent software or other Nortel Networks software products are licensed for use under the terms of the applicable Nortel Networks Software License Agreement that accompanies such software and upon payment by the end user of the applicable license fees for such software.

**2. Restrictions on use; reservation of rights.** The Software and user manuals are protected under copyright laws. Nortel Networks and/or its licensors retain all title and ownership in both the Software and user manuals, including any revisions made by Nortel Networks or its licensors. The copyright notice must be reproduced and included with any copy of any portion of the Software or user manuals. Licensee may not modify, translate, decompile, disassemble, use for any competitive analysis, reverse engineer, distribute, or create derivative works from the Software or user manuals or any copy, in whole or in part. Except as expressly provided in this Agreement, Licensee may not copy or transfer the Software or user manuals, in whole or in part. The Software and user manuals embody Nortel Networks’ and its licensors’ confidential and proprietary intellectual property. Licensee shall not sublicense, assign, or otherwise disclose to any third party the Software, or any information about the operation, design, performance, or implementation of the Software and user manuals that is confidential to Nortel Networks and its licensors; however, Licensee may grant permission to its consultants, subcontractors, and agents to use the Software at Licensee’s facility, provided they have agreed to use the Software only in accordance with the terms of this license.

**3. Limited warranty.** Nortel Networks warrants each item of Software, as delivered by Nortel Networks and properly installed and operated on Nortel Networks hardware or other equipment it is originally licensed for, to function substantially as described in its accompanying user manual during its warranty period, which begins on the date Software is first shipped to Licensee. If any item of Software fails to so function during its warranty period, as the sole remedy Nortel Networks will at its discretion provide a suitable fix, patch, or workaround for the problem that may be included in a future Software release. Nortel Networks further warrants to Licensee that the media on which the Software is provided will be free from defects in materials and workmanship under normal use for a period of 90 days from the date Software is first shipped to Licensee. Nortel Networks will replace defective media at no charge if it is returned to Nortel Networks during the warranty period along with proof of the date of shipment. This warranty does not apply if the media has been damaged as a result of accident, misuse, or abuse. The Licensee assumes all responsibility for selection of the Software to achieve Licensee’s intended results and for the installation, use, and results obtained from the Software. Nortel Networks does not warrant a) that the functions contained in the software will meet the Licensee’s requirements, b) that the Software will operate in the hardware or software combinations that the Licensee may select, c) that the operation of the Software will be uninterrupted or error free, or d) that all defects in the operation of the Software will be corrected. Nortel Networks is not obligated to remedy any Software defect that cannot be reproduced with the latest Software release. These warranties do not apply to the Software if it has been (i) altered, except by Nortel Networks or in accordance with its instructions; (ii) used in conjunction with another vendor’s product, resulting in the defect; or (iii) damaged by improper environment, abuse, misuse, accident, or negligence. THE FOREGOING WARRANTIES AND LIMITATIONS ARE EXCLUSIVE REMEDIES AND ARE IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Licensee is responsible for the security of its own data and information and for maintaining adequate procedures apart from the Software to reconstruct lost or altered files, data, or programs.

**4. Limitation of liability.** IN NO EVENT WILL NORTEL NETWORKS OR ITS LICENSORS BE LIABLE FOR ANY COST OF SUBSTITUTE PROCUREMENT; SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES; OR ANY DAMAGES RESULTING FROM INACCURATE OR LOST DATA OR LOSS OF USE OR PROFITS ARISING OUT OF OR IN CONNECTION WITH THE PERFORMANCE OF THE SOFTWARE, EVEN IF NORTEL NETWORKS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL THE LIABILITY OF NORTEL NETWORKS RELATING TO THE SOFTWARE OR THIS AGREEMENT EXCEED THE PRICE PAID TO NORTEL NETWORKS FOR THE SOFTWARE LICENSE.

---

**5. Government Licensees.** This provision applies to all Software and documentation acquired directly or indirectly by or on behalf of the United States Government. The Software and documentation are commercial products, licensed on the open market at market prices, and were developed entirely at private expense and without the use of any U.S. Government funds. The license to the U.S. Government is granted only with restricted rights, and use, duplication, or disclosure by the U.S. Government is subject to the restrictions set forth in subparagraph (c)(1) of the Commercial Computer Software—Restricted Rights clause of FAR 52.227-19 and the limitations set out in this license for civilian agencies, and subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause of DFARS 252.227-7013, for agencies of the Department of Defense or their successors, whichever is applicable.

**6. Use of Software in the European Community.** This provision applies to all Software acquired for use within the European Community. If Licensee uses the Software within a country in the European Community, the Software Directive enacted by the Council of European Communities Directive dated 14 May, 1991, will apply to the examination of the Software to facilitate interoperability. Licensee agrees to notify Nortel Networks of any such intended examination of the Software and may procure support and assistance from Nortel Networks.

**7. Term and termination.** This license is effective until terminated; however, all of the restrictions with respect to Nortel Networks' copyright in the Software and user manuals will cease being effective at the date of expiration of the Nortel Networks copyright; those restrictions relating to use and disclosure of Nortel Networks' confidential information shall continue in effect. Licensee may terminate this license at any time. The license will automatically terminate if Licensee fails to comply with any of the terms and conditions of the license. Upon termination for any reason, Licensee will immediately destroy or return to Nortel Networks the Software, user manuals, and all copies. Nortel Networks is not liable to Licensee for damages in any form solely by reason of the termination of this license.

**8. Export and Re-export.** Licensee agrees not to export, directly or indirectly, the Software or related technical data or information without first obtaining any required export licenses or other governmental approvals. Without limiting the foregoing, Licensee, on behalf of itself and its subsidiaries and affiliates, agrees that it will not, without first obtaining all export licenses and approvals required by the U.S. Government: (i) export, re-export, transfer, or divert any such Software or technical data, or any direct product thereof, to any country to which such exports or re-exports are restricted or embargoed under United States export control laws and regulations, or to any national or resident of such restricted or embargoed countries; or (ii) provide the Software or related technical data or information to any military end user or for any military end use, including the design, development, or production of any chemical, nuclear, or biological weapons.

**9. General.** If any provision of this Agreement is held to be invalid or unenforceable by a court of competent jurisdiction, the remainder of the provisions of this Agreement shall remain in full force and effect. This Agreement will be governed by the laws of the state of California.

Should you have any questions concerning this Agreement, contact Nortel Networks, 4401 Great America Parkway, P.O. Box 58185, Santa Clara, California 95054-8185.

LICENSEE ACKNOWLEDGES THAT LICENSEE HAS READ THIS AGREEMENT, UNDERSTANDS IT, AND AGREES TO BE BOUND BY ITS TERMS AND CONDITIONS. LICENSEE FURTHER AGREES THAT THIS AGREEMENT IS THE ENTIRE AND EXCLUSIVE AGREEMENT BETWEEN NORTEL NETWORKS AND LICENSEE, WHICH SUPERSEDES ALL PRIOR ORAL AND WRITTEN AGREEMENTS AND COMMUNICATIONS BETWEEN THE PARTIES PERTAINING TO THE SUBJECT MATTER OF THIS AGREEMENT. NO DIFFERENT OR ADDITIONAL TERMS WILL BE ENFORCEABLE AGAINST NORTEL NETWORKS UNLESS NORTEL NETWORKS GIVES ITS EXPRESS WRITTEN CONSENT, INCLUDING AN EXPRESS WAIVER OF THE TERMS OF THIS AGREEMENT.

---

# Contents

## Preface

Before You Begin .....	xv
Related Publications .....	xvi
How to Get Help .....	xviii

## Chapter 1

### Overview of the Model 5625HD Switch Module

Overview of the EtherSpeedII Switch Module .....	1-1
Features of the Model 5625HD Switch Module .....	1-3
Physical Description .....	1-5
Switch Configuration and Management .....	1-6
SpeedView .....	1-6
Command Line Interface .....	1-7
SNMP MIB Support .....	1-7
TFTP Support .....	1-7
Spanning Tree Protocol 802.1d Support .....	1-7
Support for Virtual LANs .....	1-8
Filtering .....	1-8
Hot-Swapping Capability .....	1-8
About the Model 500xBH/BHC Backplane .....	1-9
LEDs .....	1-10
10/100 Mb/s UTP Autonegotiation Ports .....	1-10

## Chapter 2

### Planning a Network with the Model 5625HD Switch Module

Physical Configuration Guidelines .....	2-1
Connecting to Ethernet Hubs and Network Devices .....	2-2

Network Configuration Examples .....	2-3
Giving a Server a Dedicated Port .....	2-5
Replacing a Bridge .....	2-6
Desktop Switch with ATM Uplinks .....	2-7
Segment Switch in an Enterprise Network .....	2-9
Desktop Switch and Frame-to-Cell Converter .....	2-10
Multi-Link Trunking .....	2-11
Default Port Configuration .....	2-12
Predefined SpeedView Configurations .....	2-12

### **Chapter 3**

#### **Installing the Model 5625HD Switch Module**

Arranging Modules in a Model 500xBH/BHC Chassis .....	3-2
Required Tools and Equipment .....	3-5
Installing the Switch Module .....	3-6
Checking LEDs .....	3-8
Making 10/100 Mb/s Connections .....	3-8
Connecting Terminals and Management Stations .....	3-9
Checking the Module Connection to the Backplane .....	3-11
Removing and Replacing the Switch Module .....	3-11
Conditions for Replacing a Switch Module .....	3-11
Removing a Switch Module .....	3-12
Installing the Replacement Switch Module .....	3-13
Reconfiguring the Replacement Switch Module .....	3-13

### **Chapter 4**

#### **Troubleshooting**

Preliminary Steps .....	4-2
Previous Module Configuration Incompatibility .....	4-2
Model 5625HD Switch Module Startup Failure .....	4-3
Port Connection Problems .....	4-4

### **Appendix A**

#### **Technical Specifications**



**Appendix B**  
**Cables and Connectors**

UTP Cable Length Limitations ..... B-1  
UTP Cabling ..... B-2  
10BASE-T/100BASE-TX MDI Ports and MDI-X Ports ..... B-2  
UTP Cables and Connectors ..... B-4  
Using Category 5 Unshielded Twisted Pair Cables ..... B-5  
Using Shielded Twisted Pair Cables ..... B-6

**Appendix C**  
**LEDs**

**Index**



# Figures

Figure 1-1.	EtherSpeedII Switch Modules in a Network Center .....	1-2
Figure 1-2.	Model 5625HD EtherSpeedII 24-Port Autonegotiating Switch Module ...	1-5
Figure 1-3.	Model 5000BH/BHC ATM/Router Backplane Bus Structure .....	1-9
Figure 1-4.	Model 5005BH ATM/Router Backplane Bus Structure .....	1-9
Figure 1-5.	LEDs on the Model 5625HD Switch Module .....	1-10
Figure 2-1.	Network Example .....	2-4
Figure 2-2.	Connecting Servers to Dedicated Ports .....	2-5
Figure 2-3.	Replacing a Bridge .....	2-6
Figure 2-4.	Desktop Switch with ATM Uplinks .....	2-8
Figure 2-5.	Segment Switch in an Enterprise Network .....	2-9
Figure 2-6.	Desktop Switch and Frame-to-Cell Converter .....	2-10
Figure 2-7.	Multi-Link Trunking Example .....	2-11
Figure 3-1.	Model 5000BH/BHC Chassis Backplanes .....	3-3
Figure 3-2.	Model 5005BH Chassis Backplanes .....	3-4
Figure 3-3.	Insertor/Extractor Levers in Vertical Position .....	3-6
Figure 3-4.	Installing the Module .....	3-7
Figure 3-5.	Seating the Backplane Connectors .....	3-7
Figure 3-6.	Releasing the Backplane Connectors .....	3-12
Figure B-1.	MDI-X Internal Crossover (RJ-45 Example) .....	B-2
Figure B-2.	MDI-X to MDI-X External Crossover (RJ-45 Example) .....	B-3
Figure B-3.	10BASE-T/100BASE-TX Ethernet UTP Crossover Cable .....	B-4
Figure B-4.	Fast Ethernet Type 1 Balun Media Adapter .....	B-6
Figure C-1.	LED Display for the Model 5625HD Switch Module .....	C-1
Figure C-2.	RJ-45 LEDs for the Model 5625HD Switch Module .....	C-3



# Tables

Table 2-1.	Factory Defaults for the Model 5625HD Switch Module .....	2-12
Table 3-1.	Service Port Pin Assignments .....	3-10
Table B-1.	10BASE-T/100BASE-TX MDI-X Port Pin Assignments .....	B-4
Table B-2.	Pairs in an RJ-45 Crossover Cable .....	B-5
Table C-1.	LEDs on the Model 5625HD Switch Module .....	C-2



This guide provides an overview of the Nortel Networks™ Model 5625HD EtherSpeedII 24-Port Autonegotiating Switch Module and information about installing the module. This switch module introduces high-density Ethernet 10/100 autonegotiation frame switching into the Model 500xBH/BHC ATM/Router Backplane.

The Model 5625HD switch module incorporates current System 5000™ and Centillion™ EtherSpeedII™ technologies and the features described in [“Features of the Model 5625HD Switch Module” on page 1-3](#).

Configuring the EtherSpeed switch modules is described in *Using SpeedView 4.0 for Windows* and *Release Notes for SpeedView 4.1*. For more information about this topic, see [“Related Publications” on page xvi](#).

## Before You Begin

This guide is intended for local area network administrators who are responsible for installing, configuring, or maintaining a network and have the following background:

- Familiarity with Ethernet network administration
- Familiarity with the tools and procedures for installing and operating sensitive electronic equipment
- Understanding of Nortel Networks network management concepts and terminology

## Related Publications

For information about the Centillion switches, refer to the following related publications:

- *Using SpeedView 4.0 for Windows* (Bay Networks® part number 893-891-D)  
Describes this application, which is used for configuring the module.
- *Release Notes for Centillion Platform 4.1*  
(Bay Networks part number 203315-B)  
Describes the updates to the SpeedView application for the 4.1 software release.
- *Reference Guide for the Centillion 50/100 and Model 5000BH Switches*  
(Bay Networks part number 893-01006-C)  
Provides reference information about switching terminology and concepts; describes configuration examples using Centillion 50/100 and Model 500xBH/BHC switches.
- *Reference Guide for the Centillion Command Line Interface 4.0*  
(Bay Networks part number 893-00985-C)  
Describes setup and configuration procedures for Centillion switches using the command line interface.
- *Installing the Model 5000BH ATM/Router Backplane*  
(Bay Networks part number 893-00949-A)  
Provides installation instructions for the Model 5000BH ATM/Router Backplane in the Model 5000 chassis.
- *Installing the Model 5005BH ATM/Router Backplane*  
(Bay Networks part number 893-01056-A)  
Provides installation instructions for the Model 5005BH ATM/Router Backplane in the Model 5005 chassis.
- *Installation and Reference for the Model 5000 Chassis*  
(Bay Networks part number 893-598-C)  
Provides installation instructions and maintenance information for the Model 5000 Chassis.



- *Installation and Reference for the Model 5005 Chassis*  
(Bay Networks part number 893-696-A)

Provides installation instructions and maintenance information for the Model 5005 Chassis.

- *Release Notes for the Centillion Platform Release 3.2*  
(Bay Networks part number 896-00189-C)

You can print selected technical manuals and release notes free, directly from the Internet. Go to [support.baynetworks.com/library/tpubs/](http://support.baynetworks.com/library/tpubs/). Find the product for which you need documentation. Then locate the specific category and model or version for your hardware or software product. Using Adobe Acrobat Reader, you can open the manuals and release notes, search for the sections you need, and print them on most standard printers. You can download Acrobat Reader free from the Adobe Systems Web site, [www.adobe.com](http://www.adobe.com).

You can purchase selected documentation sets, CDs, and technical publications through the collateral catalog. The catalog is located on the World Wide Web at [support.baynetworks.com/catalog.html](http://support.baynetworks.com/catalog.html) and is divided into sections arranged alphabetically:

- The “CD ROMs” section lists available CDs.
- The “Guides/Books” section lists books on technical topics.
- The “Technical Manuals” section lists available printed documentation sets.

## How to Get Help

If you purchased a service contract for your Nortel Networks product from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance.

If you purchased a Nortel Networks service program, contact one of the following Nortel Networks Technical Solutions Centers:

<b>Technical Solutions Center</b>	<b>Telephone Number</b>
Billerica, MA	800-2LANWAN (800-252-6926)
Santa Clara, CA	800-2LANWAN (800-252-6926)
Valbonne, France	33-4-92-96-69-68
Sydney, Australia	61-2-9927-8800
Tokyo, Japan	81-3-5402-7041

---

# Chapter 1

## Overview of the Model 5625HD Switch Module

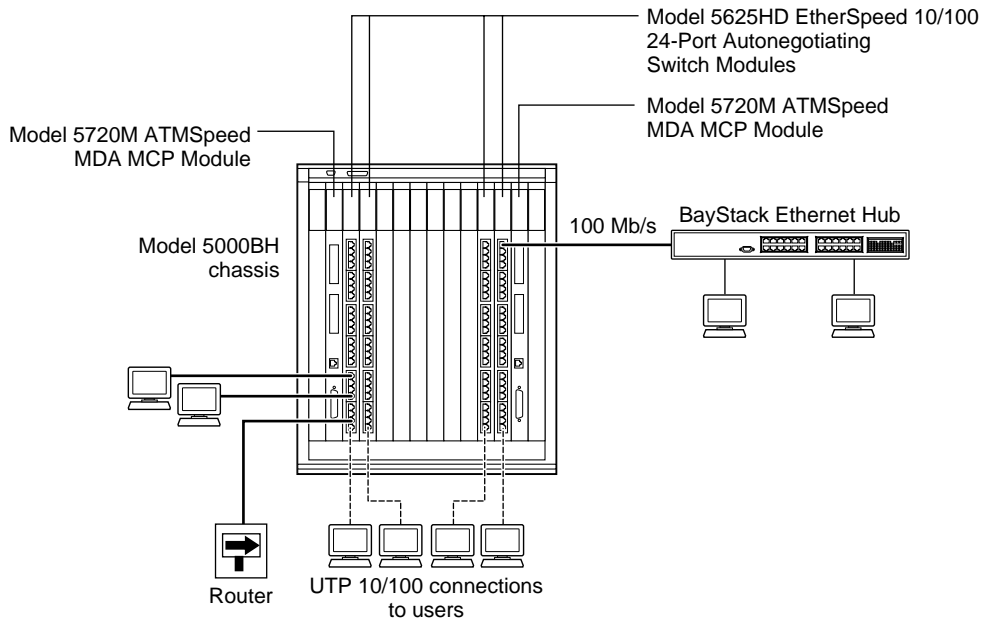
This chapter introduces the Model 5625HD EtherSpeedII 24-Port Autonegotiating Switch Module and includes information about the following topics:

- Overview of the EtherSpeedII switch module (this page)
- Features of the switch module ([page 1-3](#))
- Physical description of the switch module ([page 1-5](#))
- Switch configuration and management ([page 1-6](#))
- Model 500xBH/BHC backplane architecture ([page 1-9](#))

### Overview of the EtherSpeedII Switch Module

EtherSpeedII switch modules provide 10/100 megabits per second (Mb/s) autonegotiation ports that support servers, routers, or dedicated connections to users ([Figure 1-1](#)). The switch modules can also support multiple users through a shared-media hub connection to a port.

Each EtherSpeedII switch module is installed in a single slot of a Model 500xBH/BHC chassis. You can use SpeedView™ network management software to configure and manage the modules.



9342EA

**Figure 1-1. EtherSpeedII Switch Modules in a Network Center**

The Model 5625HD switch module provides 24 RJ-45 10/100 Mb/s autonegotiating switched Ethernet connections for the Model 500xBH/BHC ATM/Router Backplane for the System 500x chassis. The switch module combines the powerful ATM capabilities of the Centillion platform with the connectivity features of the Model 500xBH chassis.

For Ethernet connectivity, the Model 5625HD switch module RJ-45 connectors accept Category 3 and 5 unshielded twisted pair (UTP) or shielded twisted pair (STP) cable connections. For more information about cabling, refer to [Appendix B, "Cables and Connectors."](#)



**Note:** Category 3 UTP cable can be used only for fixed 10 Mb/s port operation. It is not used for 100 Mb/s or 10/100 autonegotiating port operation.

---

---

## Features of the Model 5625HD Switch Module

The Model 5625HD switch module offers the following features:

- Wire-speed, port-to-port, packet transfer
- Single-slot design to fit into the System 500xBH/BHC chassis
- Autonegotiation of Ethernet 10/100 Mb/s speed
- Autonegotiation of half- or full-duplex mode on dedicated switch ports
- Layer 2 MAC-based switching
- Local frame switching, module-to-module switching, backplane switching, and riser switching
- 200 MHz RISC processor
- 24 RJ-45 UTP network interface connectors
- Front-panel LEDs to indicate module and port operational status
- Port-based virtual LANs (VLANs)
- Protocol-based VLANs

Protocol-sensitive VLANs classifies packets based on protocol types. Most customers have multiple protocols per LAN segment, so a switch port needs to support multiple VLANs based on different protocol types. This feature allows you to separate data based on protocols and not on physical limitations.

- IEEE 802.1Q Tag Recognition Support

The Model 5625HD switch module supports recognition of VLAN tagged frames based on IEEE 802.1Q tags. Frames entering a Model 5625HD switch module port that contain an 802.1Q tag are mapped to a corresponding VLAN. Based on the final destination, the frame is sent as either an Ethernet-type frame or an 802.1Q VLAN tagged frame. VLAN membership is to be assigned by any combination of port with either tag or protocol.

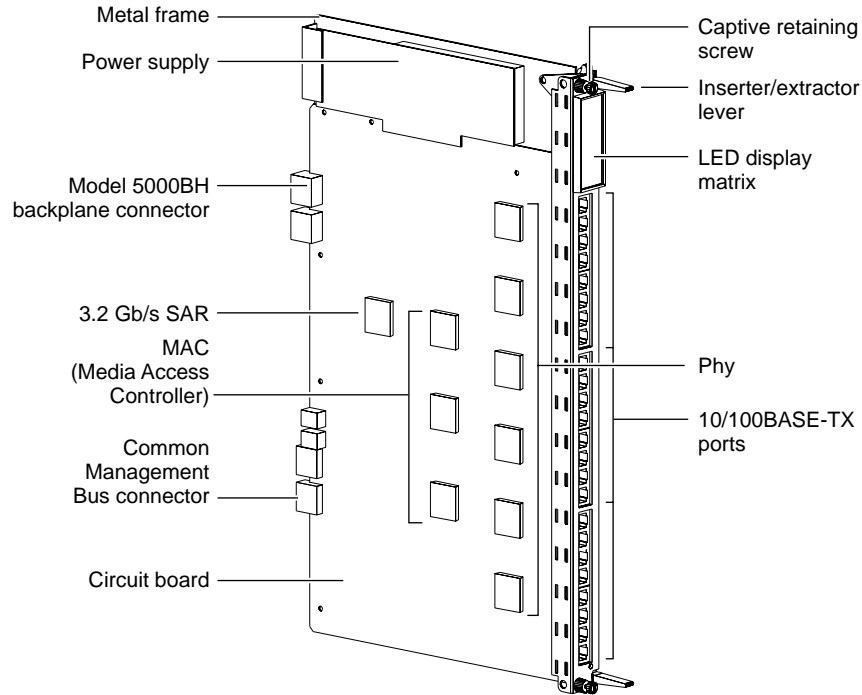
- Support for IEEE 802.1d Spanning Tree
- Content-addressable memory (CAM) support for 8192 entries
- Port steering/port mirroring
- Input and output filtering supported by switching software
- Hardware support for IP multicast

- Support for RMON Management Information Base (MIB)
  - Ethernet Statistics Group
  - Ethernet History Group
  - Ethernet Alarm Group
  - Ethernet Event Group
- Ability to install, remove, and replace a module in an operational chassis (hot-swap)
- Hardware Assist Multi-Protocol over ATM (MPOA)

MPOA is the ATM Forum standard that specifies a method to efficiently transport intersubnet unicast data in a LANE environment. MPOA uses LANE and NHRP processes to allow direct shortcut virtual channel connections (VCCs) to be established for intersubnet communication without requiring passage through a router. The intrasubnet communication continues to be supported over LANE. For IP, Nortel Networks has adopted MPOA as the standard to implement layer 3 switching in an ATM network.
- Improved performance in segmentation and reassembly (SAR) to 3.2 gigabit
- Multi-Link Trunking (MLT)

## Physical Description

The Model 5625HD switch module (Figure 1-2) consists of a printed circuit board with a metal module faceplate. The module includes captive retaining screws and inserter/extractor levers on the top and bottom of the front panel.



9362FA

**Figure 1-2. Model 5625HD EtherSpeedII 24-Port Autonegotiating Switch Module**

There are 24 RJ-45 ports on the Model 5625HD switch module that automatically detect speed and duplex mode. (For more information about cables, refer to [Appendix B, “Cables and Connectors.”](#))

Each Model 5625HD switch module occupies one slot in a Model 500x BH/BHC chassis. You can install a maximum of 10 Model 5625HD switch modules, along with two master control processor (MCP) switch modules, in a Model 5000BH/BHC chassis or a maximum of five Model 5625HD switch modules, and one MCP switch module, in a Model 5005BH chassis.

## Switch Configuration and Management

You manage and configure a Model 5625HD switch module through access to an installed MCP module in the Model 500xBH/BHC chassis with the following network management features:

- SpeedView for Windows 4.1 and greater
- Command line interface (CLI)
- Simple Network Management Protocol (SNMP) agent with System 5000 MIB extensions
- Trivial File Transfer Protocol (TFTP) support

### SpeedView

SpeedView is a network management application that runs on Microsoft® Windows® 95 or Windows 98 and Windows NT® and provides a graphical user interface to set up your switch. SpeedView allows you to monitor and control network traffic and to perform advanced operations such as filter configuration. For more information about SpeedView, refer to *Using SpeedView 4.0 for Windows* and *Release Notes for SpeedView 4.1*.

Optivity Network Management System™ (NMS) provides enterprise-wide configuration and monitoring support for the Model 500xBH/BHC chassis switches. Configuration support is provided using SpeedView, which is integrated with Optivity NMS. Expanded View™, OmniView™, Network Atlas™, Threshold Manager™, and other Optivity® applications provide comprehensive monitoring and troubleshooting support. For more information about Optivity network management software, refer to your Optivity documentation.



## Command Line Interface

The CLI provides an out-of-band interface for the initial setup of basic configuration parameters such as IP address and bridging mode. For more information about the CLI structure and commands, refer to *Reference Guide for the Centillion Command Line Interface*.

## SNMP MIB Support

The System 5000BH/BHC MCP modules support an SNMP-compatible agent with private MIB extensions. Built-in SNMP agent support ensures compatibility with existing network management tools. The MCP modules support MIB-I and MIB-II (RFC 1213) standards that provide access to detailed management statistics.

Using SpeedView, you can configure SNMP traps to be generated automatically for conditions such as unauthorized access attempts or changes in operating status on individual ports.

## TFTP Support

TFTP is a supported Transmission Control Protocol/Internet Protocol (TCP/IP) service used to download software and configuration information to the MCP module memory. TFTP allows you to transfer an updated switch agent and configuration files from a remote server to flash memory. You can perform a transfer over the network or through a serial connection to the installed MCP module.

## Spanning Tree Protocol 802.1d Support

The Model 5625HD switch module software supports the Spanning Tree Protocol as specified in the IEEE 802.1d standard. The Spanning Tree Protocol is implemented to detect and eliminate logical loops in a bridged or switched network. When multiple paths exist, the spanning tree algorithm configures the network so that a bridge or switch uses only the most efficient path. If that path fails, the protocol automatically reconfigures the network to make another path become active, thus sustaining network operations.

## Support for Virtual LANs

Using the Model 5625HD switch module, you can group one or more physical ports to form a virtual LAN that constitutes a single broadcast domain.

Virtual LANs (VLANs) are formed when broadcast domains are configured across multiple switches. Each Ethernet segment is an independent physical segment with its own collision domain, but all segments within a VLAN appear to the user as a broadcast domain.

## Filtering

Filtering capabilities for the Model 5625HD switch module are implemented in system hardware and controlled by system software. Refer to the appropriate Centillion release guides for descriptions of the supported filtering capabilities, features, and availability.

## Hot-Swapping Capability

A Model 5625HD switch module can be inserted into or removed from a chassis without interrupting service to other modules within the Model 500xBH/BHC chassis. This feature is called “hot-swapping.”



**Caution:** Be sure to remove cables from all ports on the module, or disable all the ports through the management interface, prior to hot-swapping.

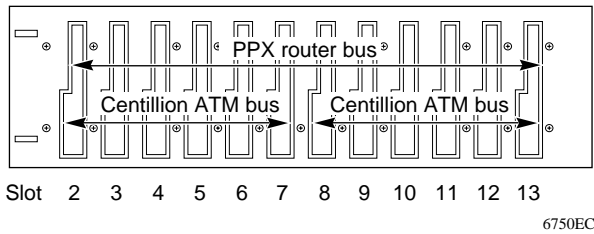
---

## About the Model 500xBH/BHC Backplane

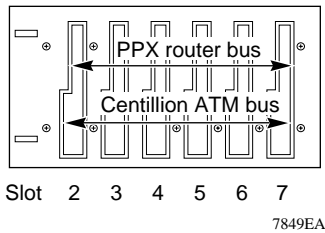
The Model 500xBH/BHC ATM/Router Backplane integrates the two bus technologies shown in [Figure 1-3](#) and [Figure 1-4](#).



**Note:** The Model 5000BH and 5000BHC backplanes are identical with the exception of an additional shared 100 Mb/s backplane on the Model 5000BHC. The Model 5625HD switch module does not connect to these shared backplanes. The Model 5625HD switch module can be used with the Model 5000BH and 5000BHC backplanes without altering the module's performance.



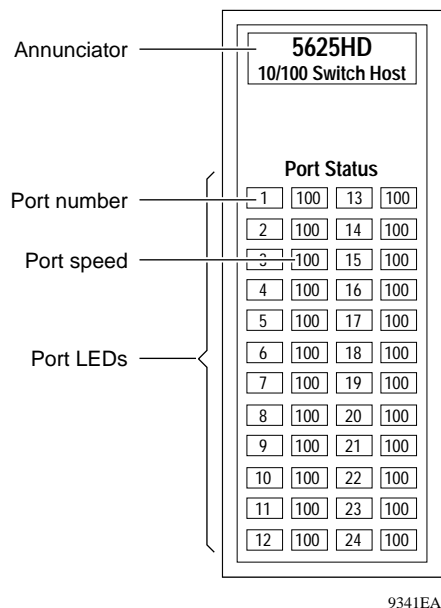
**Figure 1-3. Model 5000BH/BHC ATM/Router Backplane Bus Structure**



**Figure 1-4. Model 5005BH ATM/Router Backplane Bus Structure**

## LEDs

LEDs on the module indicate port operating status and speed ([Figure 1-5](#)). The numbers on the LEDs correspond to the port numbers. For more information about the operation of the LEDs, refer to [Appendix C, “LEDs.”](#)



**Figure 1-5. LEDs on the Model 5625HD Switch Module**

## 10/100 Mb/s UTP Autonegotiation Ports

A Model 5625HD switch module contains 24 10/100 Mb/s autonegotiating Ethernet ports with shielded RJ-45 connectors. The RJ-45 connectors accept Category 3 and 5 UTP or STP cable and are wired as MDI-X ports to connect end stations to patch panels, without using crossover cables. See [Appendix B, “Cables and Connectors,”](#) for information about wiring and pin assignments.

---

# Chapter 2

## Planning a Network with the Model 5625HD Switch Module

Installing the Model 5625HD EtherSpeedII 24-Port Autonegotiating Switch Module in a network can significantly improve LAN performance. This chapter provides information to help you plan a network that uses this module. The chapter includes the following topics:

- Physical configuration guidelines (this page)
- Typical network configuration examples ([page 2-3](#))
- Factory-set and predefined configurations ([page 2-12](#))

### Physical Configuration Guidelines

Follow the basic guidelines in [Appendix A, “Technical Specifications,”](#) and [Appendix B, “Cables and Connectors,”](#) when you plan a network using the Model 5625HD switch module.

## Connecting to Ethernet Hubs and Network Devices

You connect the ports of the Model 5625HD switch module to the front panel, wired as MDI-X connections. This wiring allows you to use a straight-through cable between the Model 5625HD switch module and the patch panel.

To connect the ports on the patch panel to another Ethernet switch or an Ethernet hub, follow these guidelines:

- Personal computers (PCs) and servers typically have network interface controllers (NICs) that are configured as MDI connections. To connect these devices, use a straight-through cable.
- Hubs and other switches typically have connectors that are configured as MDI-X. Some hubs and switches have ports that are set by a toggle switch for either MDI or MDI-X operation.
  - To connect a port set for MDI-X to the Model 5625HD switch module port, use a crossover cable.
  - To connect a port set for MDI to the Model 5625HD switch module port, use a straight-through cable.

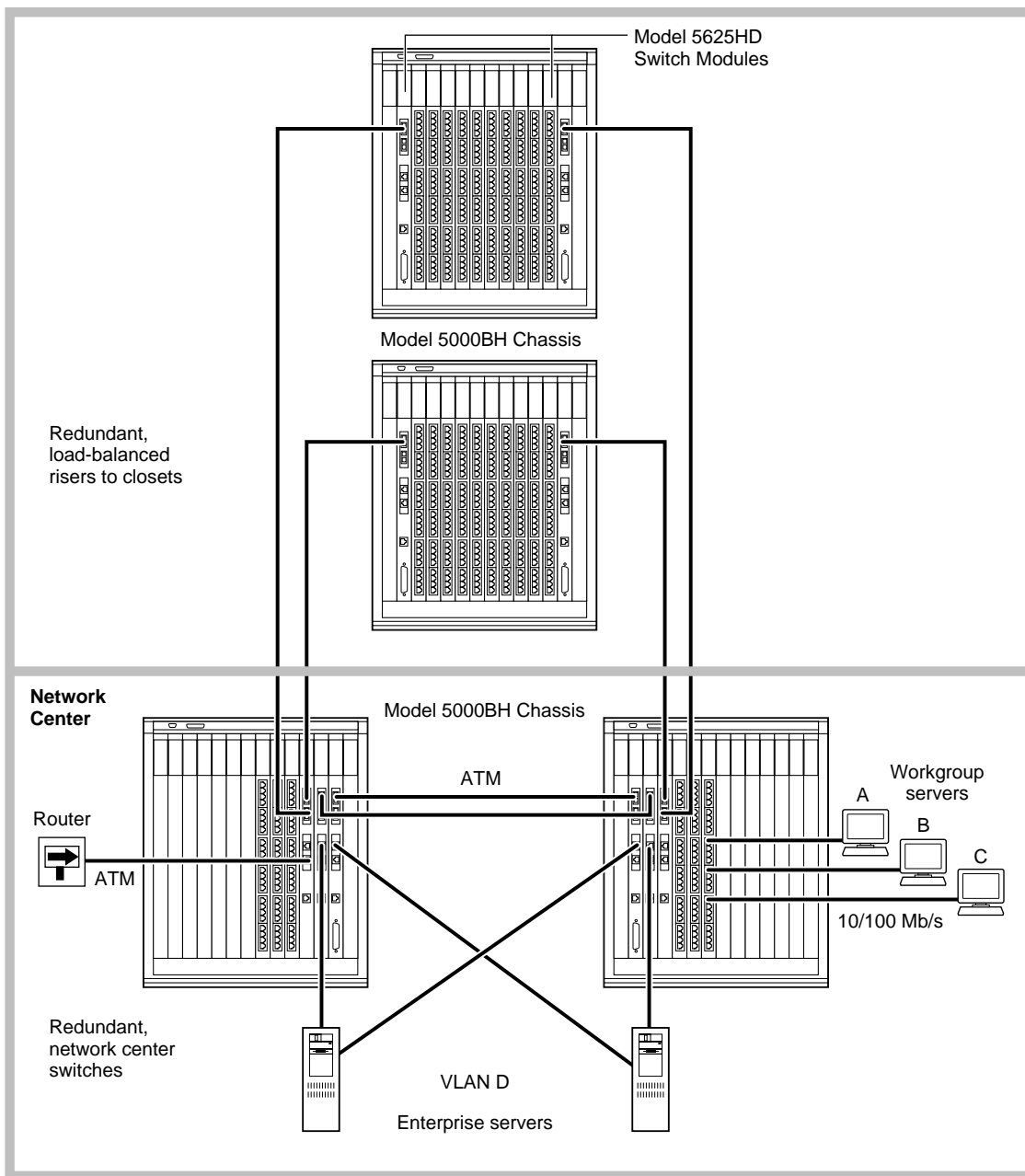
For connector specifications for MDI-X ports, refer to [Appendix B, “Cables and Connectors.”](#)

## Network Configuration Examples

The Model 5625HD switch module is an adaptable switch suitable for use in wiring closets or network centers in conjunction with the Model 500xBH/BHC chassis. [Figure 2-1](#) shows an example of Model 5625HD switch modules in a sample network configuration.

This section describes the following Ethernet switching applications:

- Dedicated ports for servers ([page 2-5](#))
- Replacement for a bridge port ([page 2-6](#))
- Desktop switch with ATM uplinks in a wiring closet ([page 2-7](#))
- Segment switch in a wiring closet with ATM uplinks to a network center switch ([page 2-9](#))
- Desktop switch and frame-to-cell converter ([page 2-10](#))



9380EA

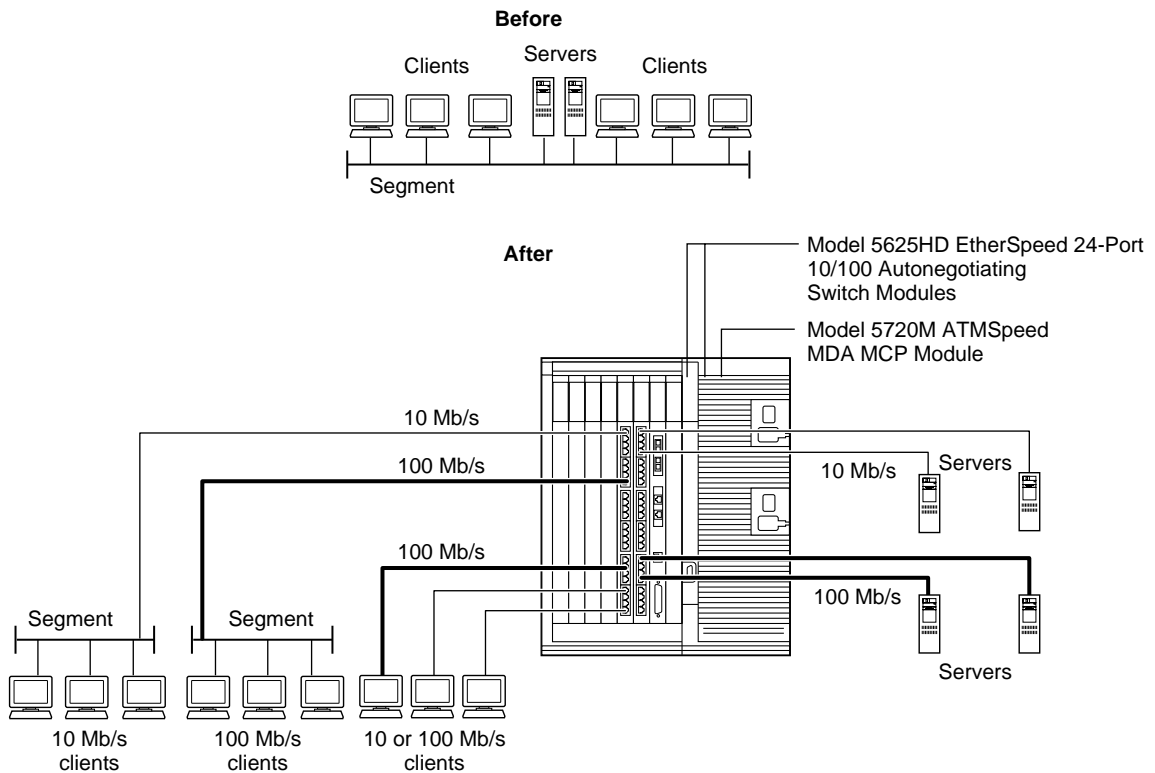
Figure 2-1. Network Example



## Giving a Server a Dedicated Port

Moving a server from a 10 Mb/s shared-media connection to a dedicated port on the Model 5625HD switch module improves server response time and increases throughput capacity. For even higher performance, the server could be upgraded to 100 Mb/s and the Model 5625HD switch module would autonegotiate for 100 Mb/s.

In [Figure 2-2](#), the “Before” example shows clients and servers sharing the same network segment. The “After” example shows the same clients assigned to different segments through a shared hub (either 10/100 Mb/s or directly connected) and the original servers connected to switch ports on a Model 500xBH/BHC chassis. In addition, two servers have been added through 10/100 Mb/s connections.

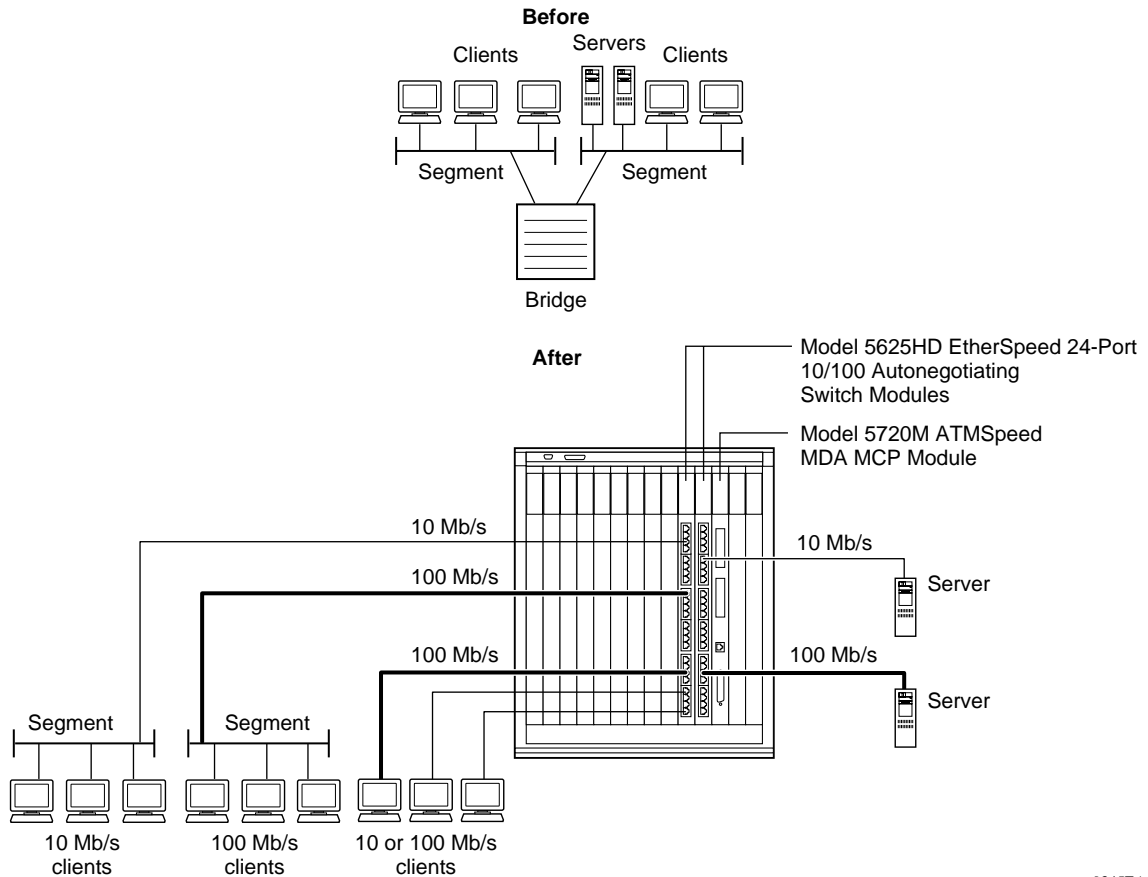


9344EA

**Figure 2-2. Connecting Servers to Dedicated Ports**

## Replacing a Bridge

Using a switch instead of a bridge in the network can increase the aggregate network bandwidth. The “After” example in [Figure 2-3](#) shows one server connected to a dedicated 10BASE-T port. It also shows the other server and additional clients attached using dedicated 100BASE-TX connections. This network configuration allows you to have switched 10 Mb/s Ethernet along with segmented 10 Mb/s Ethernet to conserve ports.



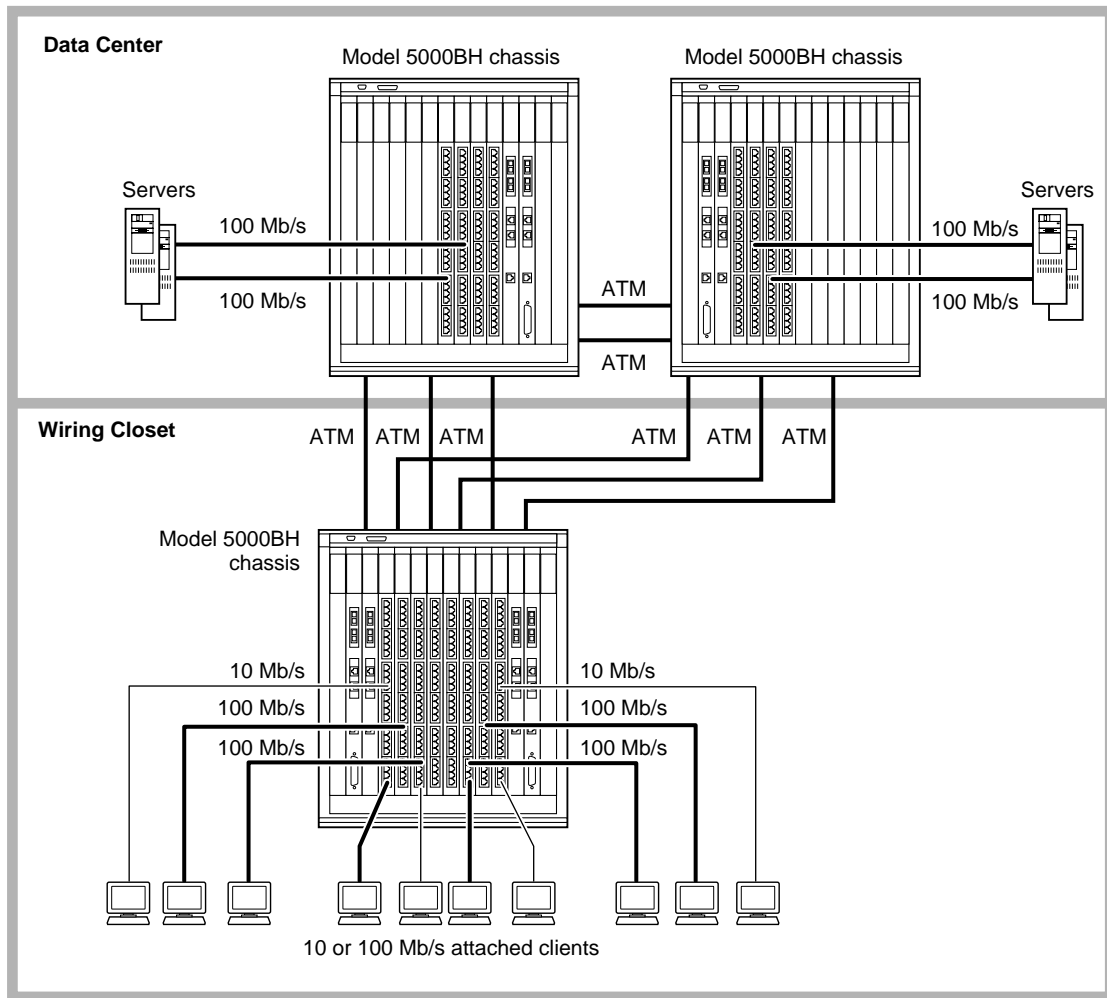
9345EA

**Figure 2-3. Replacing a Bridge**

## Desktop Switch with ATM Uplinks

In the example shown in [Figure 2-4](#), the Model 5625HD switch module provides up to 24 RJ-45 switched Ethernet (10/100 Mb/s) ports to connect to desktops, with redundant high-speed ATM OC-3c and OC-12c ports to connect to an ATM backbone. This network configuration can support small to large wiring closets.

[Figure 2-4 on page 2-8](#) shows a sample network providing ATM uplinks to a Model 5000BH/BHC chassis. Servers are connected to the network through the Model 5000BH/BHC chassis, and network stations are connected to the 10/100BASE-T ports on the Model 5625HD switch modules. The chassis are dual-homed with ATM OC-3c and OC-12c uplinks to the Model 5000BH/BHC chassis. Model 5000BH/BHC chassis can be interconnected with multiple ATM links.

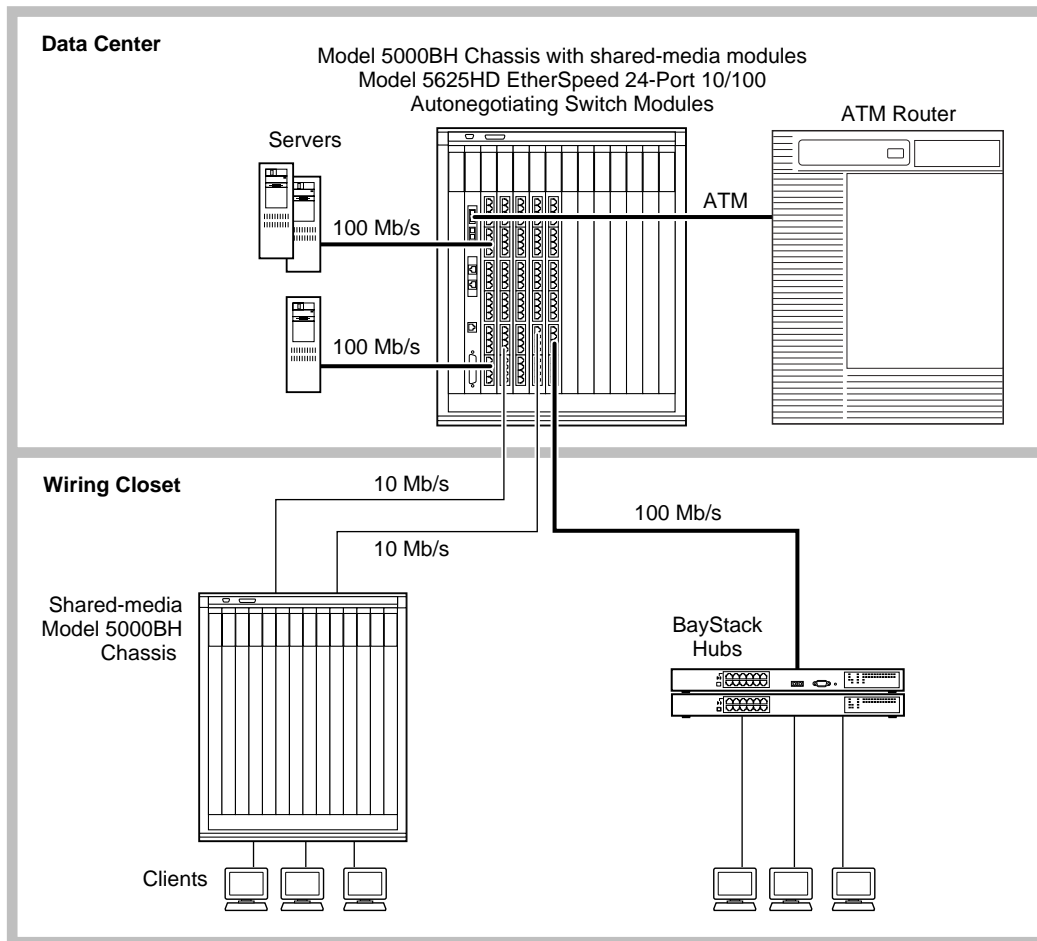


9346EA

Figure 2-4. Desktop Switch with ATM Uplinks

## Segment Switch in an Enterprise Network

To achieve a gradual transition from shared media to switched networks, you can use the Model 5625HD switch module to aggregate traffic from stations connected to one or more hubs. [Figure 2-5](#) shows such a network with switches used to connect shared-media hubs to a backbone switch. Stations connected to the Model 5000BH/BHC switch are associated with different segments through the configuration switching feature.



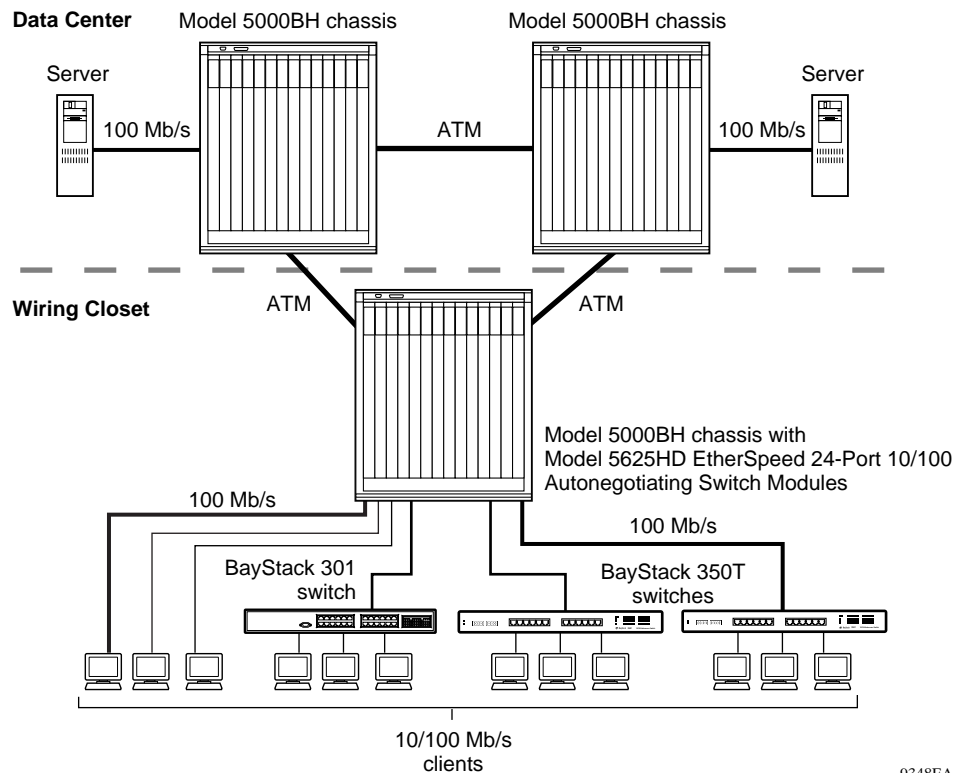
9347EA

**Figure 2-5. Segment Switch in an Enterprise Network**

## Desktop Switch and Frame-to-Cell Converter

For wiring closets with higher densities and lower bandwidth requirements, you can use the Model 5625HD switch module to aggregate traffic from other stackable switch products such as the BayStack 301 and BayStack 350T switches (providing frame switching) to an ATM backbone (providing cell switching). The stackable switches and the 24 RJ-45 10/100 Mb/s switched Ethernet ports on the Model 5625HD switch module provide desktop connectivity.

[Figure 2-7](#) shows a network with a Model 5625HD switch module used to connect BayStack 301 and 350T switches to the Model 5000BH/BHC chassis in a data center. The 10/100 Mb/s ports on the Model 5625HD switch module provide high-speed connections to the BayStack™ switches. The Model 5625HD switch module provides switched 10 Mb/s or 100 Mb/s capability for higher-bandwidth desktop connectivity and can upgrade to 100 Mb/s with a client NIC upgrade.

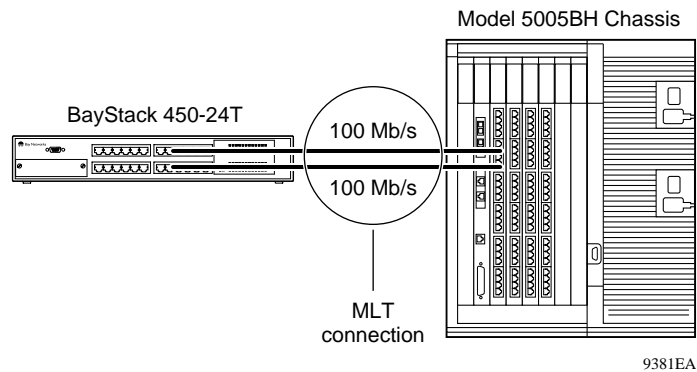


**Figure 2-6. Desktop Switch and Frame-to-Cell Converter**

## Multi-Link Trunking

Multi-Link Trunking (MLT) allows up to four physical connections for the same media type and speed to be grouped and treated as a single logical link. MLT improves performance between two switches or between a switch and a server.

MLT allows data to be carried over multiple 100 Mb/s full-duplex links connected to the same device, thus improving performance. [Figure 2-7](#) shows that connecting multiple BayStack 450 ports into a Model 5625HD switch module allows the data to load share across those multiple ports, and overall performance is improved.



**Figure 2-7. Multi-Link Trunking Example**

## Default Port Configuration

The Model 5625HD switch module is shipped preconfigured with the settings listed in [Table 2-1](#).

**Table 2-1. Factory Defaults for the Model 5625HD Switch Module**

Parameter	Factory Default	Configurable Options
Switching mode	Transparent	Transparent
Spanning Tree Protocol	None	None, IEEE
State	Enable	Enable/Disable
Filters	Disable (none)	Enable/Disable
Port speed/display	Auto	Auto 10/100
Spanning tree group	2	2–32
Priority	128	0–255
Path cost	10	1–65535

## Predefined SpeedView Configurations

SpeedView offers several predefined configurations. You may simply choose one of these without having to configure individual ports. Predefined configurations are available for the following applications:

- All transparent switching with no Spanning Tree support
- All transparent switching with IEEE 802.1d Spanning Tree support

You must enter additional configuration information if you are using any of the following features:

- ATM
- VLANs
- Filtering
- Combinations of bridging modes and Spanning Tree Protocol not offered as defaults

Instructions for using these features appear in *Using SpeedView 4.0 for Windows* and *Release Notes for SpeedView 4.1*.



---

# Chapter 3

## Installing the Model 5625HD Switch Module

This chapter describes how to install a Model 5625HD EtherSpeedII 24-Port Autonegotiating Switch Module in the Model 500xBH/BHC chassis and includes the following information and procedures:

- Arranging Model 5625HD switch modules in a Model 500xBH/BHC chassis (this page)
- Using required tools for installation ([page 3-5](#))
- Installing a switch module ([page 3-6](#))
- Checking module LEDs ([page 3-8](#))
- Making 10/100 Mb/s connections ([page 3-8](#))
- Connecting terminals and management stations ([page 3-9](#))
- Checking the module connection to the backplane ([page 3-11](#))
- Removing and replacing a switch module ([page 3-11](#))

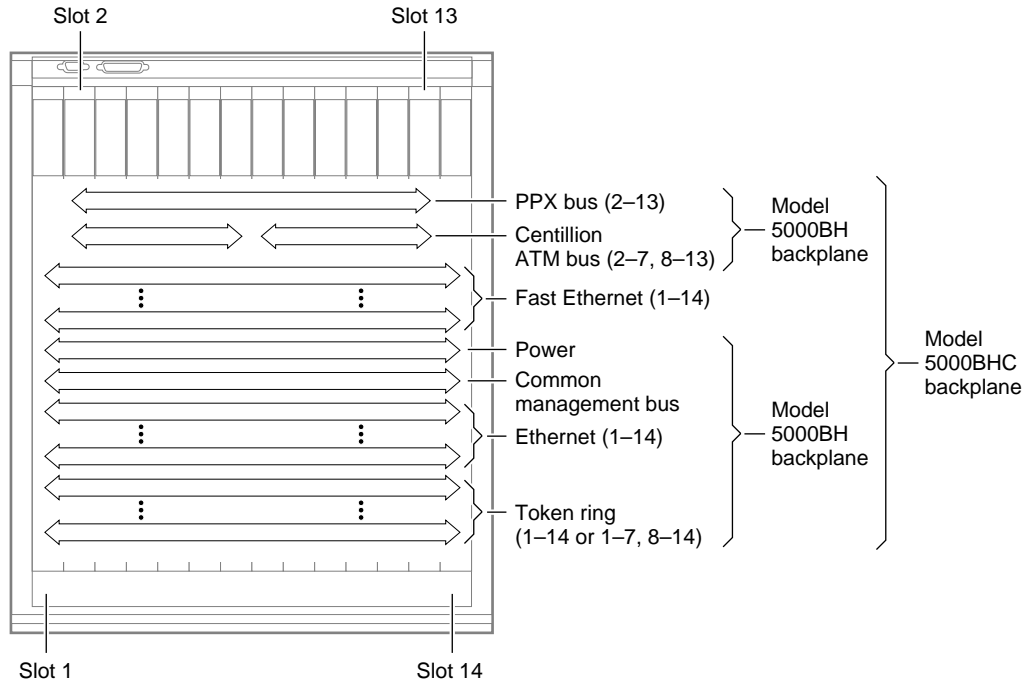
## Arranging Modules in a Model 500xBH/BHC Chassis

The Model 5000BH ATM/Router Backplane has two Centillion ATM buses and a PPX bus to accommodate switch and router modules. The Centillion ATM buses span two slot ranges in a Model 5000BH/BHC chassis: slots 2 through 7 and 8 through 13. When you install a Model 5625HD switch module in one of these slot ranges, you must also install an MCP switch module (such as the Model 5720M ATMSpeed™ MCP module) in the same range of slots. You can attach up to six System 5000 switch modules (one of which must be an MCP module) to each Centillion ATM bus in a Model 5000BH/BHC chassis.

The PPX bus spans slots 2 through 13. A router module may be installed in any of these slots. Router modules for the Model 5000BH ATM/Router Backplane include the Model 5380 Ethernet Router Module, the Module 5580 Token Ring Router Module, and the Model 5782 Centillion Multiprotocol Engine Module.

Any slot designated for switch modules can also be used for a standard Ethernet, token ring, or FDDI, or ATM module with the appropriate backplane(s) installed in the chassis.

[Figure 3-1](#) shows the logical relationship between the Model 5000BH ATM/Router Backplane and shared-media backplanes in a Model 5000BH/BHC chassis.



8662EA

**Figure 3-1. Model 5000BH/BHC Chassis Backplanes**



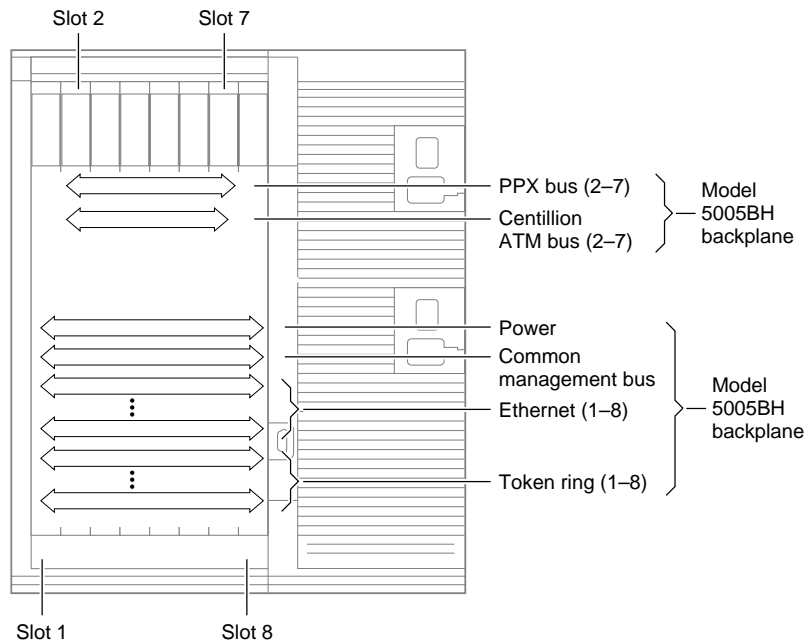
**Note:** The Model 5000BH and Model 5000BHC backplanes are identical with the exception of an additional shared 100 Mb/s backplane on the Model 5000BHC. The Model 5625HD switch module does not connect to this shared backplane. The Model 5625HD switch module can be used with the Model 5000BH and Model 5000BHC backplanes without altering the module's performance.

The Model 5005BH ATM/Router Backplane (see [Figure 3-2](#)) has a single Centillion ATM bus and PPX® bus. The Centillion ATM bus spans slots 2 through 7 in the Model 5005BH chassis. When you install a System 5000 Model 5625HD switch module in one of these slot ranges, you must also install an MCP switch module (such as the Model 5720M ATMSpeed MCP module) in the same range of slots. You can attach up to six System 5000 switch modules (one of which must be an MCP module) in a Model 5005BH chassis.

The PPX bus spans slots 2 through 7. A router module may be installed in any of these slots. Router modules for the Model 5000BH ATM/Router Backplane include the Model 5380 Ethernet Router Module, the Module 5580 Token Ring Router Module, and the Model 5782 Centillion MultiProtocol Engine Module.

Any slot designated for switch modules can also be used for a standard Ethernet, token ring, or FDDI, or ATM module with the appropriate backplane(s) installed in the chassis. Slot 1 is reserved for the clock module.

[Figure 3-2](#) shows the logical relationship between the Model 5005BH ATM/Router Backplane and shared-media backplanes in a Model 5005BH chassis.



8749EA

**Figure 3-2. Model 5005BH Chassis Backplanes**

## Required Tools and Equipment

You need the following tools and equipment to install a Model 5625HD switch module:

- Medium flat-tip screwdriver
- Grounded antistatic mat and wrist strap or discharge leash



**Caution:** The System 5000 equipment uses electronic components that are sensitive to static electricity. Static discharge from your clothing or other fixtures around you can cause damage. Take all possible precautions to prevent static discharge damage when working with printed circuit boards.

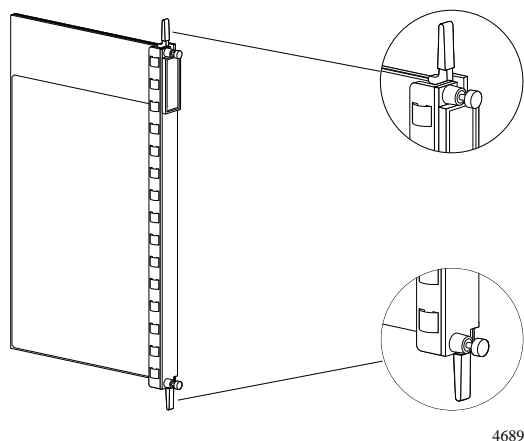
Place each module on a grounded antistatic mat until you are ready to install the module. If you do not have an antistatic mat, wear a wrist strap or discharge leash to free yourself of static before touching any of the modules, or free yourself of static by touching the metal chassis before handling the module.

---

## Installing the Switch Module

To install and secure the Model 5625HD switch module in the chassis:

1. **Remove the filler panel from the chassis slot where you intend to install the module.**
2. **Extend the switch module inserter/extractor levers to the vertical position (Figure 3-3).**



**Figure 3-3. Inserter/Extractor Levers in Vertical Position**

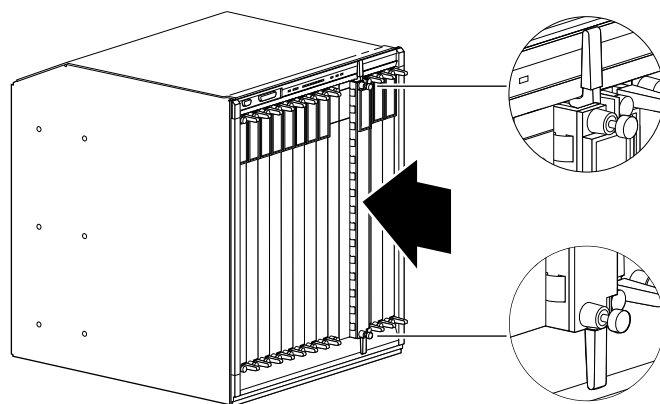


**Note:** These instructions illustrate installing a Model 5625HD switch module in a Model 5000BH/BHC chassis. The instructions also apply to a Model 5005BH chassis.

---

3. **Align the top and bottom edges of the metal printed circuit board carrier with the slot card guides at the top and bottom of the slot.**
4. **Slide the switch module into the chassis until you feel it engage the backplane (Figure 3-4).**

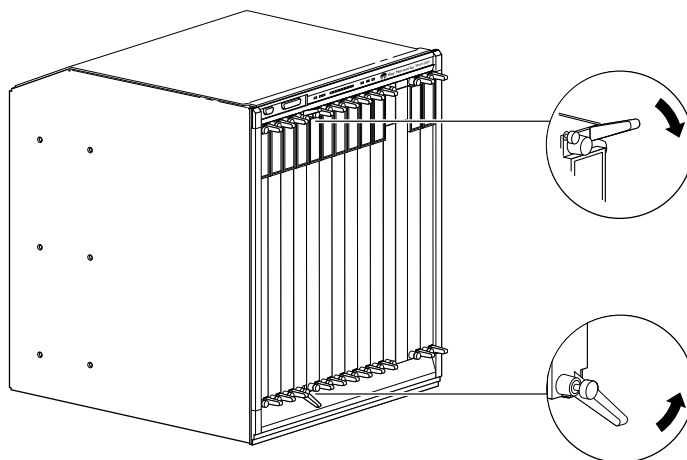
The inserter/extractor levers should still be in the vertical position and in contact with the front of the chassis. *Do not* push the switch module all the way into the chassis.



3649.1

**Figure 3-4. Installing the Module**

5. Rotate the inserter/extractor levers in toward the center of the switch module front panel to seat the backplane connectors ([Figure 3-5](#)).



4690.2

**Figure 3-5. Seating the Backplane Connectors**

6. Use the flat-tip screwdriver to tighten the captive retaining screws at both ends of the switch module front panel.

## Checking LEDs

Immediately after you have installed a Model 5625HD switch module, watch the LEDs on the front panel. If the board is installed and functioning properly, the following LED color sequence occurs:

- The annunciator lights amber and then lights green.
- The Port Status LEDs light green or amber for each port showing link status or port management disabled status.
- Each Port Speed LED lights green when you have a 100 Mb/s Ethernet connection and is off when you have a 10 Mb/s connection.

See [Appendix C, “LEDs,”](#) for the LED definitions.

## Making 10/100 Mb/s Connections

The 10/100 Mb/s jacks on the Model 5625HD switch module accept standard UTP or STP cable connections.

To connect network devices to the 10/100 Mb/s ports on the Model 5625HD switch module, follow these guidelines:

- Use Category 3 or 5 UTP or STP cable with RJ-45 connectors for the ports on the Model 5625HD switch module.
- Use straight-through cables to connect the network interface card (NIC) in a PC workstation or server. These devices typically have MDI connectors.
- Use a crossover cable to connect to ports configured as MDI-X (such as Ethernet hubs).

For more information about cables, connectors, and connector pin assignments, see [Appendix B, “Cables and Connectors.”](#)



---

## Connecting Terminals and Management Stations

This section provides information about connecting terminals or PCs to the service port on the Model 500xBH/BHC chassis. For information about connecting a management station to an MCP module, refer to the using guide shipped with that module.

Refer to *Using SpeedView 4.0 for Windows* and *Release Notes for SpeedView 4.1* for information about advanced configuration and monitoring of the switch.

To connect a terminal to the Model 500xBH/BHC chassis service port, you need the following equipment:

- A TTY-compatible terminal or a portable computer with a serial port and the ability to emulate a TTY-compatible terminal. The terminal communication parameters should be set for:
  - 9600 baud (default)
  - 8 data bits
  - No parity
  - 1 stop bit
  - No handshaking
  - Standard ASCII code
- An RS-232 modem cable with a female DB-9 connector to connect to the service port on the chassis front panel. The cable should use the service port pin assignments that are specified in *Installation and Reference for the Model 5000 Chassis* and *Installation and Reference for the Model 5005 Chassis*.

The other end of the cable must have a connector appropriate to the serial port on your computer or terminal. (Most terminals or computers use a male DB-9 or DB-25 connector.) See [Table 3-1](#) for the pin assignments.



**Note:** RS-232 signals on other pins (such as DTR, CTS, and CD) are ignored.

---

**Table 3-1. Service Port Pin Assignments**

Terminal			To Service Port	
DB-9 Pins	DB-25 Pins	Function	DB-9 Pins	Function
2	3	Receive data	2	Transmit data
3	2	Transmit data	3	Receive data
5	7	Signal ground	5	Signal ground

To connect the terminal to the chassis service port:

- 1. Connect the RS-232 cable to the terminal (or a computer in terminal-emulation mode) and to the chassis service port.**
- 2. Set the terminal communication parameters as described earlier in this section.**
- 3. Turn on the terminal; adjust contrast and brightness as required.**

---

## Checking the Module Connection to the Backplane



**Note:** The Model 5625HD switch module communicates through the MCP rather than the common management bus (CMB). Modules without the CMB interface do not display on the Slot Selection menu, and there is no way to verify that they are connected to the backplane using the service port menus.

---

## Removing and Replacing the Switch Module

This section provides the following information and procedures:

- Conditions for replacing a Model 5625HD switch module
- Removing a Model 5625HD switch module
- Installing the replacement Model 5625HD switch module

### Conditions for Replacing a Switch Module

The following hardware conditions indicate that the switch module needs to be replaced:

- The annunciator on the front panel remains off. This condition indicates that a hardware reset is active or that the module is not receiving +5 volt power.
- The annunciator remains amber. This condition indicates that the module has failed to boot.

For information about using LEDs to troubleshoot an EtherSpeed switch module, see [Appendix C, “LEDs.”](#)

For information about troubleshooting other System 500x modules, refer to the using guide for the specific module.

## Removing a Switch Module

To remove a Model 5625HD switch module from the chassis:



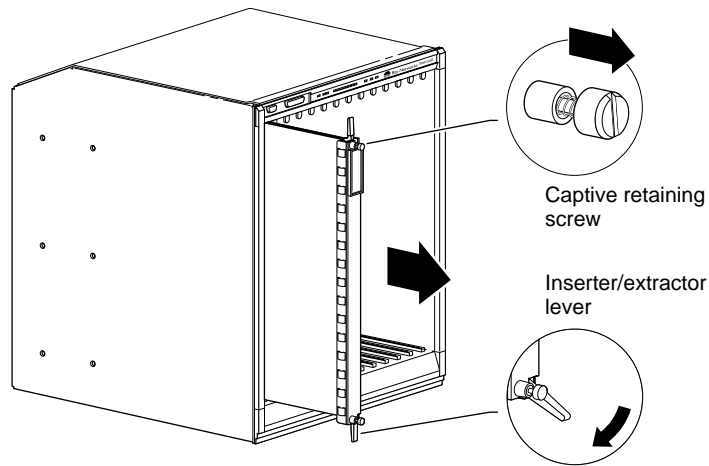
**Note:** Be sure to remove cables from all ports on the module, or disable all the ports through the management interface, prior to hot-swapping.

---

1. Use a flat-tip screwdriver to loosen the two captive retaining screws that secure the module to the chassis.

These screws are spring-loaded to pop outward when they are unscrewed from the chassis. The screws are held in place on the module front panel by locking washers.

2. Rotate the top and bottom inserter/extractor levers away from the center of the switch front panel to release the module from the backplane connectors ([Figure 3-6](#)).



3249.10

**Figure 3-6. Releasing the Backplane Connectors**

**3. Slide the Model 5625HD switch module out of the chassis.**

Hold the front panel with one hand while you support the bottom of the switch module with the other hand.

**4. Place the Model 5625HD switch module on an antistatic mat until you are ready to put it back into the chassis.**

**5. If you are not installing another Model 5625HD switch module, install a filler panel over the empty slot.**

## Installing the Replacement Switch Module

To install the replacement switch module, follow the procedure described in [“Installing the Switch Module”](#) on [page 3-6](#).

## Reconfiguring the Replacement Switch Module

The Model 5625HD switch module keeps the configuration of an identical replacement module. If the replacement is not a Model 5625HD switch module, the module needs to be reconfigured after it has been replaced. Follow the procedure described in [“Installing the Switch Module”](#) on [page 3-6](#).



---

# Chapter 4

## Troubleshooting

This chapter provides suggestions for troubleshooting problems with a Model 5625HD EtherSpeedII 24-Port Autonegotiating Switch Module and includes the following topics:

- Preliminary steps in troubleshooting ([page 4-2](#))
- Incompatibility with the configuration of a previously installed module ([page 4-2](#))
- Startup failure in the Model 5625HD switch module ([page 4-3](#))
- Problems with the port connection ([page 4-4](#))

To expedite support when you call Nortel Networks, please have the following information ready:

- Hardware configuration
- Software configuration (including the image file version number and SpeedView version number)
- Network diagram
- Module or switch part number and serial number for the suspected module
- Brief description of the problem

## Preliminary Steps

If you suspect problems with a newly installed Model 5625HD switch module, start troubleshooting by checking the following items:

- Check all power cable connections and power sources.
- Check network cable connections to be sure connectors are properly seated.
- Make sure the cables are the correct type, with correctly wired connectors.
- Check the LEDs for indication of link status.

## Previous Module Configuration Incompatibility

**Symptom:** A module in a powered-on chassis fails to start up.

The slot the module occupies in the System 500xBH/BHC chassis may have had a different module type installed in it previously.

The Model 5625HD switch module keeps the configuration of an identical replacement module. If the replacement is not a Model 5625HD switch module, the module needs to be reconfigured after it has been replaced. Follow the procedure described in [“Installing the Switch Module”](#) on [page 3-6](#).

To check for possible incompatibility in module type:

- 1. Connect a SpeedView management station to the MCP port on the switch, using either the direct connection or the modem connection.**

This procedure is described in *Using SpeedView 4.0 for Windows and Release Notes for SpeedView 4.1*.

- 2. Select the Map menu.**

If this module is displayed with all ports disabled, the MCP module is not able to manage this module because there is no stored configuration information about the module. You must enable the ports and download the new configuration to the MCP module.

After you download the new configuration, you are prompted to reset the switch.



---

## Model 5625HD Switch Module Startup Failure

**Symptom:** All LEDs are off on the Model 5625HD switch module.

This condition indicates that the links on all ports are not functioning.

To resolve the problem:

1. **Use the CLI, SpeedView, or other network management tool to verify port status.**
2. **Ensure that all modules in the chassis are firmly seated and that the retaining screws have been tightened.**
3. **Remove and reinsert the failing module.**

If the problem persists, contact Nortel Networks customer support. Be ready to give the service representative the information listed on [page 4-1](#).

## Port Connection Problems

**Symptom:** The LED on an Ethernet port is off.

If an LED does not light when traffic is present, there may be a port connection problem.

To resolve the problem:

**1. Verify whether or not the port is enabled, using SpeedView or the CLI.**

**a. From the Map window in SpeedView, choose Switch and then choose Configure.**

When the configuration information has been downloaded to the management station, check the port state. The port state should be either enabled or disabled.

**b. From the Map window, choose Statistics.**

When the statistics information has been downloaded to the management station, check the port state. If the port state is Down, the port is receiving no link signal or it is disabled.

**c. From a configuration terminal connected to the serial port on the switch, access the CLI.**

Use the **show port** command and specify the module number and port number for the suspected port. When the port information is displayed, verify that port\_state is up and SPTstate is forwarding.

**2. Verify that the cable is correctly connected.**

Disconnect and reseal the cable at the Model 5625HD switch module port and at the patch panel or punchdown block. Check the port LED for a change in status.

---

**3. Verify that the port is transmitting and receiving data frames.**

**a. Check the green RJ-45 LED, which indicates a data exchange.**

Refer to [Appendix C, “LEDs,”](#) for additional information.

**b. From the Map window in SpeedView, choose Statistics.**

When the statistics information is displayed at the management station, verify that the octet counts for transmit and receive are incrementing. Also verify that the frame counts for transmit and receive unicast traffic and for multicast traffic are incrementing.

**c. From a configuration terminal connected to the serial port on the switch, access the CLI.**

Use the **show port** command and specify the module number and port number for the suspected port. Verify that the following counters are incrementing:

- InOctet
- OutOctet
- InUcastPkt
- OutUcastPkt
- MulticastTransmittedOk
- MulticastReceivedOk
- BroadcastTransmittedOk
- BroadcastReceivedOk

**4. If the port still fails, try inserting it into another switch network or shared segment.**

If the port functions correctly, check the status of the first switch network or shared segment.

If the port fails to function, contact Nortel Networks customer support. Be ready to give the service representative the information listed on [page 4-1](#).



---

# Appendix A

## Technical Specifications

This appendix provides technical specifications for the Model 5625HD EtherSpeedII 24-Port Autonegotiating Switch Module. For connector pin assignments and other information about cables, see [Appendix B, “Cables and Connectors.”](#)

---

<b>Industry Protocols and Standards</b>	ISO/IEC 8802-3 (ANSI/IEEE 802.3) Fifth Edition 1996-07-29 Clause 4: Medium Access Control and Clause 14: Twisted-Pair Medium Attachment Unit (MAU) and Baseband Medium Type 10BASE-T.  IEEE Std. 802.3u-1995, Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units, and Repeater for 100 Mb/s Operation, Type 100BASE-T (Clauses 21-30).
<b>Interface Options</b>	RJ-45 connectors (8-pin modular)
<b>Data Rates</b>	10 Mb/s and 100 Mb/s switched Ethernet
<b>Autonegotiating Features</b>	10/100 Mb/s speed autonegotiation Half/Full Duplex autonegotiation
<b>Microprocessor</b>	64-bit MIPS 5000 series processor, 200 MHz per module
<b>Memory</b>	
Processing	8 MB
Dynamically Allocated Buffer Pool	16 MB
CAM (Content Addressable Memory)	8,192 entries
SIMM Flash Memory	4 MB

---

**Electrical Specifications**

Power Consumption	57 W (max)
Thermal Rating	194.5 BTU/hr (max)

**Physical Specifications**

Dimensions	(L) 10.5 in. x (W) 12.25 in. x (H) 1.0 in. [(L) 26.7 cm x (W) 31.7 cm x (H) 2.5 cm]
Weight	Module alone: 4 lbs, 14 oz. (2.05 kg) Packaged: 6 lbs (2.7 kg)

**Environmental Specifications**

Operating Temperature	5° to 40° C
Storage Temperature	-25° to 70° C
Operating Humidity	85% maximum relative humidity, noncondensing
Storage Humidity	95% maximum relative humidity, noncondensing
Operating Altitude	10,000 ft (3,000 m) (max)
Free Fall/Drop	ISO 4180-s, NSTA 1A
Vibration	IEC 68-2-6/34
Shock/Bump	IEC 68-2-27-29

**Electromagnetic Emissions**

Meets requirements of	FCC Part 15, Subpart B, Class A EN 55 022 (CISPR 22:1985), Class A VCCI Class 1 ITE
-----------------------	---

**Electromagnetic Susceptibility**

Electrostatic Discharge (ESD)	EC 801-2, Level 2
Radiated Electromagnetic Field	EC 801-2, Level 2
Electrical Fast Transient/Burst	EC 801-4, Level 2
Electrical Surge	IEC 801-5, Levels 1 and 2 Complies with EN 50082-1 (European CE mark requirements)

---

<b>Safety Agency Approvals</b>	<p>International Electrical Code of 950 (IEC 950)</p> <p>Underwriters Laboratories (UL 1950)</p> <p>Canadian Standards Association (C22.2 No. 950) or Bi-national Standard (UL1950 and C22.2 No. 950) equivalent to UL and cUL</p> <p>European Union (EN60950)</p> <p>Norma Oficial Mexicana (NOM-19-SCFI)</p> <p>Meets UL-94-V1 (PWB) flammability requirements</p>
<b>Mean Time Between Failure (MTBF)</b>	347,000 hours*
<b>Cabling Specifications (Model 5625HD)</b>	<p>Types: Category 3 or 5 unshielded twisted pair (UTP) or shielded twisted pair (STP)</p> <p><b>Note:</b> Category 3 UTP cable may be used only for 10 Mb/s port operation, not for 100 Mb/s or 10/100 Mb/s autonegotiating port operation where the negotiated rate may be 100 Mb/s.</p> <p>Maximum Length: 100 meters (cable plant and patch cables inclusive)</p> <p>Connector Types: Shielded RJ-45 connectors</p>

---

\*See the Disclaimer on page ii of this manual.





---

# Appendix B

## Cables and Connectors

This appendix provides general information about 10BASE-T and 100BASE-TX cabling and connections.

### UTP Cable Length Limitations

All 10BASE-T/100BASE-T ports on the Model 5625HD switch module support the maximum lengths for twisted pair cable that are specified in the IEEE 802.3 10BASE-T/100BASE-TX Ethernet specification. This specification defines the maximum segment length in terms of the performance characteristics of the cable media, which can vary according to cable type. In most networks, cable runs are less than 100 meters (m) to ensure that data is not distorted or lost.

For UTP links of #24 AWG cable between a network interface (transceiver or 10BASE-T/100BASE-TX network interface controller) and a hub or between hubs, these performance specifications are normally met by a cable run of 100 m (330 ft) or less, including any patch cables and cross-connect cables. The 10BASE-T/100BASE-TX standard specifies this length as a design objective. The Model 5625HD switch module is designed to support a maximum cable length of 100 m.

Your cable plant can contain Category 3 or 5 UTP cables, up to a maximum length of 100 m between the end station and the Model 5625HD switch module. Use an appropriate patch cable to connect your cable to this module. For additional information, refer to Appendix A in *Planning and Managing a System 5000 Network* (see “Related Publications” in the Preface).

## UTP Cabling

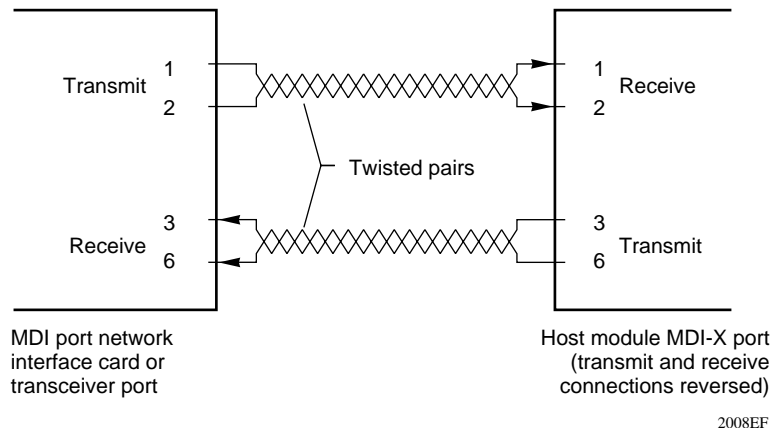
A 10BASE-T/100BASE-TX connection between two ports requires two twisted pairs. The transmit data (TD) pair carries data out from the port transmitter. The receive data (RD) pair carries data to the port receiver.

The 10BASE-T/100BASE-TX TD and RD circuits must be connected as follows:

- Individual conductors must provide pin-to-pin continuity (TD+ to RD+, TD- to RD-, and so on) between the Model 5625HD switch module port and the attached MDI port on a transceiver or other network interface.
- Each signal circuit must use a single twisted pair throughout the link.
- Standard Ethernet patch panels and cables provide the previous features.

## 10BASE-T/100BASE-TX MDI Ports and MDI-X Ports

In the 10BASE-T/100BASE-TX standard, MDI is the electrical and mechanical interface specified for the 10BASE-T/100BASE-TX transceiver or network interface card connector (for example, on the station at the end of a link). MDI port pins 1 and 2 carry the transmit (TD) signal, and pins 3 and 6 carry the receive (RD) signal as shown in [Figure B-1](#).

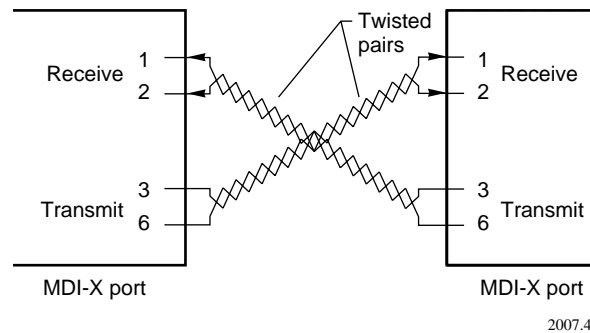


**Figure B-1. MDI-X Internal Crossover (RJ-45 Example)**

The Model 5625HD switch module receives data on pins 1 and 2 and transmits its data on pins 3 and 6. The host module ports implement this MDI standard crossover internally and are called MDI-X (the X for crossover), as shown in [Figure B-1](#). All Model 5625HD switch module 10BASE-T ports are MDI-X standard.

Two simple rules govern all usual RJ-45 connections from each Model 5625HD switch module 10BASE-T/100BASE-TX port to the 10BASE-T/100BASE-TX port on another device:

- A straight-through cable (MDI to MDI-X) is customarily used for connection to a station NIC, to a transceiver, or to a cable plant patch panel.
- A crossover cable or adapter (MDI-X to MDI-X; as shown in [Figure B-2](#)) is customarily used for connection to another switch or hub port.



**Figure B-2. MDI-X to MDI-X External Crossover (RJ-45 Example)**

Making the crossover externally with a crossover cable or adapter that exchanges the TD and RD wire pairs (as shown in [Figure B-2](#)) is possible but has the following disadvantages:

- Because a crossover cable is not standard, you might have to specially order one or make your own.
- Having crossover cables and standard cables that resemble one another in a network invites confusion.

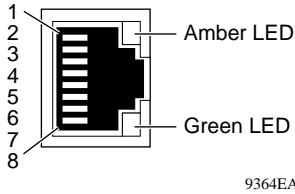


**Caution:** Make any crossover cable you use look obviously different from normal straight-through cables and put a tag on each end; for example, use a distinctive color like yellow and put a tag labeled “X-over” on each end.

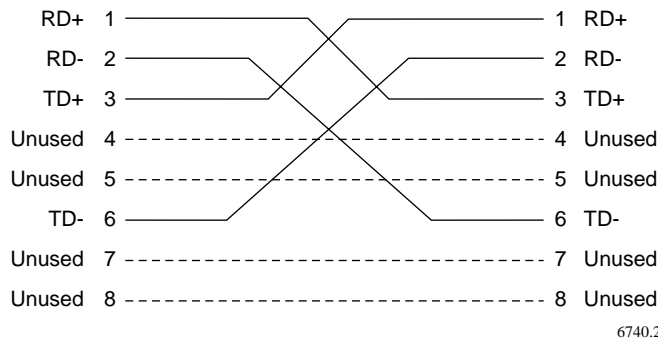
## UTP Cables and Connectors

[Table B-1](#) shows the pin assignments for 10BASE-T/100BASE-TX ports in the standard MDI-X configuration.

**Table B-1. 10BASE-T/100BASE-TX MDI-X Port Pin Assignments**

RJ-45 Connector Port	Pin #	MDI-X Ports
	1	Receive data +
	2	Receive data -
	3	Transmit data +
	4	Not used
	5	Not used
	6	Transmit data -
	7	Not used
	8	Not used

[Figure B-3](#) shows a 10BASE-T/100BASE-TX Ethernet UTP crossover cable used to connect an Ethernet hub directly to the Model 5625HD switch module.



**Figure B-3. 10BASE-T/100BASE-TX Ethernet UTP Crossover Cable**

Pin 1 crosses to pin 3, and pin 2 crosses to pin 6. To build this cable, you must cross pairs. The pairs are listed in [Table B-2](#), with an example of the color combinations found in two typical cables.

**Table B-2. Pairs in an RJ-45 Crossover Cable**

Pairs	Example 1 Color Combinations	Example 2 Color Combinations
1 and 2	Orange/white and white/orange	Orange and blue
3 and 6	Green/white and white/green	Yellow and black
4 and 5	Blue/white and white/blue	Red and green
7 and 8	Brown/white and white/brown	Brown and gray

## Using Category 5 Unshielded Twisted Pair Cables

Unshielded twisted pair (UTP) cable is the recommended wiring option for 100BASE-TX Fast Ethernet, as specified in the IEEE 802.3 standard for Ethernet. Fast Ethernet recommended UTP cable consists of four pairs of twisted insulated copper conductors bound in a single plastic sheath. The 100BASE-TX Fast Ethernet transmissions are implemented through two-pair or four-pair Category 5 UTP wiring using standard shielded RJ-45 connectors. Category 5 cable is certified to handle up to 100 MHz bandwidth. The EIA/TIA T568A standard recommends the installation of Category 5 UTP cable for 100 Mb/s networks.

Use the following guidelines to ensure that your cables perform to specifications:

- **Certification**—Make sure that your Category 5 UTP cable has completed the Underwriters Laboratories (UL) or Electronic Testing Laboratories (ETL) certification process.
- **Terminating method**—To minimize crosstalk noise, maintain the twist ratio of the cable up to the point of termination (untwist at any termination should not exceed 0.5 in.).
- **Pairing options**—For optimal performance from your cable plant, use the EIA-T568A Commercial Building Wiring Standard pairing option at each end of the cable. The terminating hardware offered by most major manufacturers is correctly color-coded for proper wire placement according to that standard.

## Using Shielded Twisted Pair Cables

Type 1 shielded twisted pair (STP) cabling also operates with 10BASE-T Ethernet and 100BASE-TX Fast Ethernet. Type 1 STP cable consists of tinned-copper braided shield surrounding two data-grade twisted pairs of #22 AWG solid copper conductors that have individual or S-shaped shields of aluminum-backed insulating tape or metallized Mylar foil.

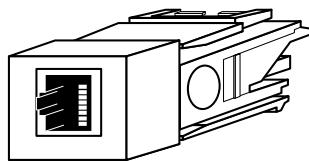


**Note:** A balun media adapter is required when connecting 100-ohm RJ-45 100BASE-TX ports to a 150-ohm STP cable plant. This adapter provides impedance matching between UTP (100-ohm) and STP (150-ohm) cabling.

---

Type 1 cable generally is used between wiring closets or from the wiring closet patch panel to the work area wall outlet.

Type 1 cable generally is terminated with an IBM four-position (MIC) data connector. Nortel Networks Fast Ethernet supports 100BASE-TX Fast Ethernet over STP media through the application of a specialized balun media adapter, also referred to as a Type 1 balun ([Figure B-4](#)). When adapting 150-ohm STP cable plants for Fast Ethernet applications, balun media adapters are required at both the hub and station ends of the STP cable plant. Media adapters (such as AMP part number 558421-1) are available that plug into the RJ-45 patch cable connectors, allowing the patch cable to connect with an IBM data connector. The media adapter and patch cable provide impedance matching between UTP (100-ohm) and STP (150-ohm) cabling.



6737

**Figure B-4. Fast Ethernet Type 1 Balun Media Adapter**



**Note:** For additional information about AMP Type 1 balun media adapters (part number 558421-1), contact your AMP reseller or distributor. The user should verify that the combination of the STP cable plant and the impedance-matching baluns meets the requirements of the applicable LAN standard.

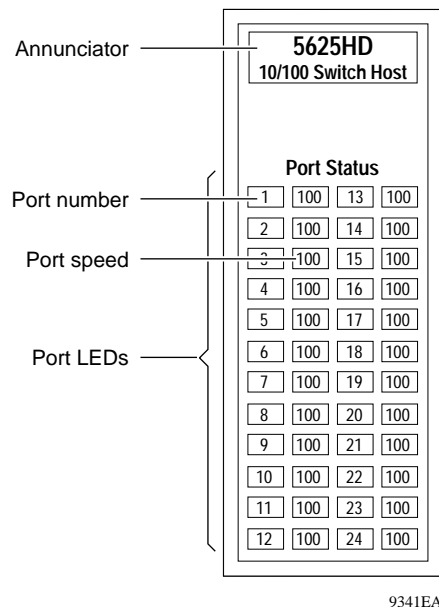
---

# Appendix C

## LEDs

This appendix describes the LED displays for the Model 5625HD switch module.

The LED display ([Figure C-1](#)) consists of two LEDs for each port. The LEDs labeled with the port number indicate specific operating status. The LEDs labeled 100 indicate the port speed.



**Figure C-1. LED Display for the Model 5625HD Switch Module**

[Table C-1](#) describes the operating conditions that cause the LEDs to light on the Model 5625HD switch module.

**Table C-1. LEDs on the Model 5625HD Switch Module**

Type	Label	Color/Status	Meaning	
Annunciator	5625HD 10/100Mb/s Switch Host	Amber	The switch is booting.	
		Green	The switch is running.	
		Off	The switch module is not receiving power.	
Port Status	Numbers 1 to 24	Flashing	Green/Amber	Half-duplex/spanning tree is blocked.
			Yellow/Amber	Full-duplex/spanning tree is blocked.
		Yellow		Port is operational at full-duplex mode.
		Green		Port is operational at half-duplex mode.
		Amber		Port is disabled by management.
		Off		Port is enabled, but no link exists.
Port Speed	100	Off		Port is operating at 10 Mb/s.
		Green		Port is operating at 100 Mb/s.



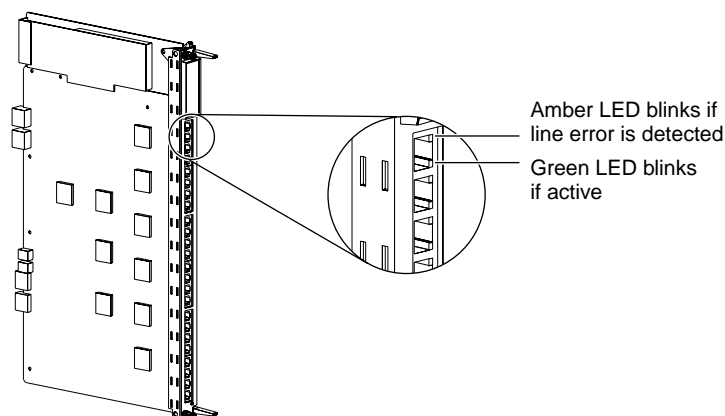
## RJ-45 LEDs

In addition to the LEDs shown in [Figure C-1](#), each port's RJ-45 connector contains two LEDs. The LEDs show Model 5625HD switch module port status.

The amber RJ-45 LED blinks if a line error is detected. The port has detected one or more CRC errors, data alignment errors, or frames that are too long.

In half-duplex mode, this blinking may also indicate receive or transmit collisions on the network, which can happen during normal operation. If these collisions continuously occur, check the statistics for the port from a management interface such as the CLI or SpeedView to identify the type of error.

The green RJ-45 LED flashes to indicate that the port is either actively receiving or transmitting data.



9363FA

**Figure C-2. RJ-45 LEDs for the Model 5625HD Switch Module**



## Numbers

- 100BASE-T
  - connecting, 3-8
  - port description, 1-10
- 10BASE-T
  - connecting, 3-8
  - port description, 1-10
- 802.1d standard, 1-7
- 802.1Q tags, 1-3

## A

- annunciator LED, 3-11
- applications
  - dedicated port for server, 2-5
  - desktop switch, 2-7
  - frame-to-cell converter, 2-10
  - segment switch, 2-9
- ATM uplinks, 2-7
- autonegotiation
  - features, 1-3
  - ports, 1-10

## B

- backbone switch, 2-9
- backplane
  - Centillion ATM bus, 3-2
  - functions, 3-3
  - structure, 1-9
- BayStack switches, 2-10
- bridge, replaced by switch, 2-6

## C

- cables
  - 10BASE-T Ethernet UTP crossover, 3-8
  - Category 5 UTP, B-5
  - connecting to EtherSpeed ports, 3-8
  - crossover, 2-2, B-3, B-5
  - EIA/TIA-T568A cable standard, B-5
  - length limits, B-1
  - RS-232 cable, 3-9
  - STP, B-6
  - straight-through, 2-2, B-3
  - UTP, B-5
- Category 5 UTP, B-5
- Centillion ATM bus, 3-2
- chassis, module placement in, 3-2
- CLI, 1-7, 4-4
- command line interface. *See* CLI
- configuration
  - ATM uplinks, 2-7
  - desktop switch, 2-10
  - frame-to-cell converter, 2-10
  - guidelines, 2-1
  - network examples, 2-3
  - previous, 4-2
  - segment switch, 2-9
  - SpeedView, 1-1
  - SpeedView predefined, 2-12
- configuration terminal
  - equipment settings, 3-9
  - protocol setup, 3-10
- congifuration
  - default, 2-12
- connections
  - problem, 4-4
  - to servers, 2-5

## connectors

- 10BASE-FL, 3-9
- 10BASE-T, 3-8
- RJ-45, 1-2, 1-10, B-4

crossover cable, 2-2

crossover cables, 2-2, B-3, B-5

customer support, xviii

## D

dedicated ports, 2-5

default configuration, 2-12

desktop switch, 2-7, 2-10

## E

EIA/TIA-T568A cable standard, B-5

enterprise network, segment switch in, 2-9

## F

factory default configuration, 2-12

features, 1-3

filtering, 1-8

filters parameter, 2-12

frame-to-cell converter, 2-10

## H

hot-swapping, 1-8

hubs, connecting, 2-2

## I

### installation

- modules, 3-6
- modules in Model 5000BH/5005BH chassis, 3-2
- switch module, 3-6
- tools and equipment, 3-5
- verifying, 3-8

## L

### LEDs

- annunciator, C-1
- description, C-2
- location, 1-10
- matrix illustration, C-1
- RJ-45 connector, C-3
- verifying installation, 3-8

## M

Management Information Base. *See* MIB

MDI connections, 2-2

MDI-X pin assignments, B-4

MIB-I, MIB-II support, 1-7

MLT, 2-11

mode parameter, 2-12

### modules

- arranging in Model 5000BH/5005BH chassis, 3-2
- installing, 3-6
- removing and replacing, 3-12

MPOA (multi-protocol over ATM), 1-4

Multi-Link Trunking, 2-11

## N

network devices, connecting, 2-2

### network examples

- dedicated port for server, 2-5
- desktop switch, 2-7
- frame-to-cell converter, 2-10
- overview, 1-2
- segment switch, 2-9

network management features, 1-6

NIC (network interface card), 3-8

## O

Optivity, 1-6

## P

path cost parameter, 2-12

physical configuration, 2-1

- pin assignments
  - MDI port, B-2
  - MDI-X port, B-2, B-4
  - service port, 3-10
- port
  - 100BASE-T, connections, 1-10
  - 10BASE-T, connections, 1-10
  - connection problems, 4-4
  - dedicated, 2-5
  - MDI, B-2
  - MDI-X, 2-2, B-2, B-4
  - priority, 2-12
  - speed, 2-12
  - state, 2-12
- product support, xviii
- protocol setup for terminal configuration, 3-9
- publications
  - hard copy, xvii
  - related, xvi

## R

- replacement conditions, 3-11
- rfc 1213, 1-7
- RJ-45 connector LEDs, C-3
- RJ-45 connectors, 1-2
- RS-232 cable, 3-9

## S

- sample networks
  - dedicated port for server, 2-5
  - desktop switch, 2-7
  - frame-to-cell converter, 2-10
  - segment switch, 2-9
- segment switch, 2-9
- server, dedicated port, 2-5
- service port
  - connecting a terminal, 3-9
  - pin assignments, 3-9
  - terminal attributes, 3-9
- shared media and switches, 2-9
- slots, placement of modules in, 3-2
- SNMP support, 1-7

- Spanning tree group
  - parameter, 2-12
- Spanning Tree Protocol
  - parameter, 2-12
  - support, 1-7
- specifications, technical, A-1
- SpeedView
  - description, 1-6
  - predefined configurations, 2-12
  - using for troubleshooting, 4-4
- stackable switches, 2-10
- STP cable guidelines, B-6
- straight-through cable, 2-2, B-3
- support, Nortel Networks, xviii
- switch, configuration and management, 1-6
- switching mode parameter, 2-12

## T

- technical publications, xvii
- technical specifications, A-1
- technical support, xviii
- terminal
  - communication parameters, 3-9
  - service port, 3-9
- tools and equipment for installation, 3-5
- troubleshooting, 3-11, 4-1
- TTY-compatible terminal, 3-9

## U

- UTP (unshielded twisted pair) cables
  - Category 5 guidelines, B-5

## V

- virtual LANs, support for, 1-8
- VLANs
  - description, 1-8
  - protocol-based, 1-3



## Free Manuals Download Website

<http://myh66.com>

<http://usermanuals.us>

<http://www.somanuals.com>

<http://www.4manuals.cc>

<http://www.manual-lib.com>

<http://www.404manual.com>

<http://www.luxmanual.com>

<http://aubethermostatmanual.com>

Golf course search by state

<http://golfingnear.com>

Email search by domain

<http://emailbydomain.com>

Auto manuals search

<http://auto.somanuals.com>

TV manuals search

<http://tv.somanuals.com>